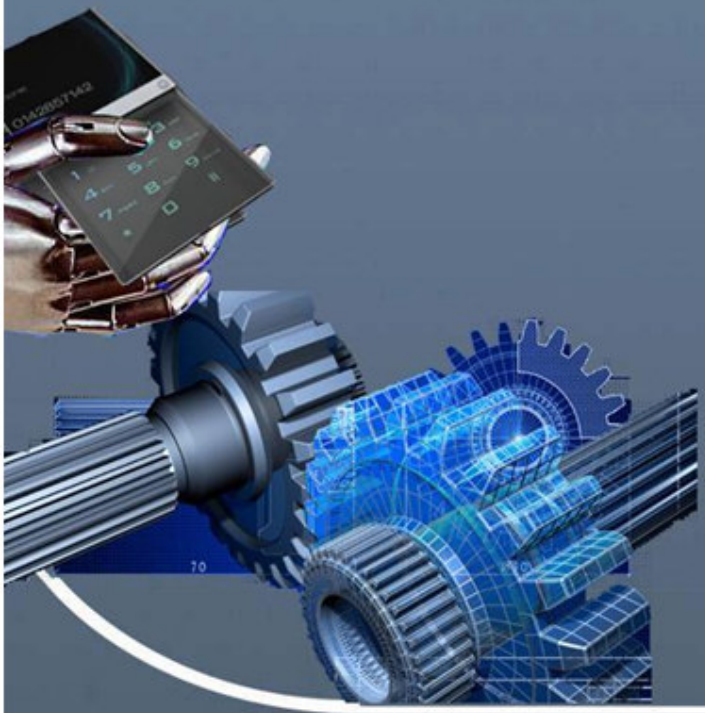
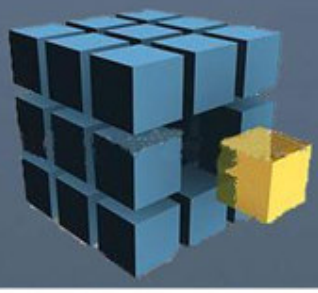
GMRIT

GMRIT TECHMAG

Vol: 4 April-2010





A few selected Photos will be pasted (Cover page back side view)

TechMag 2010

TechMag- GMRIT

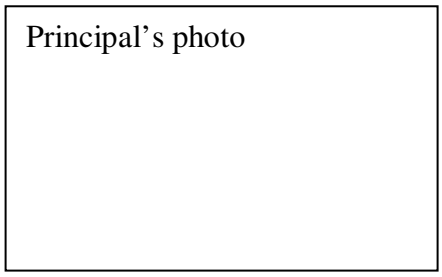
Vol. 4 **April 2010**

Table of Contents

Editorial Board

Feed back: gmrit@gmrit.org

Foreword (First Draft)



Dr. C.L.V.R.S.V.PRASAD,
Principal, GMRIT, Rajam

Reverse side of Foreword (No matter will be printed)

UBIQUITOUS COMPUTING

P.B.Kanishka
1st B.Tech.
balakanishka@gmail.com

S.Narendra
1st B.Tech.
narendra_s2007@yahoo.com

The word "ubiquitous" comes from a Latin word meaning "omnipresence." In a ubiquitously-networked society, not only mobile phones, PCs, PDAs and other communications terminals, but also intelligent appliances, home robots, and many other home electronics will be linked together, resulting in an extensive communications environment entirely different from what we know today.

Ubiquitous networking lies between network computing and exotic computing. It doesn't rely on devices such as paper computers and wearable computers, which currently exists only on drawing board, but on devices which already exist not desktop or portable computers, but devices such as mobile phones, home based information appliances ,car navigation systems, digital TV sets and video game machines will be linked by broadband wired and wireless networks.

WORKING OF UBIQUITOUS NETWORK:

1. PREREQUISITES FOR UBIQUITOUS NETWORKING:

A group of researchers at AT&T Laboratories Cambridge are preparing to put a new spin on mobile computing. In addition to taking the hardware with you, they are designing a ubiquitous networking system that allows your program applications to follow you wherever you go. By using a small radio transmitter and a building full of special sensors, your desktop can be anywhere you are, not just at your workstation. At the press of a button, the computer closest to you in any room becomes your computer for as long as you need it.

2. SENDING BAT SIGNALS:

The AT&T researchers came up with the ultrasonic location system. This location tracking system has three basic parts:

- Bats - small ultrasonic transmitters worn by users
- Receivers - ultrasonic signal detectors embedded in ceiling
- Central controller - coordinates the bats and receiver chains

Users within the system will wear a bat, a small device that transmits a 48-bit code to the receivers in the ceiling. Bats also have an imbedded transmitter which allows it to communicate with the central controller using a bidirectional 433-MHz radio link.

Inside the bat ultrasonic transmitter shows two copper coil antennae, a radio transmitter module, a battery and ultrasonic transmitters

A bat will transmit an ultrasonic signal, which will be detected by receivers located in the ceiling approximately 4 feet (1.2 m) apart in a square grid. An object's location is found using trilateration, a position-finding technique that measures the objects distance in relation to three reference points.

3. IN THE ZONE:

With an ultrasonic location system in place, it's possible for any device fitted with a bat to become yours at the push of a button. When all the sensors and bats are in place, they are included in a virtual map of the building. The computer uses a spatial monitor to detect if a user's zone overlaps with the zone of a device.

4. INFORMATION HOPPERS AND SMART POSTERS:

Once these zones are set up, computers on the network will have some interesting capabilities. The system will help us store and retrieve data in an "information hopper." This is a timeline of information that keeps track of when data is created.

Another application that will come out of this ultrasonic location system is the smart poster. A conventional computer interface requires us to click on a button on our computer screen. In this new system, a button can be placed anywhere in your workplace, not just on the computer display.

THE TECHNOLOGY FOR UBIQUITOUS NETWORKING

1. UBIQUITOUS COMPUTING**:** There are three stages in the use of computers :

- Mainframes : one computer, many people;
- Personal computers : one person one computer; and
- Ubiquitous computing : one person ,many computers

2. THE UBIQUITOUS NETWORK MARKET: During the age of the Internet there have been major advances in the hardware, software and the network technology and so many fields are heading in the direction of ubiquitous networking and some of the most important developments have been in the following four fields:

- Information appliances
- Mobile telephones
- Videogame machines

3. INFORMATION APPLIANCES: First, information appliances, which are also referred to as home-based digital devices or home based Internet devices enables user to do things as download information on an artist from the Internet and display it on a television screen. Each smart appliance is linked to their own network.

ARTIFICIAL NEURAL NETWORKS

P.V.Gopalamma & P. Naveena,
III CSE, GMRIT - Rajam.

Neural Networks (NNs) are networks of neurons, for example, as found in real (i.e. biological) brains. Artificial Neurons are crude approximations of the neurons found in brains. They may be physical devices, or purely mathematical constructs. Artificial Neural Networks (ANNs) are networks of Artificial Neurons, and hence constitute crude approximations to parts of real brains. They may be physical devices, or simulated on conventional computers.

From a practical point of view, an ANN is just a parallel computational system consisting of many simple processing elements connected together in a specific way in order to perform a particular task.

Why are Artificial Neural Networks worth studying?

1. They are extremely powerful computational devices.
   (Turning equivalent, universal computers).
2. They can learn and generalize from training data – so there is no need for enormous feats of programming.
3. They are particularly fault tolerant – this is equivalent to the "graceful degradation" found in biological systems.
4. They are very noise tolerant – so they can cope with situations where normal symbolic systems would have difficulty.

What are Artificial Neural Networks used for?

As with the field of AI in general, there are two basic goals for neural network research:

Brain modelling:

The scientific goal of building models of how real brains work. This can potentially help us understand the nature of human intelligence, formulate better teaching strategies, or better remedial actions for brain damaged patients.

Artificial System Building:

Artificial Intelligence:

- The exciting new effort to make computers think i.e. Machine with minds.
- AI defined in four categories:
    1. System that think like humans i.e. Machines with minds.
    2. System that acts like humans.
    3. System that think rationally.
    4. System that act rationally

The engineering goal of building efficient systems for real world applications. This may make machines more powerful, relieve humans of tedious tasks, and may even improve upon human performance. These should not be thought of as competing goals. We often use exactly the same networks and techniques for both. Frequently progress is made when the two approaches are allowed to feed into each other. There are fundamental differences though, e.g. the need for biological plausibility in brains modelling, and the need for computational efficiency in artificial system building.

Learning in Neural Networks

One of the most powerful features of neural networks is their ability to **learn** and **generalize** from a set of training data. They adapt the strengths/weights of the connections between neurons so that the final output activations are correct.

There are three broad types of learning:

1. Supervised Learning (i.e. learning with a teacher)
2. Reinforcement learning (i.e. learning with limited feedback)
3. Unsupervised learning (i.e. learning with no help).

This module will study in some detail the most common learning algorithms for the most common types of neural network. Appropriate mathematical notation facilitates the specification and

programming of artificial neurons and networks of artificial neurons.

Some Current Artificial Neural Network Applications

Brain modelling

1. Models of human development – help children with developmental problems
2. Simulations of adult performance – aid our understanding of how the brain works
3. Neuropsychological models – suggest remedial actions for brain damaged patients

Real world applications

1. Financial modelling – predicting stocks, shares, currency exchange rates
2. Other time series prediction – climate, weather, airline marketing tactician.
3. Computer games – intelligent agents, backgammon, first person shooters
4. Control systems – autonomous adaptable robots, microwave controllers
5. Pattern recognition – speech recognition, hand-writing recognition, sonar signals
6. Data analysis – data compression, data mining, PCA, GTM
7. Noise reduction – function approximation, ECG noise reduction
8. Bioinformatics – protein secondary structure, DNA sequencing.

ENTERPRISE GRID COMPUTING AND ROLE IN REDUCING IT INVESTMENTS

M.DURGA BHAVANI

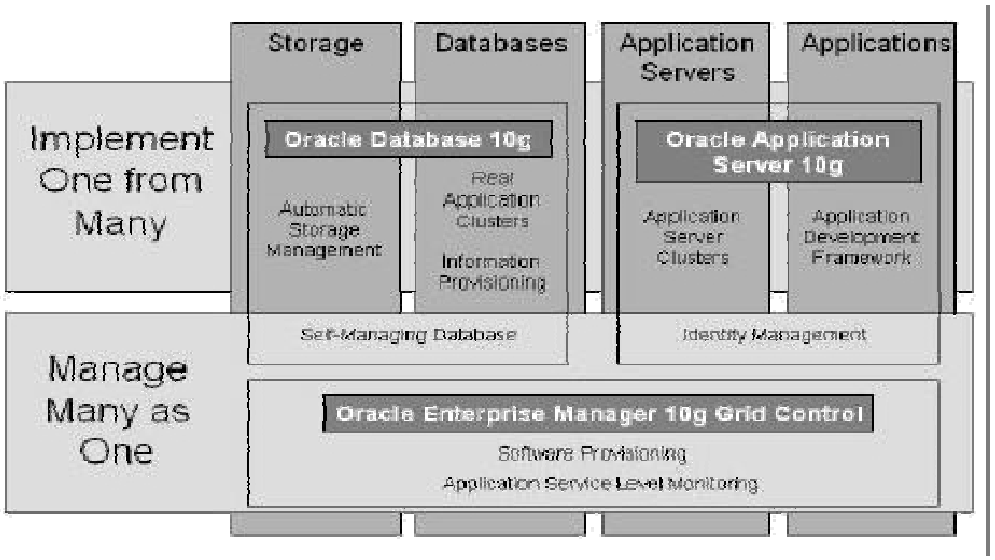
III B.Tech C.S.E

GMRIT, Rajam

Enterprise IT is under continuous pressure to do more with less. Every day something or the other is coming up new in the industry, and companies need to adapt quickly to stay competitive. To deal with the unpredictability and immediacy of computing needs, companies typically size servers for peak loads and staff IT organizations to handle ad hoc requests.

Enterprise Grid Computing

Grid computing architecture is used by enterprises in an attempt to ease the process of homogenizing heterogeneous and soiled compute environments.



1. Implement One from Many: Grid computing coordinates the use of clusters of machines to create a single logical entity, such as a database or an application server. By distributing work across many servers, grid computing exhibits benefits of availability, scalability, performance and uses low-cost components. Because a single logical entity is implemented across many machines, companies can add or remove capacity in small increments, online.

2. Manage Many as One: Grid computing allows user to manage and administer groups of machines, database instances and application servers at low-cost. Grid computing first removes many of the administrative costs of managing a single system by making each database and each application server adaptive to changing circumstances.

Benefits of Enterprise Grid Computing

The primary benefit of grid computing to businesses is achieving high quality of service and flexibility at lower cost. Enterprise grid computing lowers costs by:

- Increasing hardware utilization and resource sharing.
- Enabling companies to scale out incrementally with low-cost components.
- Reducing management and administration requirements.

Grid Computing Attributes

The requirements for grid computing infrastructure can be described by the following attributes:

- **Virtualization** at every layer of the computing stack.
- **Provisioning** of work and resources based on policies and dynamic requirements.
- **Pooling** of resources to increase utilization.
- **Self-adaptive software** that largely tunes and fixes itself.
- **Unified management** and provisioning

ROLE IN REDUCING IT INVESTMENTS

Companies today rely on information technology more than they ever have in the past. Trillions of dollars have been spent in the last decade by companies trying to optimize all aspects of their operations, such as financial, audit, supply chain, back office, sales and marketing, engineering, manufacturing and product development.

Grid Computing Business Value Analysis

Leveraging Existing Hardware Investments & Resources

Reducing Operational Expenses

Creating a Scalable & Flexible Enterprise IT Infrastructure

Accelerating Product Development and Raising customer Satisfaction

Increasing Productivity

REDTACTON

(HUMAN AREA NETWORK)

Sheik imam & S. Pradeep Kumar

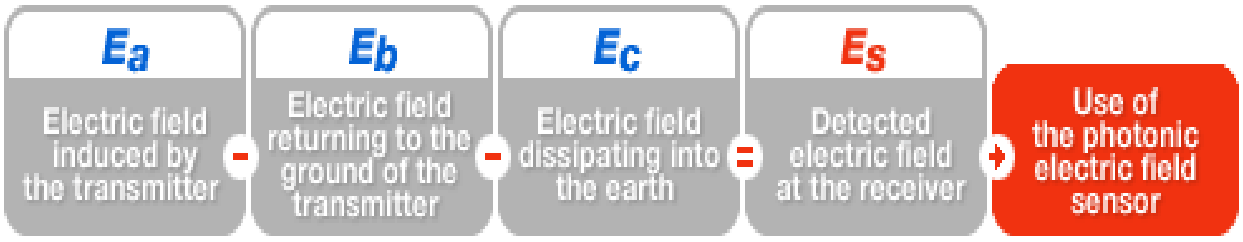
3rd B-Tech, Computer Science and Engineering

Ubiquitous services are characterized by their ability to connect to networks at any time, from anywhere, by any one and for any purpose. To make these services simple enough for anyone to use, it is important that these connections can be established naturally without user's awareness. This necessitates the implementation of "human area network" (HAN), which extends as far as an outstretched arm and thus covers a small region than wide area and local area networks.

When cables are used for communication between terminals, the routing of cables is clearly inconvenient. When very weak radio signals are used for communication, data speeds are reduced by packet collision and other such problems in crowded places exhibition sites and a security risk for unwanted signal interception is another problem. Technology for solving such problems includes the use of person's body as a signal path for communication. A transmission path is formed automatically when a person comes into contact with a device, and communication between mobile terminals begins.

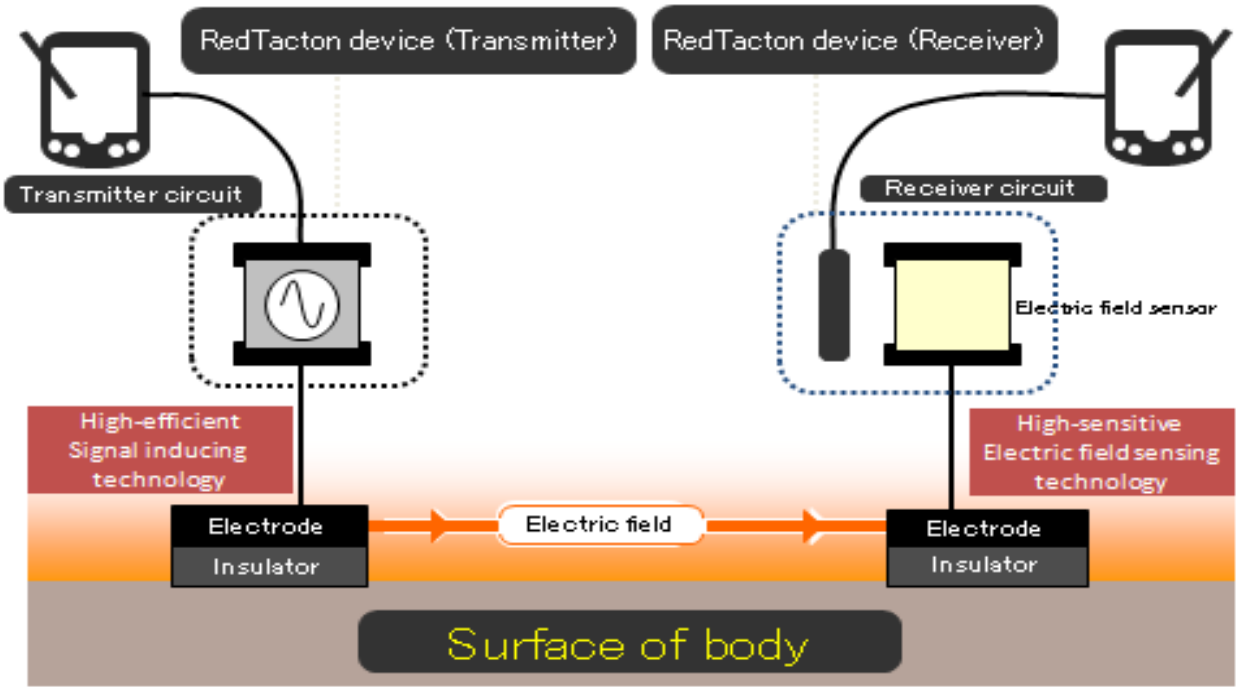
Redtacton is a registered trademark of Nippon Telegraph and Telephone Corporation. This technology on transmission between a person's two hands demonstrated transmission with error rates that pose on practical problems at data speed of 10 Mbit/s. communication between two points other than the two hands, such as between foot and palm of hand, was so confirmed. In addition to points on the body, communication via clothing and shoes was also confirmed.

Mechanism of communication with Redtacton:The naturally occurring electric field induced on the surface of the human body dissipates into the earth. Therefore, this electric field is exceptionally faint and unstable. The super-sensitive electric field sensing technology measures the weak electric fields induced by the super-efficient alternating electric field induction technology developed by NTT. The transmitter sends data based on fluctuations in the weak electric field induced in the body. The electric field is received using super-sensitive electric field sensing technology.



How Redtacton works?

Redtacton can achieve duplex communication over the human body at a maximum speed of 10 Mbps.



The RedTacton transmitter induces a weak electric field on the surface of the body. The electric field sensor (transistor or photonic electric field sensor) detects electric field that reaches the RedTacton receiver. Signals are processed in the receiver circuit and the data is downloaded.

Features of RedTacton: RedTacton has three main functional features.

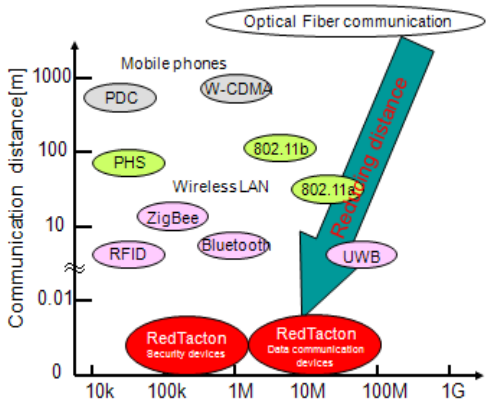
1.Touch: Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations through physical contact according to the human's natural movements.

2.Broad and interactive: Communication speed can deteriorate in crowded spaces due to a lack of bandwidth. . Maximum communication speed may be slower than 10Mbps depending on the usage environment.

3.Any media: In addition to the human body, various conductors and dielectrics can be used as transmission media. Conductors and dielectrics may also be used in combination.

Comparison with other network technologies:

The chart below shows the positioning of RedTacton with respect to existing communication technologies. The focus on ubiquitous service has brought about the shortening of distances in communication. RedTacton is positioned as the last 1m solution to ultimate close-range communication. RedTacton is situated directly between wireless and wired communication.



Security:

- Requires physical contact, means wearing the transceiver and touching something else with a transceiver.
- Less potential for wireless interference and between other RedTacton devices.
- Allows for encryption and authentication.
- You decide what to share with whom and what devices you communicate with.

Conclusion:

We conclude that, when we compare RedTacton with other technology present today it can give a better performance over others. And we can say that to connect the network with in short distances RedTacton is best. In this technology there is no problem of hackers as our body is itself a media. Most important data can be transferred in a most secured medium.

LED's to light up the World

P. Pradeep Kumar

2nd ECE

White light emitting diodes are set for a bright future in the household and commercial lighting markets.

In Short

1. **White LED lights offer many advantages over incandescent, fluorescent and halogen lighting.**
2. **They are already in use, in city streetlights, shops and Buckingham Palace.**
3. **Currently they are expensive to buy, but prices are coming down.**
4. **LED's are predicted to dominate the domestic and commercial lighting market in coming future.**

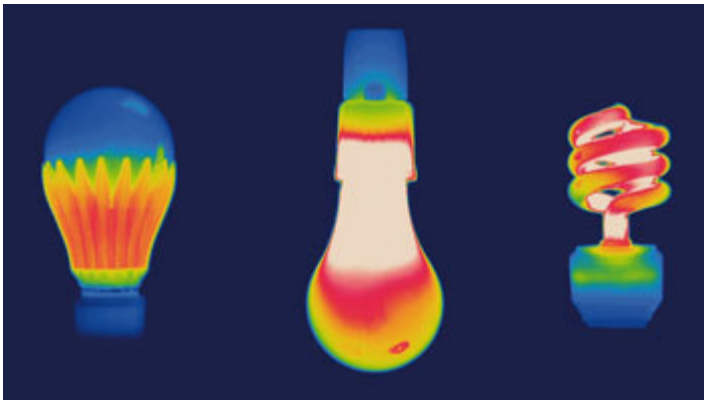
Electronics manufacturers are hailing 2010 as the year that white LED (light emitting diode) lighting will make its mark on the household lighting market. It has been predicted that this year a significant number of consumers will finally start buying LED products to light up their homes. LED lighting, also called solid state lighting, has a long list of potential benefits over incandescent, fluorescent and halogen lighting, including lasting upwards of 20,000 hours before burning out, extremely low power consumption, no UV radiation, no radiated heat from light, easy dimming, colour possibilities without using filters, focusing capability, shock resistance, no buzzing or hum, and easy digital control. But high prices and technology problems have so far prohibited their mass uptake by homeowners.

The LED white lighting market is however already booming in the commercial sector - in offices, hotels, factories and other businesses - as firms, which have more lights glowing for more hours per day than homes, can recoup LED investment within a few years in reduced energy and replacement costs. Companies also benefit from a combination of subsidies and tax breaks for

using these low energy products. Now, manufacturers believe that semiconductor and other technologies behind LEDs are finally capable of producing pleasant white lighting at prices, which although not yet cheap are low enough to trigger increased household sales. And as a result, this year lighting retailers are expanding their offerings of LED lighting products for the home. The market will also get the added boost of government mandated gradual phase outs of electricity-guzzling incandescent bulbs, already underway in Australia and parts of Europe (including the UK), and due to start in 2012 in the US.

Getting technical

The technology behind LED lighting has more in common with the chips in your computer than with incandescent bulbs or fluorescent tubes. With incandescent bulbs, electric current resistance causes tungsten filaments to heat up and glow, with 90 per cent of the energy wasted as heat. In fluorescent lamps, electricity is used to excite mercury vapour, producing shortwave UV light that is converted to visible light when it strikes the tube's phosphor coating, with about 80 per cent of energy wasted as heat. In LED lighting, the diode contains a tiny chip, usually about $1mm^2$ and grown from many layers of semi conducting material. LED lighting packages can contain just one chip or multiple chips, which are mounted on heat-conducting material, called a heat sink and usually enclosed in a lens. Electrons flow within the diode from the p-side (anode) to the n-side (cathode), but not in the reverse direction. As the electrons transit the p-n junction they fall into a lower energy level, which causes them to give off a photon of light. A small amount of heat is released back into the heat sink, leaving LEDs generally cool to touch.



LED bulbs (left) are cooler than incandescent (centre) or fluorescent light bulbs (right)

LED devices, used separately or in arrays, are mounted on circuit boards, which can be programmed to include lighting controls such as dimming, light sensing and pre-set timing. The circuit board is mounted on another heat sink to manage the heat from all the LEDs in the array.

The final system is then generally encased in 'traditional' light bulbs or tubes, called retrofits, designed to be screwed into existing incandescent, halogen or fluorescent fixtures.

Diodes can be made from different materials and substrates, each of which has an individual band gap that determines the light emitting wavelength, with various semiconductor compounds therefore producing unique colours. White light is created by combining light from different coloured LEDs within an LED device, or by coating a blue LED lens with phosphor.

LED's are beginning to light up our cafes…

The chip technology behind LED lighting means that the global lighting market now dominated by Philips, General Electric and Osram Sylvania is going to be wide open to competition. Firms with expertise in semiconductors, such as Samsung and Panasonic,are already marketing or planning to market LED lighting products.

Cyber Crime and Cyber Security

Vanama. Raja Jagannadh

08-4C1-2nd ECE, GMRIT

The history of crime and crime prevention has been akin to the history of warfare: an offense is developed, then a defense counters the offense, then a new offense counters the new defense.

Machine guns led to the development of tanks which led to the development of rocket propelled grenades, etc. When commerce consisted of camel caravans, people in the Arabian Peninsula promoted banditry, ultimately forcing the commerce to go by sea. When merchants used the sea lanes through the Mediterranean, the people of the Maghreb promoted the Barbary pirates until they were ultimately countered by a punitive US military action.

More recently, with the advent of the railroads came Jesse James, countered by thePinkertons and so on. Airlines discovered airline hijackers and parried the threat with the excruciating experience they call airport security. Move followed by counter-move. In the present conditions of economic crisis with thousands of recently fired, super-computersavvy techies on the loose, the venue for those of dishonest bent is the cyber-world. The newest bandits are the malicious professional "hackers" who are not only well organized but will strike with proven military precision driven by monetary gain. Thus, businesses must learn to be en garde and protect their cyber property, such as Intellectual Property (IP), which frequently accounts for 70% of the market value of companies that specialize in franchising and licensing.

The commonly accepted definition of cyber security is the protection of any computer system, software program, and data against unauthorized use, disclosure, transfer, modification, or destruction, whether accidental or intentional. Cyber attacks can come from internal networks, the Internet, or other private or public systems. Businesses cannot afford to be dismissive of this problem because those who don't respect, address, and counter this threat will surely become victims.

Where's the risk?

Everywhere: Cyber-crime is on the rise. On average, there has been a reported cybersecurity event every single day since 2006. If there's a transaction that involves a card with a magnetic strip and a swipe, there's a transaction that involves a risk. And if there's a computer system with software designed to allow access by multiple users (e.g. by franchisees, vendors, or other providers) without security in mind, then there's a major risk of being hacked for malicious or competitive purposes. Mobile devices, often containing sensitive data, are lost or stolen every day.

Face it: With the proliferation of free hacking tools and cheap electronic devices such as key loggers and RF Scanners, if you use e-mail or your company's systems are connected to the

Internet, you're being scanned, probed, and attacked constantly. This is also true for your vendors and supply chain partners, including payment processors. E-mail and the web are the two main attack vectors used by hackers to infiltrate corporate networks.

So, clearly, every company is vulnerable because every company needs to have thesefunctions. Conversely every company needs to guard its systems against unauthorized access through these openings because supposed firewalls offer no protection whatsoever once a hacker has entered.

Who's been hacked?

As they say in the cyber security world, there are only two kinds of computer systems:those that have been hacked and those that will be hacked. For example, crooks used sophisticated methods to evade detection and place malware on nearly 300 Hannaford Bros. supermarket servers to intercept payment information. As many as 4.2 million credit and debit card numbers may have been exposed. Ironically, Hannaford was notified of its massive problems on the very same day it was recertified as being Payment Card Industry Data Security Standard-compliant. *Like an AIDS test, penetration testing in the cyber security arena offers assurance and protection only as of the date of the testing.* So once is not enough. Penetration testing must be done regularly and thoroughly to maintain its value or it becomes worth no more than a cancelled subscription. And just because people are computer savvy does not mean their data are safe. The website of online retailer Geeks.com featured the "hacker safe" notification from McAfee ScanAlert. Nevertheless, a hacker broke in and accessed customer credit card numbers and other personal information on its site. And in another really scary example, mortgage giant Fannie Mae narrowly avoided a software time-bomb set to destroy all data on its computers. Some disgruntled contractor who had been terminated embedded into the system a malicious code, tucked at the end of a legitimate software program scheduled to run each morning. It was set to go into effect (months after he was gone) on all 4,000 of the company's servers. It was only discovered by chance by another Fannie technician or the whole agency's database would have been wiped out.

Even Deborah Platt Majoras, Chairman of the Federal Trade Commission from 2004 to 2008, was a victim of identity theft. So it's no wonder that she and the FTC have been such strong proponents of protecting consumers from shoddy data protection practices and enforcing regulations and levying fines on businesses

What could happen?

Lots of things: all of them bad. Accordingly, a company (particularly franchise businesses and other licensors) must evaluate its risk to determine and implement appropriate policies and procedures.

We have formulated a "Chan Scale of Cyber In-Security"©, based on the potential harm that can be caused:

 **1 Chan – Low risk.** Hacker has gained entry to system but minimally. Minor risk of business disruption, but access can aid attackers in information gathering and planning future attacks.

 **2 Chans – Medium Risk.** Malware has been implanted in the company's network, which could cause malfunctions and mischief. There is a significant risk of a business disruption that could result in financial loss and/or damage of goodwill.

 **3 Chans – Medium-to-High Risk.** Using sniffers or other equipment, hackers have obtained personally identifiable information (PII) from point of sale (POS) systems. There is a significant risk of a business disruption that could create financial loss and/or damage of goodwill.

 **4 Chans – High Risk.** Inside job: data stolen by disgruntled employee. There is a potential risk of business disruption, resulting in financial loss and damage of goodwill. PII may be taken, as well as company's confidential information and financial information.

 **5 Chans – Critical Risk.** Hackers have gotten into the system and can access PII as well as the company's financial information and confidential information. There is a severe risk of business disruption, financial loss, damage

What are potential liabilities?

Major liability may be incurred from, *inter alia*, individual litigation, class litigation, regulatory investigation, contract dispute, loss of customers, reputation damage, data theft, denial of service, cyber-terrorism, cyber-extortion, and fraud.

Some statutes impacting cyber-liability include:

• Communications Act of 1934, updated 1996
• Computer Fraud & Abuse Act of 1984
• Computer Security Act of 1987
• Economic Espionage Act of 1996
• Electronic Communications Privacy Act of 1986
• Federal Privacy Act of 1974
• Health Insurance Portability & Accountability Act of 1996
• National Information Infrastructure Protection Act of 1996
• U.S.A. Patriot Act of 2001
• Payment Card Industry Data Security Standard (PCI DSS) effective 2006 – industry-defined standard, not government

Introduced in 110th Congress (2007) – none enacted:

• Personal Data Privacy and Security Act of 2007
• Data Accountability and Trust Act
• Identity Theft Prevention Act
• Data Security Act of 2007

Introduced in 111th Congress:

• S.139, Data Breach Notification Act

What about policies/procedures?

Participants at the Davos conference on the international economy that ended in February 2009 took note of the world-wide gangs and other criminal organizations invading the cyber world. They estimated the damages from cyber crime to be $1 trillion per year. The cost of notifying customers alone in the case of a cyber event has been estimated at $1-3 per file accessed and $100-300 or more per file compromised.

In light of these numbers, companies are well advised to have policies in place with respect to data protection, data retention, data destruction, privacy, and disclaimers to

customers. And, if a security breach occurs, the company should expect, and be prepared for, a regulatory investigation during which the company will have to show that its policies were well documented, updated as business processes change and *observed*, or risk significant fines, agency oversight, or worse. The policies must be more than mere window dressing; failure to conform to a company's own stated, internal policies may be worse than having no policies at all.

For example, the FTC recently went after two companies for failing to provide reasonable and appropriate security for sensitive consumer information, leading to identity theft and forced a settlement containing bookkeeping and record-keeping provisions to allow the agency to monitor compliance. Under the terms of the settlement, the FTC ordered the two companies to hire third-party security auditors to assess their security programs on a biennial basis *for the next 20 years*; to certify that the companies' security programs meet or exceed the requirements of the FTC's orders; and to prove that the companies are providing "reasonable assurance that the security of consumers' personal information is being protected."

A similarly onerous set of conditions was imposed in February 2009 by the FTC as part of a settlement with CVS Caremark, requiring that company to establish policies for protecting and properly disposing of personal information, to be subject to a biennial audit by a third party, *and to pay a multi-million dollar fine* for improper treatment of information required to be protected under HIPAA.

What about cyber crisis planning/management?

IT (Information Technology) systems are vulnerable to a variety of disruptions from a variety of sources such as natural disasters, human error, and hacker attacks. These disruptions can range from mild (e.g. short-term power outage, hard disk drive failure) to severe (e.g. equipment destruction, fire, online database hacked). Crisis (and Disaster Recovery) planning refers to those interim measures needed to recover IT services following an emergency or system disruption. Interim measures may include the relocation of IT systems and operations to an alternate site, the recovery of IT functions using alternate equipment, or the performance of IT functions using manual methods to minimize the business impact.

In January 2009 Heartland Payment Systems, which processes 100 million credit and debit card transactions per month, disclosed that hackers had penetrated its computer network. By installing malicious software, the hackers gained access to digital information encoded on a card's

magnetic strip that could be used to create duplicate cards. In the wake of what was described as the biggest single breach of consumer and financial data security ever, Heartland's stock was hit hard. In public statements following the incident, Heartland's CEO compared the potential industry-wide impact of the breach to the Tylenol poisonings that nearly brought down the drug maker Johnson & Johnson in the early 1980s.

The Heartland debacle highlights the potential fallout companies face as a result of ineffective planning for data security breaches. The costly consequences may include damage to reputation and brand value, shareholder derivative suits, directors' and officers' liability, regulatory agency investigations, and class-action litigation.

Effective crisis planning and crisis management processes must be developed to enable businesses to continue operating following failure of, or damage to, vital services or facilities.

The cyber crisis planning process covers the following:

Identification and prioritization of critical business processes including • the technology that supports them (servers, databases, applications) and technology owners. • Identification and agreement with respect to all responsibilities and emergency arrangements for business continuity planning and recovery with all affected parties throughout the organization.

• 'Call Tree' and contact details.

• Documentation of workarounds (electronic and manual) and/or rectification procedures and a linkage to any relevant reference material or documents.

• Appropriate education of staff in the execution of the agreed emergency procedures and processes.

• Checklists and procedure guidelines to assist all parties to recover from a crisis or disaster.

• Testing and updating of the plans on a regular basis.

Cyber Crisis Management (Incident Response – Stop the bleeding) process covers the following:

• **Identify the Crisis at Hand –** For example, is it a customer data breach, privacy breach, virus outbreak, targeted malicious code attack, denial of service attack, phishing attack, or third party data compromise?

• **Analysis and Assessment –** Triage of the incident to determine the severity (See Chan Scale of Insecurity) and impact on the business.

• **Coordination/Response Plan –** Decide whether to protect or prosecute including contacting the proper law enforcement authorities. If prosecution is the course of action, all evidence (system/application logs, audit trails, and affected systems) must be collected in a forensically sound manner to hold up in a court of law. Contact all affected parties and communicate and agree upon a response plan.

• **Containment/Recovery Plan –** Restore affected systems to normal business operation.

• **Incident Learning –** What can be learned from this incident? What can be improved so this type of incident does not again?

What about regular surveillance?

Many companies overlook the fact that security monitoring or surveillance is necessary in order to protect their information assets. Security Information Management Systems (SIM), if configured properly, can be useful in collecting and correlating security data (system logs, firewall logs, anti-virus logs, user profiles, physical access logs, etc.) to help identify internal threats and external threats. A successful surveillance program includes practices such as:

• Security in Depth is a best practice. Several layers of security are better than one.

Surveillance on each layer of security will help identify the severity of a security event; alerts coming from the internal corporate network might be more urgent than on the external network.

• Critical business data should be encrypted with strict role-based access controls and logging of all changes for an accurate audit trail.

• A policy of "least privileges access" should always be implemented with respect to sensitive information and logs should be reviewed regularly for suspicious activity.

• Review of Identity Management Process to determine who has access to what information on the corporate network. Ensure that the access of ex-employees, contractors and vendors is eliminated when they are no longer needed or leave the organization.

• Placement of Network Intrusion Detection/Prevention Systems throughout the corporate network to help detect suspicious or malicious activity.

What about access controls?

Curiosity is a natural human trait. The viewing of private records of political figures and celebrities has led to people losing their jobs or being criminally convicted. Most of these workplace incidents were not tied to identity theft or other bad intentions, but were simply

instances of employees taking advantage of access control policy gaps, sometimes without realizing that they were breaking privacy laws and exposing their organizations to risk.

So companies need to focus on ensuring that employees' access to information is required for their particular job. Sometimes employees' access is supplemented as they are promoted, transferred, or temporarily assigned to another department within the organization. Users that drag such excess access into their new role may create holes in corporate security or create other business risks. These are common problems in large organizations, a natural consequence of the pressure on IT departments to provide access quickly when employees are transferred or promoted.

Organizations should consider putting automated controls in place for cyber-access to ensure that user privileges are appropriate to their particular job function or process role. Access to personally identifiable information must be governed by the need; there must be a valid business reason for access.

Security Training and Awareness

The human factor is the weakest link in any information security program. Communicating the importance of information security and promoting safe computing are key in securing a company against cyber crime. Below are a few best practices:

• Use a "passphrase" that is easy to remember — E@tUrVegg1e$ (Eat your veggies) and make sure to use a combination of upper and lower case letters, numbers, and symbols to make it less susceptible to brute force attacks. Try not to use simple dictionary words as they are subject to dictionary attacks – a type of brute force attack.

• Do not share or write down any "passphrases."

• Communicate/educate your employees and executives on the latest cyber security threats and what they can do to help protect critical information assets.

• Do not click on links or attachments in e-mail from untrusted sources.

• Do not send sensitive business files to personal email addresses.

• Have suspicious/malicious activity reported to security personnel immediately.

• Secure all mobile devices when traveling, and report lost or stolen items to the technical support for remote kill/deactivation.

• Educate employees about phishing attacks and how to report fraudulent activity.

SATELLITE BASED TSUNAMI AND EARTHQUAKE ALERT SYSTEM

N. Mohana Krishna

2nd ECE, GMRIT

The term 'Tsunami' was adopted for general use in 1963 by an international scientific

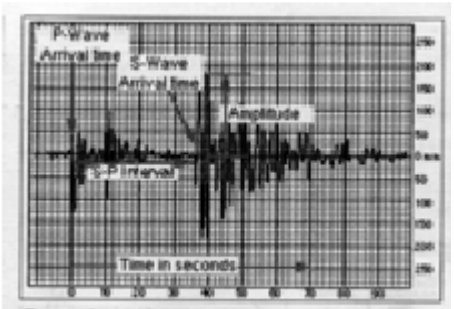


Fig. 1: P and S waves

conference. Tsunami is a Japanese word made of 'Tsu' and 'nami' characters where 'Tsu' maeans 'harbour' or 'port' and 'nami' means 'waves' and the term earthquake it is also called as 'seismic' waves.When an earthquake occurs it release energy in the form of waves that radiates form the earthquake sources in all direction. To sense this energy waves by using accelerometer and alert message is done in tsunami alert system, except that an accelerometer in use in place of the bottom pressure recorder.

EARTHQUACKE (SEISMIC) WAVES

When an earthquake occurs it releases energy in the form of waves that radiate from that earthquake source in all directions. Different types of energy wave shake the ground in different ways and also travel through the earth different velocities.The fastest waves is called the primary wave, or P wave. Like sound wave, this is the compress ional in nature. It compresses an expands material in the direction it is traveling. P waves move at the rate of 8 km./second. This move the earth up and down perpendicular to the direction their motion.S wave or secondary wave are slower than P wave and move at half speed of P wave, that is 4 km./ second. Vertical ground motion generated by S wave is highly damaging to the structure figure one shows recording of both the P and S waves. Most structural damage occus due to slower surface wave (Slower than S wave) called love and Rayleigh, these wave shake the ground horizontally perpendicular to the direction of motion. Destruction also depends on the frequency of ground vibrations. P and S waves have a higher frequency of vibration, which shakes the low-

rise buildings. The love and Rayleigh waves have less than 1 Hz vibrations,which causes high rise buildings to vibrate.

TSUNAMI WAVES

Tsunami is a series of ocean waves generated by a rapid, large scale disturbance of the sea water, associated primarily with earthquakes occurring below or near the ocean floor for much less frequently by volcanic eruptions, land slides,undersea slumps and meteor impact. Tsunami are characterized shallow water waves. Sallow water waver are different from wind generated waves the waves many of us have observed on the beaches. Wind generated waves usually have period (time between to successive waves) of 5 to 20 seconds and wave length (distance between to successional wave) of 100 to 200 meters (300 to 600 ft.) on the other hand, tsunami can have period in the range of ten minutes to two hours and wave length in excess of 500 km (300miles).

TSUNAMI ALARM SYSTEMS

It is clear that two types of generated seismic surface waves that induce vertical motion of the sea floor and tsunami wave that cause displacement of the sea surface. Both waves can be recorded by a special type of equipment called bottom pressure recorder (BPR) deployed at the bottom of the ocean.The waves are represented as one of the two dispinct packets of energy as shown in figure 4. The first packet is composed of the seismic waves that traveled at 11000 km per hours to arrive at the BPR only minutes after the events.The seconds packet shows the tsunami waves that traveled at 800 km per hours. (the maximum so far) two arrive 70 minutes after the earthquake.

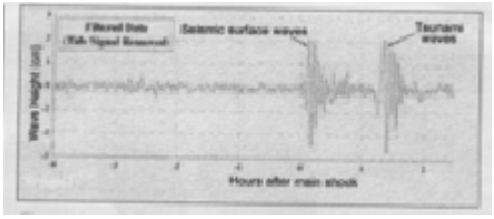


fig.2 seismic surface and tsunami waves

Real time Tsunami Reporting System

The main function tsunami reporting system is to record seismic waves followed by tsunami waves and transfer this data to the warning dissemination center through satellite communication media. A near real time prototype tsunami reporting system can be design using surface buoy. Moored see fig. 6 over a BPR as a relay point for tsunami data. It is not practical for various reasons to make and electrical connection from the sea flowers to the surface to transmit data.

One of the reason is continuous circular movement and change in direction of the surface buoy due to wind and waves. A typical deep ocean assessment and reporting of tsunami (DART) bottom package mooring consist of bottom pressure recorder,acoustic modem acoustic release unit and battery pack bolted to a plat form, to which a disposable anchor, flotation and recovery aids are attached.

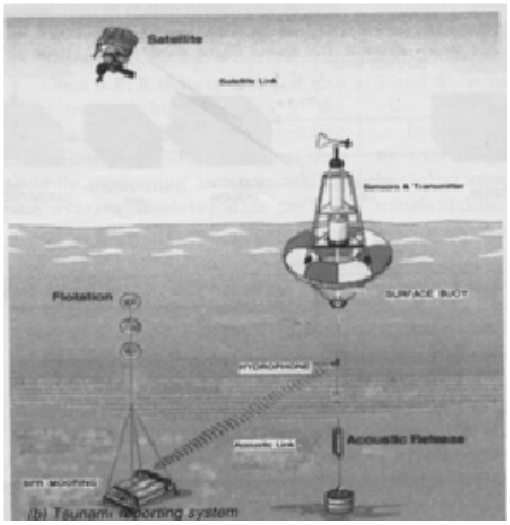


fig 3: Tsunami reporting system

Mooring are designed to free fall to the bottom and are deployable for 24 months at depths of 6000 meters; recovery is initiated by triggering the acoustic release to separate from the anchor, at which point the flotation bring unit to the surface.The tsunami reporting system (fig. 7) consist of and anchored seafloor bottom pressure recorder and a companion moored surface buoy for real time communication. And acoustic link transmits data from the bottom pressure recorder on the sea floor to satellite communications equipments global positioning system (GPS) receiver fitted on the surface buoy. The data is then relayed via a GOES satellite link to ground stations, which demodulated the signal for immediate dissemination to tsunami warning center.

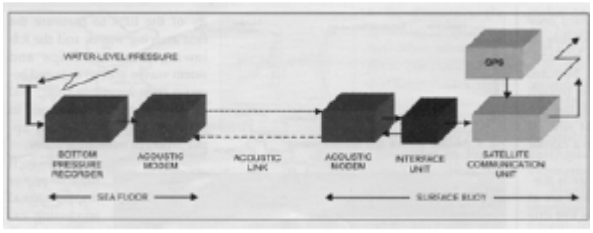


fig. 4- block diagram of tsunami reporting system

Bottom Pressure Recordered

The pacific marine environmental laboratory (PMEL) has develop a bottom pressure recorder (BPR) that can record seismic waves followed by tsunami waves. This BPR is being use deep-ocean tsunami observation in pacific ocean project. The BPR can function on long term (more than one year) deployments under sea and accurately measure tsunamis with amplitudes as small as 0.5 cm in water depth up to 6 km. The recorded amplitudes of the seismic surface wave (fig 4) are greatly exaggerated by accelerations forces but these record clearly demonstrates the ability of the BPR to measure the first arriving waves and the following tsunamis ships and storm waves are not detected because there length is short, and as with currents, changes in pressure are limited to the upper layers of over laying water. The BPR has low-power digital signal processing capabilities and acoustic modems (that are similar to the familiar telephone based computer modem) to communicate with the satellite communication unit (SCU) on surfacebuoy.The tsunami BPR uses a pressure transducer manufactured by paroscientific, Inc.(see fig 5)

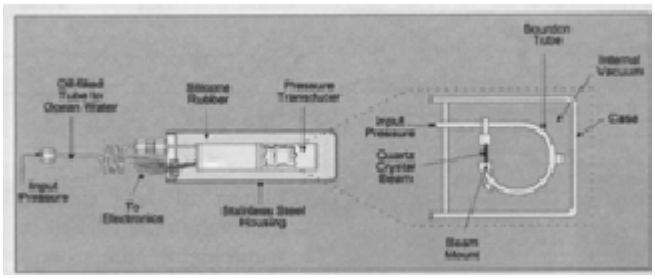


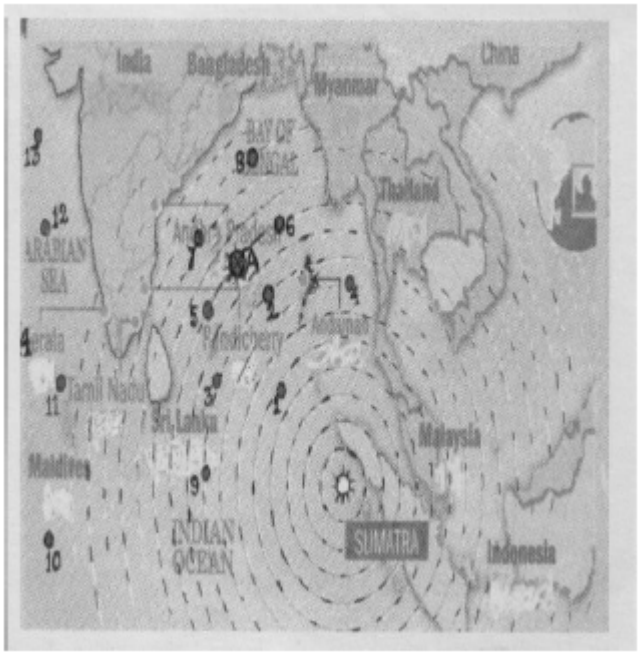
fig5: paroscientific pressure trnsducers

The transducer uses a very thin quartz crystal beam, electrically induced to vibrate at it lowest resonant mode. This oscillator is attach to bourdon tube that is open on one end to the ocean environment. As a tsunami waves crest passes over the instrument, the increase pressure causes the bourdon tube to uncurl, stretching the quartz crystal and increasing the vibrational frequency. Conversely, the passage of a tsunami through reduces the pressure, allowing the bourdon tube to the curl more tightly, there by compressing the quartz crystal and lowering the vibrational frequency. These vibrational frequency changes of the quartz crystal can be measured precisely by the electronic system of the tsunami gauge and then converted in to the corresponding changes in tsunami heights. For periods greater than a minute or so, and for deployment at depths of 5000 meters, the transducers is sensitive to changes in wave heights of less than millimeter. The change in water depth due to tsunami in the open ocean is generally less than one cm.

Working Of The Tsunami Warning System

An array of reporting system (as shown fig 6 and 7) is to be deployed in the Indian ocean such that it covers the entire coastal areas. A large number of reporting systems will give near real time an accurate direction of killer waves. However, these will also increase the cost and maintenance of the total system. Functioning of the system beings with the detection of an earthquake, which has a magnitude and location that make it potentionally capable of generating a tsunami. When the earth quack of occurs it generates seismic surface waves (SSWs) that travel in all the direction at the speed of 3 to 8 km / second as the wave move away from the epicenter,these will hit all the BPRs (deployed in Indian ocean) one by one. The BPR nearest to the epicenter will be struck first. Once a BPR detects SSWs, it will start transmitting this data to the warning center through the satellite communication unit and start frequently monitoring and transmitting the average sea level data until it reaches its peak. It will also continue to transmit the sea level data until the sea come to its normal state because tsunami waves may be more than one. Peak level is the height of the tsunami waves. The satellite communication unit adds GPS data to the GPR data as the GPS measure the heights of waves, confirming the rise of the sea level and also helps to interpret the BPR data. But when a GPS can give heights of the waves, Why the BPR is required? It has been found that some times the surface buoy jumps (due to impact force of the wave) 5 to 6 meters for actual waves height of one meter. The time between SSWs and tsunami depends on the distance between the epicenter and the reporting terminal. The Indian metrological department (IMD) continuously monitors earthquake activities through observatory centers deployed in different part of India. On the arrival of SSWs, the warning center will be continuously in touch with the IMD to find out the location of the epicenter (as shown in fig.3) which takes 15 to 20 minutes. In the men, the warning center will continuously receive the sea level data from different reporting terminals at different times. This data can be simulated on a computer to find out the approximate situation of the sea affected by SSWs wave and help interpret the BPR data.After confirmation of the magnitude and locations of the epicenter from the IMD, the warning center will wait for the tsunami wave to hit the nearest reporting terminal and that gives the magnitude of tsunami. It will decide to broadcast warning depending on the size of tsunami. The past record shows that tsunami is not always generated due to and earthquake. In the event of tsunami due to earthquake, the warning time before tsunami hits the coastline depends on the location of the epicenter and the reporting terminal if the distance of the epicenter from the shore (found after confirmations from the IMD) is less and

the magnitude earthquake very high, the warning should be broadcast to restricted areas. Since the warning is issued on the basis of seismic data alone reporting or even warning will win issue occasionally when tsunami have not been generated. But in the above situation, 20 minutes or more have been wasted to confirm the magnitude of the earthquake and location the epicenter from the IMD.



EARTHQUACKE ALARM SYSTEMS

When ever an earthquake occurs, most of the casualties are due to structural damage caused by S-waves followed by L-and R-waves. These wave travel at a speed 3 to 4 km/second in all directions. A house located 40 to 50 km away from the epicenter of a high magnitude earthquake would there fore be hit by S wave after 10 to 12 seconds. It will take 10 to 15 seconds to damage the house if it is poorly structure. There fore, a person gate a total time of 20 to 25 seconds to go to a safer place if an alarm is raise just 10 seconds before the killer wave hit the house. It has been observed that the effect of high magnitude earthquake (of the order of 6.5 to 9 on R-scale) on the surface is up to 400 to 500 km only. There fore depending on the distance from the epicenter, alarm time of 20 to 120 seconds is available for an early warning system. This is sufficient even if a middle edge person takes 40 to 50 seconds to go down the stairs form the fourth or fifth floor. An earth vibration sensor (such as an accelerometer calibrated in terms of the magnitude of the earthquake) is connected through interface unit to the satellite communication unit (the same as used in the tsunami reporting terminals.) see the fig. – 8

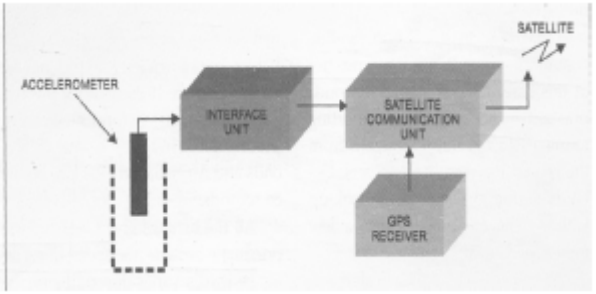


fig. 7 – Earthquake reporting terminal

It can be use as and earthquake reporting terminal. The accelerometer- interface unit combination is adjusted such that it triggers the satellite communication unit only when an earthquake of 6.0 R-scale magnitude or more strikes it. Less than 6.0 R-scale magnitude is not much effective, hence can be ignored. This reporting terminal is very similar to the tsunami reporting terminal, except that an accelerometer is use in place of the bottom pressure recorder. Packet formation and satellite channel access are the same as for tsunami reporting terminal. The network manager can identify from the source ID of the reporting terminals where the received data is for the earthquake alert system or the tsunami alert system.

Time To Alert For Earthquake

Time to alert is the time between the actual occurrence of the earthquake at the sensing point and the warning message out put at warning receivers place at different public places or government offices. Time to delay at the sensor location includes the sensor (accelerometer) response times, circuit delay and processing time at the interface unit which negligible at a few tens of milliseconds delay due to single hop satellite communication is 250 milliseconds but in this case delay is 500 milliseconds due to two hops, i.e. from reporting terminals to the hub an again form hub to the warning receivers delay time due to search of the look up table by the computer is also a few milliseconds only. There fore the total time to alert will be less than a seconds. This means that an alarm can be raised with in a seconds of the occurrence of an earthquake (assuming sensors are placed near the epicenter).

LIMITATION

The bottom pressure recorder and interface units for accelerometer deployment of this mooring in the sea are to be developed indigenously. The pacific marine environmental laboratory (PMEL) has developed this India can also go for development of such a system with the help of renowned R & D institutions of India.

NANOTECHNOLOGY

B. Amritha

1st B. Tech – Chemical

Nanotechnology refers broadly to a field of applied science and technology whose unifying theme is the control of matter on the atomic and molecular scale, generally 100 nanometers or smaller, and the fabrication of devices with critical dimensions that lie within that size range.

Nanotechnology is a highly multidisciplinary field, drawing from fields such as Applied Physics, Materials Science, Interface and Colloid Science, Device Physics, Supramolecular chemistry (which refers to the area of chemistry that focuses on the noncovalent bonding interactions of molecules), Self-replicating Machines and Robotics, Chemical Engineering, Mechanical Engineering, Biological Engineering, and Electrical Engineering. Much speculation exists as to what may result from these lines of research. Nanotechnology can be seen as an extension of existing sciences into the nanoscale, or as a recasting of existing sciences using a newer, more modem term. Grouping of the sciences under the umbrella of "nanotechnology" has been

questioned on the basis that there is little actual bound -crossing between the different sciences that operate on the nano-scale.

Two main approaches are used in nanotechnology: In the “bottom-up" approach, materials and devices are built from molecular components which assemble themselves chemically by principles of molecular recognition. In the "top-down" approach, nano-objects are constructed from larger entities without atomic-level control. The impetus for nanotechnology comes from a renewed interest in Interface and Colloid Science, coupled with a new generation of analytical tools such as the Atomic Force Microscope (AFM), and the Scanning Tunneling Microscope (STM). Combined with refined process such as electron beam lithography and molecular beam epitaxy, these instruments allow the deliberate manipulation of nanostructures, and lead to the observation of novel phenomena.

Examples of nanotechnology in modern use are the manufacture of polymers based on molecular structure, and the design of computer chip layouts based on surface science. Despite the great promise of numerous nanotechnologies such as quantum dots and nanotubes, real commercial applications have mainly used the advantages of colloidal nanoparticles in bulk form, such as suntan lotion, cosmetics, protective coatings, drug delivery, and stain resistant clothing.

Fundamental concepts:

One nanometer (nm) is one billionth, or 10^{-9} of a meter. To put that scale in context, the comparative size of a nanometer to a meter is the same as that of a marble to the size of the earth. Or another way of putting it: A nanometer is the amount a man's beard grows in the time it takes him to raise the razor to his face. Typical carbon-carbon bond lengths, or the spacing between these atoms in a molecule, are in the range 0.12-0.15nm, and a DNA double-helix has a diameter around 2nm. On the other hand, the smallest cellular life forms, the bacteria of the genus Mycoplasma, are around 200 nm in length.

Properties of nanomaterials:

Electrical Properties: Nano materials can hold considerably more energy than conventional because of their large grain boundary (surface) area. They are materials in which an optical absorption band can be introduced, or an existing band can be altered by the passage of current through these materials, or by application of an electric field.

Optical Properties of Nanomaterials:

Nanocrystalline systems have attracted much interest for their novel optical properties, which differ remarkably from bulk crystals. Key contributory factors include quantum confinement of electrical carriers within nanoparticles, efficient energy and charge transfer over nanoscale distances and in many systems a highly enhanced role of interfaces. With the growing technology of these materials, it is increasingly necessary to understand the detailed basis for nanophotonic properties. The linear and nonlinear optical properties of such materials can be finely tailored by controlling the crystal dimensions, and the chemistry of their surfaces, fabrication technology becomes a key factor for the applications.

Surface Plasmons (SP) are the origin of the color of nanomaterials. AN SP is a natural oscillation of the electron gas inside has a frequency close to that of the SP, and then the SP will absorb energy. The frequency of the SP depends on the dielectric function of the nanomaterials, and the shape of the nanoparticle. For a gold spherical particle, the frequency is about 0.58 of the bulk plasma frequency. Thus, although the bulk plasma frequency is in the UV, the SP frequency is in the visible (close to 520 nm).

Suppose we have a suspension of nanoparticles in a host. If a wave of light is applied, the local electric field may be hugely enhanced near an SP resonance. If so, one expects various nonlinear susceptibilities, which depend on higher powers of the electric field, to be enhanced even more. Depending on the particles' size, different colors are seen.

Chemical Properties of Nanomaterials:

One of the important factors of the chemical applications of nanomaterials is the increment of their surface area which increases the chemical activity of the material.

Mechanical Properties of Nanomaterials:

Scientific challenges in nanoscience and nanotechnology include the development of nanomaterials with novel mechanical properties. They are used for scratch, mar and /or abrasion resistance is well established in various markets, including fingernail polishers, flooring, plastic glazing, headlamp covers and other automotive parts, transportation windows and optical lenses, where clear scratch-resistant coatings are used. Because the nanosize, many of their mechanical properties of the materials is modified, among others, hardness and elastic modulus, fracture toughness, scratch resistance, fatigue strength, and hardness. Energy dissipation, mechanical coupling within arrays of components, and mechanical nonlinearities are influenced by structuring components at the nanometer scale. This includes also the interpretation of unusual

mechanical behavior (e.g. strengths approaching the theoretical limit) and the exploration of new ways to integrate diverse classes of mechanically functional materials on the nano-size.

Magnetic Properties of Nanomaterials:

The strength of a magnet is measured in terms of coercivity and saturation magnetization values. These values increase with a decrease in the grain size and an increase in the specific surface area (surface area per unit volume) of the grains. Therefore nanomaterials also present good properties in this field.

CAUSES OF CLIMATE CHANGE

N.G.P. Jawahar

3rd B. Tech - Chemical

Climate Change (C.C) is an international issue. It is one of the greatest environmental, social and economic threats facing the planet. Causes of C.C are by natural and human activities. The natural sources are forest fires, valcanos, etc. Human causes are due to over population, increase in the need of facilities to all, resulting in development of industries, automobiles, urbanization, etc. Most of the industries, automobiles and domestic equipments include, in particular, the burning of fossil fuels, agriculture and land-use changes like deforestation. These cause emissions of carbon dioxide (CO_2), the main gas responsible for C.C. It means increase in the temperature in atmosphere, other GHG's, toxic, hazardous effluents and solid waste etc.

Therefore, the emission of green house gases from all sources has effect on Nature and human life also. The harmful impacts of burning coal are results of the gases that are produced as a result of the combustion reaction. These products are principally oxides of carbon, nitrogen, and sulfur, some of which are greenhouse gasses. However, additional products also include hydrides and nitrides of sulfur and oxygen. Examples include toxic gases such as hydrogen cyanide, M.I.C etc. Electricity production requires lot of burning of coal, which releases more of CO_2 into environment, in developed countries and developing countries also. For example, the usage of vehicles and the consumption of electricity from various countries,

Country	Usage of vehicles in every 1000 citizens	Country	Consumption of Electricity per head (KWH)

U.S.A	765
Australia	619
Canada	563
Germany	546
U.K	426
India	12

Canada	17179
U.S.A	13338
Australia	11126
Japan	8079
Germany	7030
U.K	6206
Russia	5642
India	631

Effects: Its effects are on all species of plants, animals, agriculture; traditional rituals and beliefs; social and ethical values; human health, etc. The C.C is likely to have a significant effect on the global environment such as green house effect, global warming, sporadic acid rains, ozone layer depletion, flooding, less ice, rising sea levels, and disruption of unmanaged ecosystems. Human society will face new risks and pressures, such as food and water shortages, disruption of resources as well as damage to physical infrastructure, settlements and human health. Over-pollution results in wide and rapid variations in temperature in the environment. Health of children and senior citizens will be affected by the C.C. There will be food crisis in terms of downward in cultivation, increase in the cost of grains, nuts, vegetables, pregnant ladies getting anemia, low weight newborn babies and psychological disorders for all. Due to the C.C, water scarcity also raises and it changes the seasonal conditions and periods. It affects water table resulting in storms, cyclones etc. that can create conditions where malaria, cholera, dengue, bird flu diseases can thrive.

Acid deposition is the falling of acids from the atmosphere to the earth's surface. It is more commonly known as acid rain, which occurs when the acids are contained in droplets of rain. There are two major sources of acid rain: sulfur dioxide and nitrogen oxides. Sulfur dioxide contributes to about seventy percent of acid rain while nitrogen oxides provide the remaining thirty percent. Acid rain may be produced from SO_2 synthesized as a result of burning coal. The SO_2 reacts with oxygen to form SO_3. ($2SO_2 + O_2 \rightarrow 2SO_3$). The SO_3 in turn reacts with the water in the atmosphere to produce sulfuric acid ($SO_3 + H_2O \rightarrow H_2SO_4$), which falls to the earth as acid rain. And the same way nitrous oxides also react with water and gives nitric acid ($2NO_2+H_2O \rightarrow 2HNO_3$). Other hazardous waste products: the waste products of coal plants include many heavy metals (examples: As, Pb, Hg, Cr, Cu) as well as several naturally occurring

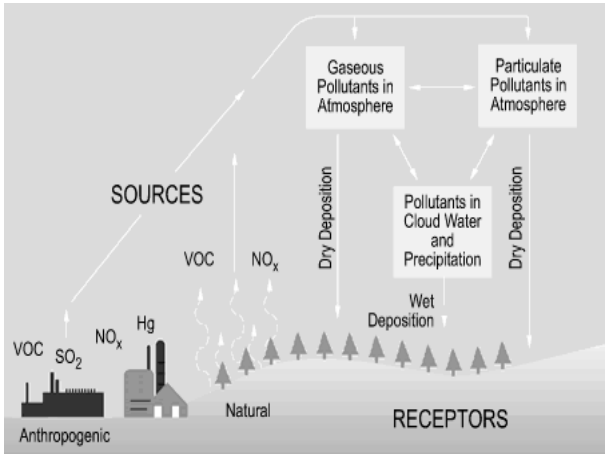
radioactive such as uranium. If not properly disposed, these byproducts pose severe risks to people and the environment.

Effects of Acid Rain on Aquatic Ecosystems:

It is especially harmful to aquatic ecosystems, as streams, ponds, and lakes on acidic or neutral bedrock are extremely sensitive to acidic deposition. Acid rain bleaches heavy metals from bedrock, and these metals often poison fish and other aquatic species. In aquatic ecosystems, the mercury is converted to methyl mercury and is absorbed by the fatty tissues of fish. Upon eating these fish, humans may suffer nervous system and kidney ailments.

Effects of Acid Rain on Soil and Plants:

Acid rain bleaches essential plant nutrients from the soil, causing decline in plant growth



Some of the important nutrients lost include calcium, potassium, and magnesium. Acid rain also leaches metals such as lead and mercury from minerals. These metals cause harm to the plants that absorb them and to the people that eat the plants. Aluminum ions bleached from the soil by acid rain damage plant roots and inhibit the plants' uptake of essential nutrients such as magnesium, potassium, and water. Acid rain reduces the health of trees and vegetation so that they are susceptible to insects, disease, drought, and severe weather. Effects of Acid Rain on Humans: The effects of acid rain on humans also deserve consideration. Toxic metals released into the environment by acid rain may enter water supplies or accumulate in fish and crops. Acid deposition also destroys statues, headstones, buildings, and fountains. Limestone structures are especially susceptible because they dissolve easily in acidic solutions. Finally, acid rain lowers the productivity of fisheries, forests, and farms, lowering profits and causing job losses in those industries.

The loss of the Ozone layer:

Earth has different atmospheres. The troposphere being the lowest layer of the atmosphere, ozone depletion takes place because of CFC's, the ozone layer is built, it is found in the stratosphere at an altitude of 10 - 50km above sea level. Ozone is formed when ultra violet (UV) rays from the sun and oxygen in the atmosphere interact. This layer shields the earth from most of the harmful UV radiation from the sun. It is this radiation which causes an increase in the incidence of skin cancer and eye cataracts. It is also produced on the earth's surface by car exhaust systems, and damages both humans and plants because it is very poisonous. The ozone molecule is not particularly stable and can be easily separated through thermolytic and photolytic reactions. Ultraviolet light energy striking the ozone molecule splits it into an oxygen molecule and a radical. The free radical joins another ozone molecule to form two oxygen molecules, or joins another radical to from an oxygen molecule. Over the years, the constant use of industrial and domestic chemical, mostly CFC's used in refrigerators and other solvents have depleted an area of this layer, in Antarctica / Polar Regions. The ice caps are melting with the result of a rise in sea level and expansion of deserts. The depletion of the ozone layer and the greenhouse effect are environmental threats that will affect all nations. More UV radiation reaches the Earth's surface. This causes skin cancer and cataracts. Ecology of oceans is expected to be affected by subsequent adverse effects on plankton growth and marine life in general. The global temperature is expected to rise by about 1.5 to 4.5 degrees Celsius, causing polar ice caps to melt. The sea level will rise by about 200mm to 1.4m.

The Greenhouse Effect:

The temperature rises because of certain gases in the atmosphere that traps the energy from the sun. The greenhouse gases are mainly water vapor, carbon dioxide, nitrous oxide and methane gas. If we didn't have these gases, the heat would be released into space. It is called "the greenhouses effect" because of the way the heat is trapped. The greenhouse effect is important because without it the Earth wouldn't be warm for humans to live but if the greenhouse effect becomes stronger than it should be, the Earth can become warmer than usual. Some little extra warming can cause problems for humans, plants and animals.

Climate Change:

It is one of the greatest environmental, social and economic threats facing the planet. The warming of the climate system is definite, as now evident from observations of increases in global average, air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level. Human activities that contribute to climate change include in particular the burning of fossil fuels, agriculture and land-use changes like deforestation. These cause emissions of carbon dioxide (CO_2), the main gas responsible for climate change, as well as of other 'greenhouse' gases. To bring climate change to a halt, global greenhouse gas emissions must be reduced significantly. Small islands also face a deterioration of coastal conditions through the erosion of beaches that will, in turn, reduce the tourism value of such locations and affect local resources such as fishing.

Control challenges / measures:

Now, search the better angles of our nature to *manage* the C.C that gives how to reduce the global warming and how to make the sustainable energy resources to protect precious earth environment. It is the time to address the challenges, if we want to save the environment that can protect us. Therefore adaptation is essential for sustainable development involving integrated ecosystem protection, with better prediction and risk management, improved agronomic practices, technical enhancement and most importantly, new water management paradigm, to launch urgent grassroots action and conservation of resources and alternate energy resources by all towards a pattern of sustainable development.

NANOMEDICINE - THE FUTURE APPLICATION OF NANOTECHNOLOGY

G.V.Mahendra

Medicine can be considered as one of the promising areas of application for nanotechnology. Nanomedicine, which can be defined as the monitoring, repair, construction and control of human biological systems at the molecular level, using engineered nanodevices and nanostructures is a newly emerging field. This is an area where every drug company is concentrating on research. Current applications of nanotechnology in medicine range from research involving diagnostic devices and drug delivery vehicles to robots that can enter the body and perform specific tasks. In the near future, applications of nanomedicine will involve engineered molecules to develop drugs, drug delivery techniques, diagnostics, medical devices and enhanced gene therapy and tissue engineering procedures**.** However, sophisticated nanorobots that can function in the body will not be practical for many years.

The research in the nanotechnology especially in the field of medicine is leading to miracles. The following areas of applications give an overview of nanomedicine in future.

Drugs

Research in the area of nanotechnology to develop novel drugs has already begun. Engineered cyclic peptides that kill bacteria, a molecular nanogenerator that targets and destroys cancer cells, and drugs based on the fullerene molecule can be considered as the three examples of this class of nanomedical products. It is claimed by a group of researchers that they have developed a class of biological polymers, known as peptide nanotubes, that can effectively combat deadly bacteria. Here the amino acids that comprise cyclic peptides are altered so that they target bacteria and insert themselves into the bacterial membrane where they spontaneously self-assemble into nanostructures. This causes the normal functioning of the cell gets disrupted, and hence the bacteria die.

Research is also progressing in the direction of developing a “nanogenerator” which can target and destroy the cancer cells In this case it consists of a molecular cage which uses a chemical ring to grab and hold a single radioactive atom, actinium-255.37 and this cage is attached to an antibody that targets cancer cells. When a cancer cell is encountered the radioactive atom is inserted into it and breaks down releasing high energy alpha particles which can destroy the cancer cells. Tests on mice with prostate cancer and widespread lymphoma have been highly successful, and researchers plan to begin clinical trials in the near future.

Another area of research where investigations are going on is the use of fullerene molecule to develop new drugs. It is a hollow sphere made up of 60 carbon atoms, which can interact with cells, proteins, and viruses, and can be altered to perform specific tasks. C Sixty, a Canadian company, has already begun clinical trials on a drug that will target HIV. The fullerene molecule binds to and inhibits the normal functioning of an enzyme, which is essential for survival of HIV.

Drug Delivery

Nanotechnology is revolutionizing the drug delivery field by creating a more effective mechanism. Research in this area is focusing on developing drug delivery system which targets certain types of cells speeding up delivery time, and preventing digestive enzymes from breaking down the medication.

Investigations in this area are paving the way for advanced drug delivery mechanisms. Researchers are experimenting with polymer dendrimers, tree-shaped synthetic molecules which have surface properties that allow them to attach to other molecules, and they can carry molecules internally. They believe that this research will ultimately produce a drug delivery device that can "infiltrate cells and detect pre-malignant and cancerous changes", release a chemical substance to kill the cells, and verify destruction of the cells.

Nanotechnology is facilitating researchers to develop implantable devices that can periodically dispense medicines, such as insulin or morphine. Such devices which are composed of copolymer-nanoshell composites, which are capable of holding medicine and when the nanoshells are exposed to infrared light, the drug is released into the surrounding tissue.

Diagnostics

Improvements in the field of diagnostics are quite possible with nanotechnology. Efficiency and accuracy of diagnosis from samples of body fluids will be increase with nanomedicine. Researchers are attempting to develop microchips that use electrodes to identify the dielectric properties of cancerous cells, viruses, and bacteria in body fluids Nanotechnology makes it possible to develop non-invasive devices, which can enter the human body and they, helps in determining glucose levels. They can also distinguish between normal and cancerous tissue, and provide genetic screening for multiple diseases. Researchers are developing a nanoscale needle that can probe cells for carcinogenic chemicals. Research in this field may yield a tiny pill that will travel through the body and provide a comprehensive diagnosis of the patient's health. It is also possible to develop tiny devices, which can be implanted in the body itself to monitor the

health constantly. In future this field may develop further and according to one report a day may come where a person will get a warning message regarding his heart beat or blood pressure simply from his\her wrist watch.

Devices

In the area of nanodevices, research could yield an array of new medical devices. We can anticipate in near future surgical tools enhanced by nanotechnology. Surgical scalpel based on nanostructered diamond, which slices more neatly into eyeballs, is an example of the nanomedical device.

Devices of miniature size that can be implanted in the human body to correct audio, visual and other impairments may appear in the market and even "visual image-enhancement or processing implants may be feasible within a decade."

Gene Therapy

Gene Therapy is the process where a gene will be introduced into the body to treat or cure a disease or abnormal medical condition. Scientists have hope that gene therapy products could treat a range of medical conditions including cancer, cystic fibrosis, heart disease, hemophilia, and infectious diseases such as HIV. One major obstacle in this therapy is to find a vehicle to deliver the gene to the nucleus of the cell without eliciting an immune response. So far scientists have primarily experimented with delivery vehicles that involve wrapping genes in genetically engineered viruses or coatings of fat

To make this therapy more effective and safer nanodevices could be used. Polymer dendrimers are considered as vehicles for gene therapy by few researchers. The relevant gene is attached to the dendrimer molecule, and the unique properties of the synthetic molecule allow the gene to be inserted into the targeted cell without provoking an immune reaction. Animal trials have demonstrated that dendrimers can transfer DNA into the nucleus of the cell without triggering a harmful immune reaction.

Cell Therapy / Tissue Engineering

Tissue engineering and cell therapy involve the use of living cells and other natural or synthetic compounds to develop implantable parts for the restoration, maintenance, or replacement of the body's tissues and organs. Nanotechnology research in the field of tissue engineering has primarily focused on reducing the risk of immune reaction. For example, to treat patients with

pancreatic cells that do not produce enough insulin, researchers have experimented with implanting insulin-producing cells from a pig. However, the primary problem associated with such a procedure is that the immune system attacks the foreign pig cells. Researchers are conducting clinical trials using a silicon capsule with nano-sized pores that prevents the immune system from identifying the foreign cells. The pores, which are only a few nanometers wide, are small enough to screen out the antibodies employed by the immune system while large enough to allow insulin molecules to exit into the bloodstream. Nanoporous fabrication technology could also be used to direct the growth of tissue and facilitate the integration of synthetic materials into the human body.

In the long run, nanomedical research could lead to the development of artificial cells that can be implanted in the brain. Complex networks of neurons are responsible for intelligence, motor control, and sensing. Researchers have made significant breakthroughs in constructing nanotechnology-based transistors that act like individual neurons and are hopeful that they can develop a neurobiochip that contains many transistors and can act as a group of brain neurons. The chip could be implanted in patients with damaged or malfunctioning brain circuitry.

Nanorobots

Nanorobots, nanomachines and other nanosystems discussed in this paper are objects with overall sizes on the order of a few micrometers or less *in all three spatial directions*, and which are assemblies of nanoscopic components with individual dimensions ~ 1-100 nm. Medical nano devices traveling in the human body for therapeutic purposes have captured the public's imagination at least since the times of the old "Fantastic Voyage" movie (Twentieth Century Fox, winner of the 1966 Oscar for best visual effects). Order-of-magnitude feasibility calculations indicate that nanorobots are not physically impossible.

Some researchers are attempting to construct complex nanorobots that can travel throughout the human body using molecular motors and computers, store and transport molecules, perform operations, and communicate with physicians. Robert Freitas has written extensively about the technical details, specific requirements, and physical limitations of nanorobots. He paints the picture of how nanorobots will transform medicine by describing how a future doctor might treat a bacterial infection:

Not only will nanorobots treat pathogens, but Freitas and others think that they will be able to eliminate cancer and HIV as life-threatening conditions, reverse trauma and injury from burns and accidents, enhance mental capabilities and physical abilities, and slow down aging.

Different researchers have described different medical nanorobots. Examples of nanorobots are "microbivores" and "pharmacy in a cell". "Microbivores," a concept designed by Freitas, are nano-sized devices that bind to targeted bacteria. The bacteria are transported to a chamber where they are digested by a sequence of engineered enzymes. The remains are then harmlessly discharged into the bloodstream.

Carlo Montemagno is attempting to construct a nanorobot that acts like a "pharmacy in a cell."(Paul Sharke, 2001) This nanorobot enters a cell, grabs proteins produced by the cell that will not be used, and stores them until they are later needed by the patient. The nanorobot consists of a nickel drum attached to a biological motor. The drum is coated with antibodies that pick up molecules, and an electric field pulls the molecules to a storage chamber and holds them in place. The motor would be powered by ATP.

In recent years, researchers have made significant progress in building the robots and motors that will power them. Scientists have made strides using two different methods to build sophisticated nanorobots. Some have used miniature robots or microscopic tweezers to build nanorobots molecule by molecule. Other scientists have made impressive breakthroughs in researching self-assembly, where nano-parts are thrown together and spontaneously assemble. They have also made progress in developing nano-sized springs, cogwheels, levers, and bearings as well as a "glue" to join nanostructures Montemagno has built a nanomotor comprised of a genetically modified ATP as protein attached to a tiny propeller. The production and breakdown of ATP by the protein, caused by electrochemical reactions with each of the molecule's three proton channels, causes the protein to rotate and the propeller to turn. Other researchers are experimenting with motors powered by different sources.

However, despite the pace at which research is progressing and the excitement generated by the prospect of nanorobots, it could be many years before nanorobots are tested in humans.

Steven Block, a biophysicist, argues that there is still "a lot of basic science works that needs to be done"and that scientists still"don't know how to design … complex macromolecules that work." Even Richard Smalley, a believer in the potential of nanotechnology to transform medicine, has doubts about nanorobots: "What they talk about doing with nanorobots is beyond

even their own considerable imagination. Critics argue that precise manipulation of atoms is extremely difficult. Even if individual nanorobots could be assembled, it may be impossible to produce billions of nanorobots necessary for commercial applications.

Nevertheless, there is reason to believe that nanorobots will have some impact on medicine in the next 30 years. Montemagno maintains that within two years, he will be able to demonstrate the uses of his biological motor, and Freitas avows that most of the work in designing and constructing nanorobots "should be complete within the next 20 to 30 years." Rapid advancements in the last few years demonstrate that nanotechnology "can go from fiction to reality in 10 years." Ultimately, only time will tell if nanorobots are more scientific fiction than reality.

Environmental Nanotechnology-an emerging trend in Environmental sustainability

K. Sundara Kumar

Dept. of Civil Engineering, GMRIT-Rajam ,

"Environmental degradation and economical development are the two sides of the same coin".

The global society in the 21st century is facing the challenges of improving the quality of air water and soil environment and maintaining ecological balance. Pollutants from such diverse sources as oil and chemical spills, pesticide and fertilizer runoff, abandoned industrial and mining sites, and airborne gaseous and particulate matter from automobiles exacerbate the situation on a daily basis. The impact of the pollutants on the environment will be significant when the accumulated pollution load had exceeded the carrying capacity of the receiving environment.

Detecting, detoxifying the pollutants and minimization of waste are among the challenges, the industries have been left with. The existing technologies will not be effective enough to meet the futuristic environmental standards, and needs innovative application of advanced technologies.

Nanotechnology is the revolutionary science and art of manipulating matter at the atomic or molecular scale that has cut across such disciplines as Chemistry, Physics, Biology, and Engineering. Nanotechnology refers broadly to using materials and structures with nanoscale dimensions, usually ranging from 1 to 100 nanometers (nm).

"Nanotechnology is the design, characterization, production and application of structures, devices and systems by controlling the shape and size at the nanometer scale"

Natural weathering of minerals, such as iron oxides and silicates, and microorganisms, such as bacteria and algae, produce nanoscale colloids, which include dispersions of nanosized-particles in media with special properties that can be important in the fate, transport, transformation, and bioavailability of environmentally harmful substances.

Nanostructures

(a) Silicon nanowires that detect pH, (b) carbon nanotubes, (c) small organic molecules, and (d) biomolecules are examples of nanoscale materials, devices, and circuits that could be used for

pollutant sensing, prevention, and treatment. Using Nanostructured zeolites makes this example more environmentally benign for two reasons. First, the oxidation reaction is initiated by visible light, which reduces energy consumption. Second, using visible light accesses low-energy reaction pathways that help eliminate wasteful secondary photoreactions and increase the yield of the desired product.

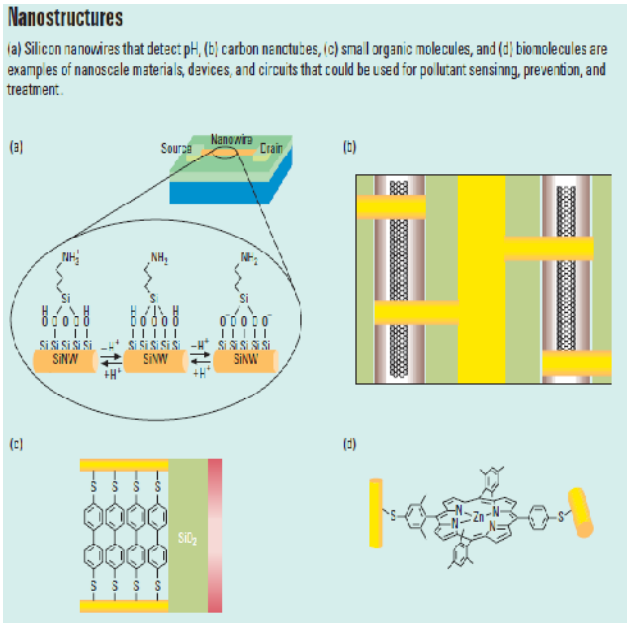


Fig.1: Nanostructures

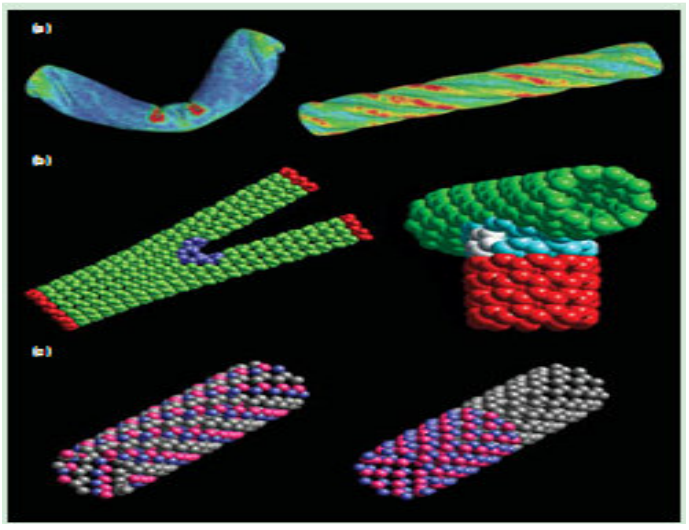


Fig.2. Carbon nano-tubes

Nanotechnologies-Environmental Applications:

Nanotechnology has the following major applications for Environmental remediation.

1. **Treatment**
    - Cleaning up waste streams of contaminants, particularly those substances that are highly toxic, persistent within the environment or difficult to treat.
    - Nanotechnology could be used for green chemistry to eliminate or reduce these wastes by synthesizing new and improved catalysts at the atomic level or molecular level for industries.
2. **Remediation**

- Clean up the contaminated sites with problems brought about by prior technologies and past practices.
- Hazardous and toxic contaminants such as heavy metals (e.g. Lead, Cadmium, Mercury, etc.) and organic compounds (e.g. Benzene, Xylene, Toluene, Chlorinated solvents, Pesticides) that are no longer in use but persistent in the environment, are all targeted for remediation/treatment.

3. **Sensors**

- Improving monitoring and detection capabilities better controls (more efficient use of materials, more data on wastes).
- Nanosensors can greatly enhance our ability to identify the source and strength of contaminants, determine the route and mechanism of environmental fate and bioavailability, and assess the effectiveness of treatment and remediation techniques.

4. **Green Manufacturing**

- Atom by atom construction(less material waste).
- Elimination of waste products and streams for all types of products by designing in pollution prevention at the source using nanotechnologies.
- Manufacture of nanomaterials themselves in a benign manner.

5. **Green Energy**

- Solar and fuel cells that use nanomaterials
- Energy savings via light weight composites, embedded systems

Nanotechnology: Water Remediation

Clean water is essential for safeguarding public health. Active Magnetic Filter (AMF) for water remediation using recent advances in Biotechnology and Nanotechnology, based on solid

physical principles, has very recently been developed by groups at the LCN and the University of BATH.

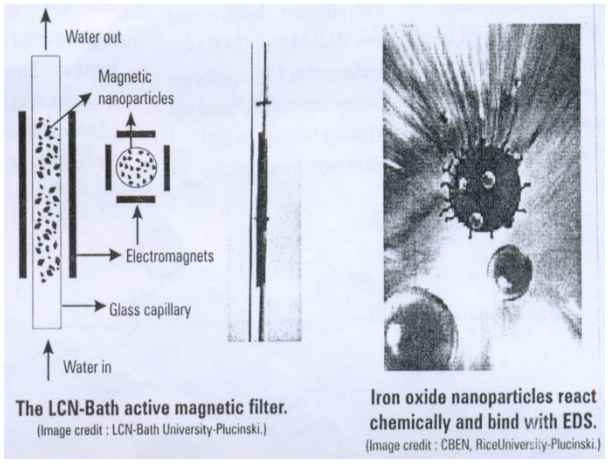


Fig.3. Active Magnetic Filter for water remediation

Nano-scale Iron particles for in-situ Remediation

Nano-scale iron particles represent a new generation of environmental remediation technologies that could provide cost-effective solutions to some of the most challenging environmental clean up problems.

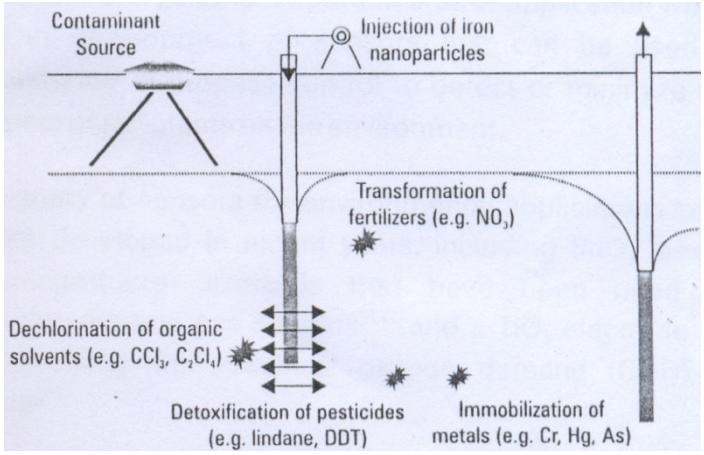


Fig.4. Nano-scale Iron particles for in-situ Remediation

Nanotechnology-Pollution Prevention

Pollution prevention refers to “source reduction” and other practices that efficiently use raw materials, energy, water, or other resources to reduce or eliminate creation of waste. This strategy also includes using less toxic and renewable reagents and processing materials, where

possible, and the production of more environmentally benign manufactured products. Nanotechnology could play a key role in pollution prevention technologies.

For example, nanotechnology- based home lighting could reduce energy consumption by an estimated 10% in the United States, saving $100 billion annually and reducing carbon emissions by 200 million tons per year.

The Right to Information Act

A. Lakshmi Prasanthi

ECE Department.

The Right to Information Act is a law enacted by the Parliament of India "to provide for setting out the practical regime of right to information for citizens". The Act applies to all States and Union Territories of India, except the State of Jammu and Kashmir - which is covered under a State-level law. Under the provisions of the Act, any citizen may request information from a "public authority" Government which is required to reply expeditiously or within thirty days. The Act also requires every public authority to computerise their records for wide dissemination and to proactively publish certain categories of information so that the citizens need minimum recourse to request for information formally. This law was passed by Parliament on 15 June 2005 and came fully into force on 13 October 2005.

Information

The Act specifies that citizens have a right to:

- request any information (as defined).
- take copies of documents.
- inspect documents, works and records.
- take certified samples of materials of work.
- obtain information in form of printouts, diskettes, floppies, tapes, video cassettes 'or in
- any other electronic mode' or through printouts

Process

Under the Act, all authorities covered must appoint their **Public Information Officer** (PIO). Any person may submit a request to the PIO for information in writing. It is the PIO's obligation to provide information to citizens of India who request information under the Act. If the request pertains to another public authority (in whole or part) it is the PIO's responsibility to transfer/forward the concerned portions of the request to a PIO of the other within 5 days. In addition, every public authority is required to designate **Assistant Public Information Officers** (APIOs) to receive RTI requests and appeals for forwarding to the PIOs of their public authority. The citizen making the request is not obliged to disclose any information except his name and contact particulars.

The Act specifies time limits for replying to the request.

- If the request has been made to the PIO, the reply is to be given within **30 days** of receipt.
- If the request has been made to an APIO, the reply is to be given within **35 days** of receipt.
- If the PIO transfers the request to another public authority (better concerned with the information requested), the time allowed to reply is **30 days** but computed from the day after it is received by the PIO of the transferee authority.
- Information concerning corruption and Human Rights violations by scheduled Security agencies (those listed in the Second Schedule to the Act) is to be provided within **45 days** but with the prior approval of the Central Information Commission.
- However, if life or liberty of any person is involved, the PIO is expected to reply within **48 hours**.

Since the information is to be paid for, the reply of the PIO is necessarily limited to either denying the request (in whole or part) and/or providing a computation of "further fees". The time between the reply of the PIO and the time taken to deposit the further fees for information is excluded from the time allowed.

If information is not provided within this period, it is treated as deemed refusal. Refusal with or without reasons may be ground for appeal or complaint. Further, information not provided in the times prescribed is to be provided free of charge.

For Central Departments as of 2006, there is a fee of Rs. 10 for filing the request, Rs. 2 per page of information and Rs. 5 for each hour of inspection after the first hour. If the applicant is a Below Poverty Card holder, then no fee shall apply. Such BPL Card holders have to provide a copy of their BPL card along with their application to the Public Authority. States Government and High Courts fix their own rules.

Wireless Pen Mouse

V. Vivekanand

1st ECE

This wireless pen mouse is working on the BLUETOOTH technology. A wireless communication apparatus sends X and Y coordinate position signals of a pen on a tablet using position modulation of RF three pulses by those pulses, mouse point position is determined.

Types of DUOs:

1. DUOs FOR LAPTOP :

TYPE A model(Model No—PMNA-01): In this receiver circuit is included in USB knob and microphone as receiving sensor.

TYPE B model (Model No---PMNB-01): In this receiver circuit located inside station and uses piezo film sensor (PVDF) of receiver.

Both types support maximum 15.4" LCDScreen size and equivalent magnitude of virtual space. This enables direct or indirect mouse and writing function on monitor. Only difference between two models is design, otherwise both display the same function.

PMPA-01 model is operated by recharging through USB, PMPB-01 model uses cell battery.

2. DUO FOR DESKTOP:

By placing only receiver station on LCD monitor or laptop and defining application area, TABLET functions are fully available to user. This model (Model No: PMMA-01) transforms general desktop monitors (including LCD and CRT) into highly-priced tablet monitor with simply placing receiver on top of monitor. It is designed to support up to 22".

WIRELESS PEN MOUSE 201:

World's only 2.4 GHz wireless mouse pen with 1000 DPI resolution and a built-in rechargeable Li battery, VM-201 surely will improve your work efficiency and your quality pf life.

VM-2001 comes with a rubberized grip, Plug-and_play USB interface, 10-meter transmission distance, non-disruptive USB charging technology, and Blue-Light optics. All these features are nearly packed in its beautifully designed less than 1.5 Oz. body

Specifications:

- General Description – 2 button 1000 DPI 2.4GHz, RF wireless rechargeable pen-style optical computer mouse. Mouse can be used as a wired mouse when battery is charging.

- Power Source – USB-based built-in rechargeable Li-ion battery.

- Power Consumption – stand-by mode 144 hours; continuous use 15 hours; normal use 48 hours, with full charge.

Features:

- Reliable 2.4 grade GHz TF transmission up to 10-meter
- Designer grade 1000 DPI minimizes work work space requirement and perfect for computer artwork and hand-input applications
- Built-in rechargeable Li-Battery with protection circuit
- Laser Presenter with page-turning functions (VM-221 Only)
- Plug-and-Play USB requires no driver installation
- 3-hour Quick Charge circuit
- Linear-footing design works even on soft and curved surfaces
- 35 gm light weight with 65,000 device codes per channel eliminates interface

- USB based charging allows product to operate without down time
- Proprietary blue light optics provides better comfort and precision
- Antenna placed above and clear of hand to reduce user EM wave absorption

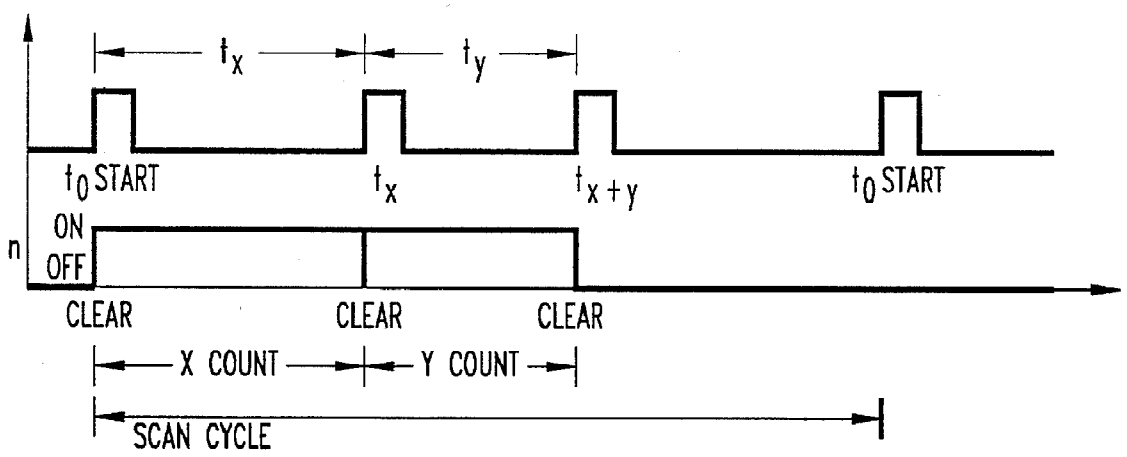
- Battery status light
- Built-in 3-stage power-save feature
- Light-touch switch with 1,000,000-click rating
- Designer *Mouse-Pad* Stand keeps product up-right when not in use
- Super Slim dongle receiver does not block adjacent USB ports
- Compatible with all major CAD, desktop publishing, photo-editing, and hand-writing input software.

TECHNICAL PRINCIPLE

"DUO" digital pen uses technology that calculates precise location of pen using speed difference between ultrasonic wave and infrared ray. "DUO" mainly consists of two parts: "pen" which creates ultrasonic wave and infrared ray at the same time, and "station" which receives them from the pen. The pen and station create X and Y coordinate by sending and receiving ultrasonic wave and infrared ray 80 times per second (equivalent to tracking down location of the pen by 1/80 seconds time interval). Thus, DUO users can write on monitor or virtual space as to write with actual pen and paper. When the pen sends out ultrasonic wave and infrared ray using PVDF film sensor and infrared diode, the station receives them through a couple of microphone sensors located on each side and IR light sensor.

During this process, "DUO" calculates location of the pen by multiplying speed gap between ultrasonic wave and infrared ray received by two micro phones with speed of moving sound. It is very similar to principle locating exact point of thundering by applying speed gap between thunders and lightening.

In particular, this is the only technology utilizing X, Y coordinates as well as Z coordinates. This enables users to enjoy various applications including 3D gaming.



TIME GAP BETWEEN 1ST & 2ND PULSES REPRESENT X-COORDINATE POSITION

TIME GAP BETWEEN 2ST & 3RD PULSES REPRESENT Y-COORDINATE POSITION

DUO FEATURES.

A. Fine writing

B. Aero pen touch

C. Note-taking

D. Virtual writing pressure

E. Word recognition

F. Gesture (motion) recognition

G "Plug-in & Play" with Microsoft Windows Vista log verification

APPLICATIONS:

Supplementary teaching method

Digital school-book or text-book

Computer teacher desk and white-board

Medical application

Business collaboration and presentation

Graphic / Animation

Vision of GMRIT

"To beamong the most prefered
institution's for engineering and
technological education in the country...
An institution that will bring out the best
from its students, faculty and staff-
to learn, to acheive, to complete and
to grow-among the very best...
An institution where ethics excellence
and excitement will be the work religion
and improvement, innovation and impact,

Mission of GMRIT

To turn out disciplined and competent engineers,
with sound work and life ethics

To meet the challenge and paucity of high quality teaching talent
in engineering and tehnology in our country through the use
of information technology

To keep the cirriculum industry friendly,
with due regard to the university curriculum.