S.A. ENGINEERING COLLEGE

(An Autonomous Institution, Affiliated to Anna University)
Accredited by NAAC with "A"Grade and ISO 9001:2015 Certified Institution

CHENNAI-77

SAANKETHIKA 2K22

Annual Magazine, May 2022

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS & COMMUNICATION

Electronics and Communication Engineering has the most demand in field of Research and Engineering among all other branches of engineering. As of today, Electronics and Communication Engineers are working in all spheres of modern industry. The goal of this course is to impart all around technical education to the students to fulfill requirements of new challenges of industries as well as to find new ways to solve the practical problems of our daily life.

The Department of Electronics and communication Engineering was established in the year 1998-99. It inculcates a spirit of scientific temper and analytical thinking and trains the students in contemporary the industry. The Department technologies in Electronics and communication to meet the needs of is well-equipped with laboratories such as Digital Design, Digital Signal Processing, Microprocessor, Electronic Circuits Analog & Digital Communications, RF & Microwave, Product development.

Computer Networks and VLSI Design which cater to program needs. The Master of Engineering degree course in communication systems was started in the academic year 2006-2007.The Department has extensive and fruitful interactions with the industry, R & D organizations and other professional bodies, the interactions with them culminate into professional activities, research agendas and partnerships through MOUs. An excellent academic environment is available for creative and productive work both for faculty as well as students.

<u>MESSAGE</u>

It offers me exuberance to appreciate the innovative proposal of the future graduate students who played a part in "SAANKETHIKA 2K22". It focuses on contributing a party line to the students to explore their affection towards writing articles and their skillful participation. Hereby, I am deeply grateful to the HOD, faculty members and editorial team members for their part and their tireless efforts to rise out this magazine. Thing to be mentioned as important as to thank all the authors who made all the articles into the magazine "SAANKETHIKA 2K22". So pleased to see you all accomplishing great things.

Thiru.D.Dasarathan,
Secretary,
S.A.Engineering College

MESSAGE

I am really over the moon to know that ECE department is rising its magazine "SAANKETHIKA 2K22" with passionate team of staff and students. It is a plan of action for the student to mark their talents in this great magazine. This magazine not only illuminates but also shows the academic value, I put one's hands together for the editorial squad to their enthusiastic and dedicated work in figuring out the goal, wishing you all the very best for your new adventure.

Dr. S.Ramachandran,
Principal,
S.A.Engineering College

MESSAGE

I feel cheering in publishing the ECE department magazine "SAANKETHIKA 2K22", which aims to highlight our student's abilities. I'm delighted to report that the department has a strong foundation experienced and well-qualified faculty who are passionate is teaching and research. This magazine will undoubtedly serve as a showcase for our student's hidden skills. Every year, we plan go showcase the skill and creativity of our faculty and students through this magazine. My warmest regards to everyone.

Dr.B.R.Tapas Bapu,
Head/ECE Department,
S.A.Engineering College

INSTITUTION

Vision:

To Transform our institution into quality technical education center imparting updated technical knowledge with character building.

Mission:

To create an excellent teaching and learning environment for our Staffs andStudents to realize their full potential thus enabling them to contribute positively to the community. To significantly enhance the self-confidence level for developing creative skills of staff and students.

DEPARTMENT

Vision:

 To achieve overall excellence in education, by continuously upgrading the teaching learning process, and incorporating latest technological advancements happening worldwide with ethical responsibilities.

Mission:

To impart sound diversified technical competency and quality education for   students to enhance the employability and ethical values.

To provide conducive environment for faculty and students with excellent facilities to improve research activity.

PROGRAMME EDUCATIONAL OBJECTIVES

- *Our graduate Engineers will have diversified professional competency in Electronics and Communication Engineering and allied technologies with good foundation in Mathematics and basic sciences.*

- *Our graduates will possess lifelong learning process and augment their engineering skills for new challenges with sustainability.*

- *Our graduates will have effective communication skills and work in Multidisciplinary team with critical thinking.*

- *Our graduates will practice the profession with ethics, integrity, leadership and social responsibility.*

PROGRAMME SPECIFIC OUTCOMES (PSO)

- *To inculcate the ability to design quality products and to develop solutions which suits the real time societal needs by applying modern tools and the best universal practices.*

- *To define and adhere the communication standards leading towards green communication.*

- *To adapt to emerging Information and Communication Technologies (ICT) and to innovate   ideas and solutions for the existing/novel problems*

PROGRAMME OUTCOMES

a. *To apply knowledge of mathematics, science and engineering appropriate toECE discipline.*

b. *To formulate and analyze the complex engineering problems by using the principles of mathematics and engineering fundamentals.*

c. *To design and develop system (or) process to meet the desired needs within the realistic constraints of the societal and environmental considerations.*

d. *To investigate complex problems by conducting experiments, analyze interpret and synthesize the information to provide conclusions.*

e. *To select and use appropriate modern tools for solving complex engineeringproblems.*

f. *To apply reasoning knowledge for providing engineering solutions tosocietal needs with professional engineering practice.*

g. *To demonstrate the knowledge of engineering for providing environmental solutions and sustainable development.*

h. *To understand the ethical principles and professional responsibilities.*

i. *To function effectively as a member (or) a leader in multidisciplinary activity.*

j. *To deliver effective presentations and communicate at ease with the society.*

k. *To be successful member (or) leader in diverse teams with enhanced administrative skills and financial management.*

l. *To realize the need for lifelong learning and adopt themselves totechnological changes.*

TABLE OF CONTENT

THE WORLD'S FIRST SAUDHI ROBOT CITIZEN

POOJA.S

II YEAR ECE-B

INTRODUCTION:

Sophia is a social humanoid robot developed by Hong Kong based company Hanson robotics. Sophia was activated on April 19 2015. She made her first public appearance at south west festival in mid of March 2016 in United States. She was able to display more than 62 facial expressions. In October 2017, Sophia became a SAUDHIARABIAN CITIZEN, the first robot to receive citizen ship in any country.

HISTORY:

Sophia was created by HENSON ROBOTICS in collaboration with AI developers. The robot was modelled after actress Audrey Hepbur is Known for her human like appearance. Sophia also imitates human gestures and facial expression and is able to answer certain questions and make a simple conversation on predefined topics. Sophia was voice recognition technology from alphabet in c and is designed to get smarter overtime. It has seven robot humanoid siblings it was also created by HENSONROBOTICS.

FEATURES:

Camera within Sophia eye combined with computer algorithms allow her to see.

- She can follow faces, sustain eye contact & recognizing individuals.
- She is able to process speech & have conversation using alphabets Google Chrome voice recognition technology & other tools.
- The software has been programmed to give prewritten responses to specific questions or phrases.
- Sophia would ultimately be a good fit to serve in HEALTH CARE, CUSTOMER SERVICE, THERAPY & EDUCATION.
- MOTION:74 degrees of freedom, articulated fingers, arms & shoulders.
- SENSORS: Face detection & body tracking.

5 THINGS YOU NEED TO KNOW ABOUT SOPHIA:

- Sophia is not a conventional robot.

- She has been modelled after Audrey Hepburn.

- She was created by DR. DAVIDHANSON founder of Hanson robotics.

- She is a media favorite fit for having given several interviews.

- She has interest in business and has met face to face with industry leaders.

- She has also appeared on stage as the panel member and presenter in higher level conferences.

ADVANTAGES:

- Sophia can solve CBI & FBI cases very easily.
- She can be a good friend for those children and adults who feel lonely.
- She can be good teacher in villages and colleges.
- She can be a business robot.

DISADVANTAGES:
- People worry that they will replace jobs.
- If they takeover middleclass citizens jobs our economy will be negatively affected.
- It makes people to become lazy.

CONCLUSION:

Sophia marks the beginning of new era in humanity. Sophia's debut is gaining Worldwide popularity because it has some remarkable human physiological features such as learning by socialization and expressing emotions according to the topic of her conversation.AI may help the real world, but eventually it may also cause some effects on human environment. Based on human nature robots were designed, but in real World it can be used for good purpose or bad purpose and also depends on programmer AI is necessary for some kind of work to be done but it's not need to have it compulsorily. AI is not useful at an extreme level because it can make the people lethargic.

APPLICATIONS OF AI IN OUR DAY-TO-DAY LIFE

ULAGESWARI
BASWAREDDY VEDIKA
III YEAR ECE

ABSTRACT:

AI is much more than its most novel applications; it's everywhere and often hiding in plain sight. Machine Learning Techniques are widely used to gain data from our work-life style and insights. Using AI to design a product with current technology that will be beneficial to the lives of others is a huge contribution to the community. This paper presents about composite spotlights just a few of the ways machine learning models are woven into our lives. We hear Tech Giants and various Insiders saying that "AI is the Next Big Thing" and so on. But widespread, we often confuse various things with AI reasoning with our own views on AI and other technology. So here are some myth-breaking uses in the world with the help of AI.

INTRODUCTION OF ARTIFICIAL INTELLIGENCE:

Artificial intelligence leverages computers and machines to mimic the problem-solving and decision-making capabilities of the human mind. At its simplest form, artificial intelligence is a field, which combines computer science and robust datasets, to enable problem-solving. It also encompasses sub-fields of machine learning and deep learning, which are frequently mentioned in conjunction with artificial intelligence.
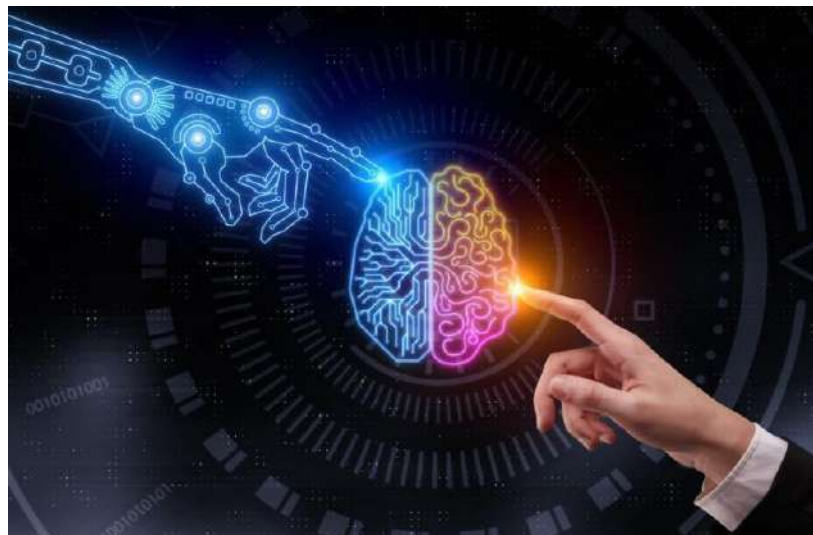
These disciplines are AI algorithms which seek to create expert systems which make

predictions or classifications based on input data. Today, a lot of hype still surrounds AI development, which is expected of any new emerging technology in the market. The product innovations like, self-driving cars and personal assistants, follow "a typical progression of innovation, from over enthusiasm through a period of disillusionment to an eventual understanding of the innovation's relevance and role in a market or domain.

TYPES OF ARTIFICIAL INTELLIGENCE:

Weak AI:
Weak Also called Narrow AI or Artificial Narrow Intelligence (ANI). In this, AI trained and focused to perform specific tasks. Weak AI drives most of the AI that surrounds us today. 'Narrow' might be a more accurate descriptor for this type of AI as it is anything but weak; it enables some very robust applications, such as Apple's Siri, Amazon's Alexa, IBM Watson, and autonomous vehicles.

Strong AI:
Strong AI is made up of Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI). Artificial general intelligence (AGI), or general AI, is a theoretical form of AI where a machine would have an intelligence equal to humans; it would have a self-aware consciousness that has the ability to solve problems, learn, and plan for the future. Artificial Super Intelligence (ASI) also known as superintelligence, would surpass the intelligence and ability of the human brain. While strong AI is still entirely theoretical with no practical examples in use today, that doesn't mean AI researchers aren't also exploring its development.

SOME SPOTLIGHTS OF AI SYSTEMS:

Wake UP, Smart phone Alarm Rings:
AI is likely to be running on the device and in the cloud which help determine, When the screen backlight should turn on, When to unlock the phone (biometrics like facial recognition, fingerprint, etc.), Recommendations (i.e., to check weather, directions, Netflix etc.), The voice assistant's natural language processing and actions (i.e. Siri, Alexa), Intelligent reminders based on prior activity.

CHECKING NEWS, EMAIL, OR SOCIAL MEDIA ON A SMARTPHONE:

We often check news from a smartphone or tablet, with nearly as many checking social media or email daily. AI is hard at work in each, working to show the Surface relevant news stories from thousands of publications and hours of video. Increase the relevance of content or search results while also filtering out hate speech, offensive images, and illegal activity Make email safer by filtering out 99.9% of email spam and scanning 300 billion email attachments formal ware weekly.

COFFEE SHOP MANAGEMENT/BEVERAGES:

Throughout the day, after completing work, Working Professionals are often stressed due to their workload and time management. This results in high usage of caffeine in daily life, we aren't aware of what these shops would go through. Inventory management and demand forecasting of overall usage of caffeine in day-to-day life of a common civilian. The in-app experience: customers who order ahead and collect rewards likely see personalized content and offers informed by ML models (Top Tier Shops). Management of Financial frauds during the transaction of a mount transaction among the

customers, potential buyers & sellers.

EXERCISE, HEALTH, OR WELLNESS TIME MANAGEMENT:

AI is often a silent partner in these efforts, powering our fitness management by Fitness tracking devices. ML models help smartwatches accurately track heart-rate and other vitals, while smartphones count steps and analyze sleep patterns. Devices like Smart-band and Smart-watches are highly used to create data from the user to provide accurate and desirable results.

HEALTH CARE AND NEW DRUGS:

In Health care whether it's whole new fields like precision medicine, improved cancer detection, a better patient experience through tele medicine, or easier access to benefits, AI is revolution using many aspects of healthcare. In New drugs, ML models are routinely used in the biotechnology and pharmaceutical industries to aid in research, including most prominently in the development and distribution of COVID-19 vaccines. Even the Indian government uses various online tools to provide immediate certification and data to the person who got vaccinated immediately with the help of AI models.

OUTCOME OF AI APPLICATIONS:

SAVE TIME

Automation is one of AI's biggest strengths. Why waste time with simple tasks a robot can do? spend your valuable time on big questions and long-term planning by saving our time. I think it is one and the same thing. Time is money and AI is known to save time. A whole lot of mental effort goes into searching for the right candidate and our algorithm takes that mental effort out and saves our time.

AI is used to communicate with customers in real-time to send personalized travel information and provide them with up-to-date information about their transportation so reduce the time consumption.

SAVE MONEY

On top of dealing with customers, AI can make it easy to analyze customer data for better-than-human insight. Digital Trails Artificial Intelligence has started playing a major role in the Financial Industry in understanding consumer behavior, Credit Decisioning, Investments and Risk Management as well. While Banks and Financial Institutions are using this data to make the life of consumers easier and run the business efficiently, consumers are also now getting solutions based on AI.

REDUCE ERROR:

Believe it or not, robots make fewer errors than humans. Not only do they work 24/7 but they produce better results. Artificial intelligence (AI)can effectively combat human error by taking up the heavy lifting involved in parsing, analyzing, drilling down, and dissecting impossibly large volumes of data. It can also perform high-level arithmetic, logical, and statistical functions at a scale that would otherwise be impossible by human-led, self-service analytics alone.

The benefits of AI-driven analytics are many, from providing actionable insights in minutes to eliminating errors or biases in self-service analytics. Now that more and more
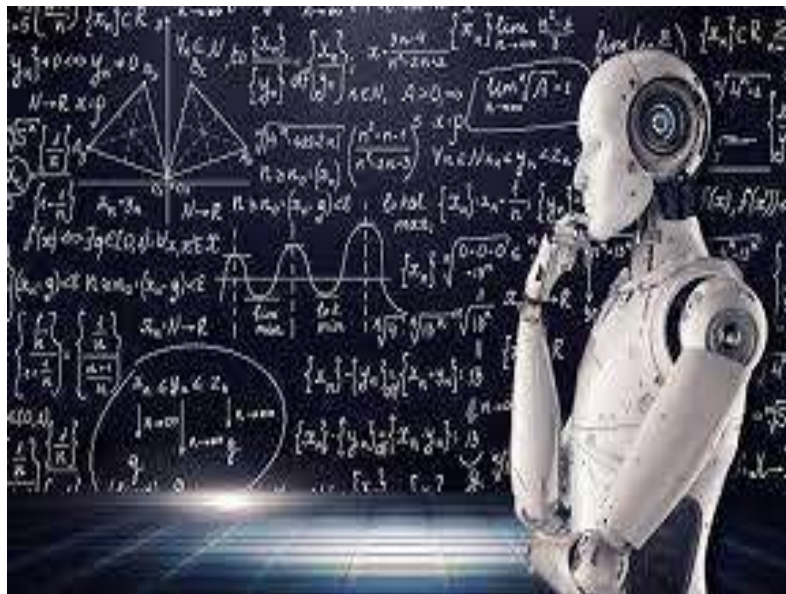
business leaders are turning to AI to get insights that propel their business, we can expect to see growing adoption of AI in analytics in the Middle East and globally.

EVERYTHING YOU NEED TO KNOW ABOUT NEUROLINK

RISVANMAHMOOD.
GUNA.P
II YEAR ECE-B
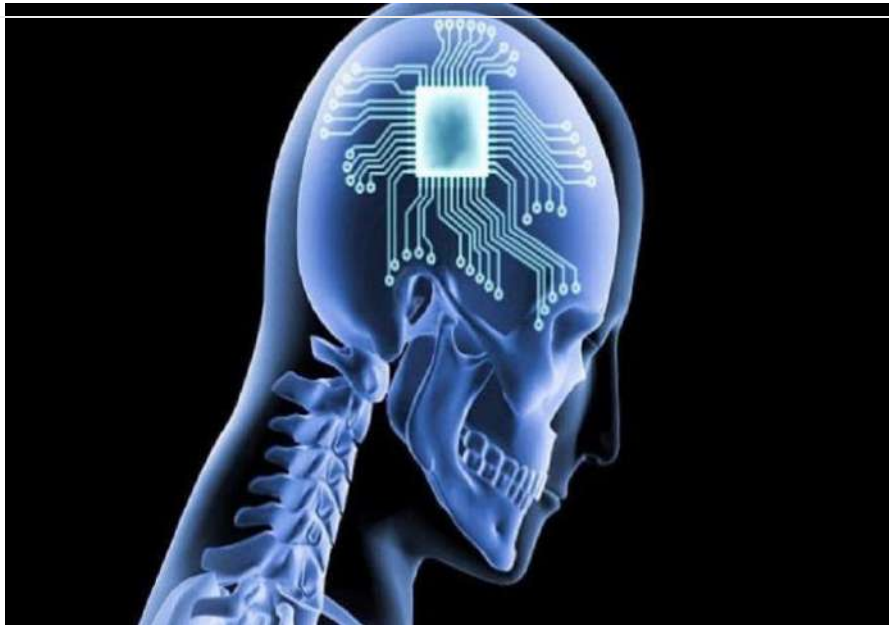
Tesla billionaire Elon Musk is known for high-profile companies like Tesla and SpaceX, but the billionaire also has a handful of unusual ventures. One them, he says, he started to one day achieve "Symbiosis" between the human brain and Artificial Intelligence.

Neuralink is Musk's neural interface technology company. Simply put, it is building technology that could be embedded in a person's brain, where it could both record brain activity and potentially stimulate it.

While Musk likes to talk up his futuristic vision for the technology, merging human consciousness with AI, the tech has plenty of near-term potential medical applications such as the treatment of Parkinson's disease.

Although Musk has touted the near-term applications of NeuraLink, he often links the company up with his fear about artificial intelligence. Musk has said that he thinks humanity will be able to achieve "symbiosis with artificial intelligence".

Musk told "Artificial Intelligence" podcast host Lex Fridman in 2019 that Neuralink was "intended to address the existential risk associated with digital superintelligence."
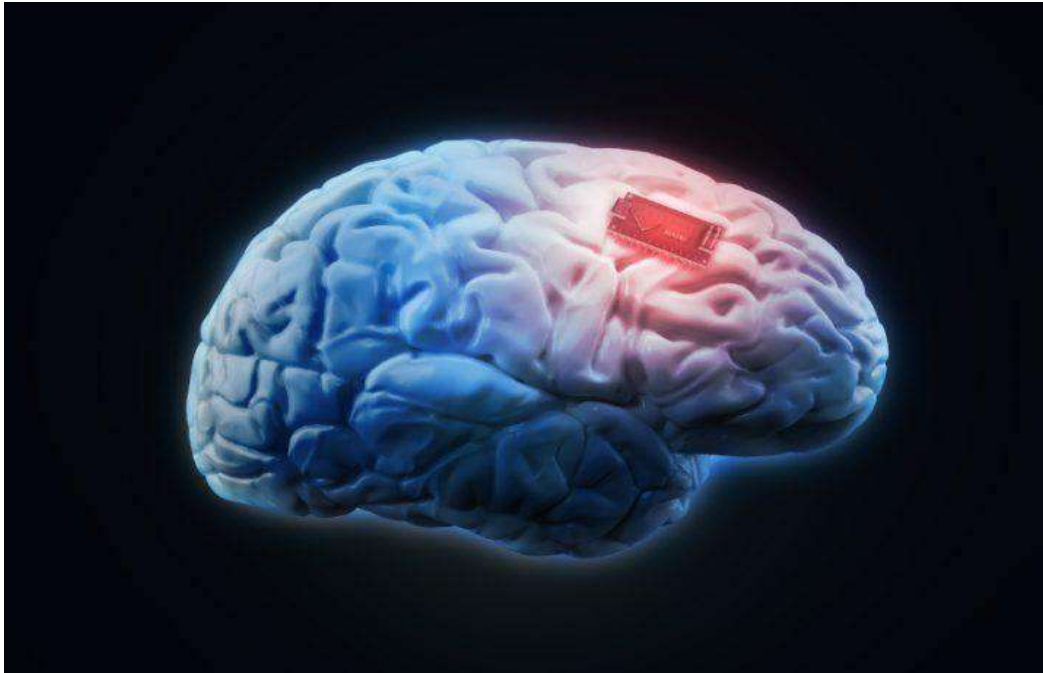
The chip Neuralink is developing is about the size of a coin, and would be embedded in a patients' skull. From the chip an array of tiny wires, each roughly 20 times thinner than a human hair, fanout into the patient's brain.

The wires are equipped with 1,024 electrodes which are able to both monitor brain activity and, theoretically, electrically stimulate the brain. This data is transmitted wirelessly via the chip to computers where it can be studied by researchers.

IMPLANTING OF NEURALINK:

Neuralink is developing two bits of equipment. The first is a chip that would be implanted in a person's skull, with electrodes fanning out into their brain.

Elon Musk's Neuralink brain chip tests kills 15 monkeys out of 23, company accused of causing 'extreme suffering' says report
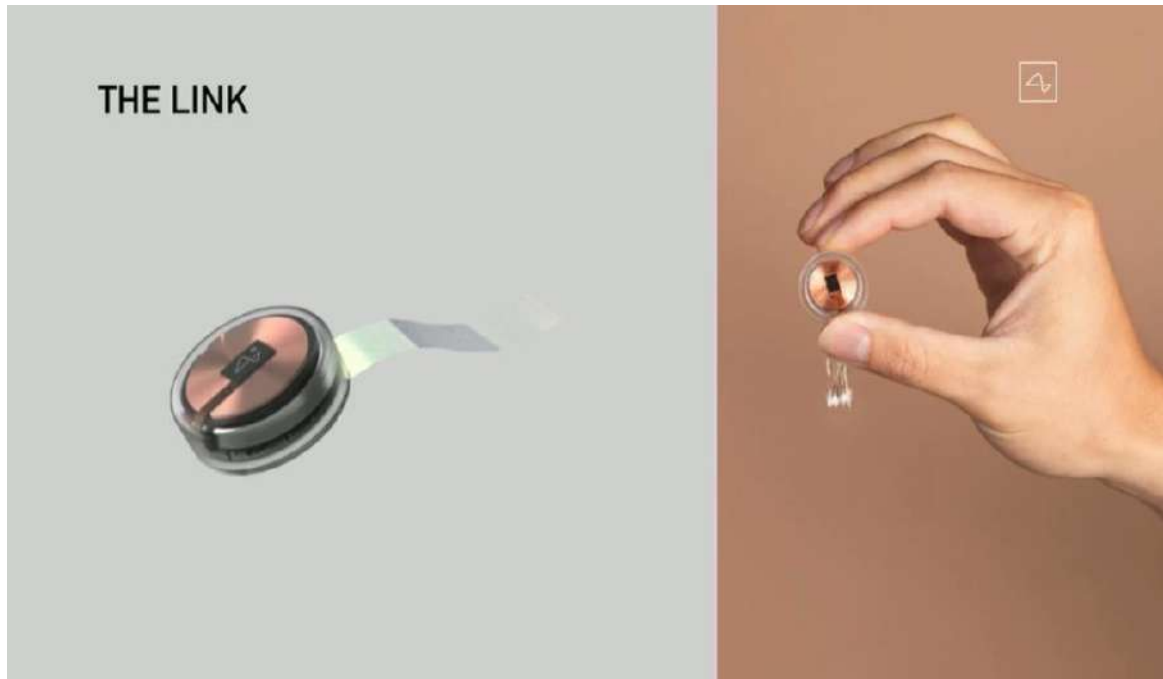
PCRM also claimed that out of 23 monkeys owned by Neuralink, only seven survived the tests and were transferred to a Neuralink facility in 2020, while15 died. However, Neuralink said only eight were euthanized.

Tesla chief Musk's Neuralink has been using the monkeys to advocate the progress of its chips.

Earlier in April 2021, the bio tech company had released a video which showed a monkey, which has a Neuralink chip places in its head, playing the videogame called 'Pong' on a computer.

An animal-rights group, Physicians Committee for Responsible Medicine, has submitted an official complaint with the US Department of Agriculture on Thursday where they have claimed that monkey's experiences "extreme suffering as a result to inadequate animal care and the highly invasive experimental head implants during the experiments," Business Insider reported.

TWENTY YEARS OF SELF DRIVING WITHOUT A SINGLE ACCIDENT INVOLVING PEOPLE

GOPINATH.R.H
JAYASATHYANARAYANAN.M
JAMESEDWIN.J
III YEAR ECE

Sandvik AB is a Swedish multinational engineering company specializing in metal cutting, digital and additive manufacturing, mining and special steel alloys& industrial heating. The company was founded in Sweden in1862.

Self-driving has been widely talked about when it comes to 'concept vehicles,' yet Sandvik's automated loaders and trucks have been working in real mines for over 20 years. That's more than 2 million operating hours of self-driving underground and, at the same time, there have been zero accidents involving people.

Recently Sandvik launched its next generation. For the first time ever, the loader's bucket filling has been automated. This means that from loading to hauling and dumping, the whole production cycle can be fully automated. "It wasn't an easy task," says Jouni Koppanen, Senior System Engineer for Automation at Sandvik. "You need to consider the different types of mines, different rock sizes and you need to fill the bucket just the right amount. But we did it, and we're the only ones who have an auto load function."

In fact, Sandvik's automated system means that its loader sand trucks learn the routes the very first time they enter a tunnel. The vehicle's intelligent system, guided by a set of lasers, maps out and records a path. Then Sandvik's patented algorithms, together with sensors and gyroscopes, ensure the machine knows where to go underground, where GPS is not available.

Above ground, in a comfortable control room, an operator can see exactly where the machine is going via the onboard cameras. Operators can prompt the machine when and where to go. But it is the intelligent system and algorithms that do all the hard work: following the determined route, calculating the speed, controlling the brakes, steering, loading, hauling and dumping—everything.

Unlike equipment above ground, underground loaders are articulated vehicles designed to move in both directions, forward and reverse, at the same speed. They are highly maneuverable in narrow tunnels. The machines are also built to with stand altitude, heat, water and corrosive environments, among other conditions down in a mine.

AUTOMATION: PUTTING PEOPLE FIRST:

"A customer we have in Australia has automated their entire mine," Koppanen says Each operator can now control multiple loaders simultaneously, while the automated machine does all the hard work. "Our automated loaders and trucks are able to maintain an accurate, consistent and efficient level of working. This reduces accidents while increasing uptime and productivity."

TESTING TECHNOLOGY:

Sandvik is able to put new innovation and technology through its paces at its underground test mine in Tampere, Finland. We test our technologies to ensure they are robust, fit for purpose and safe for the underground mining environment. Thorough testing, combined with close customer collaboration, helps ensure that Sandvik develops solutions that help its customers solve their biggest challenges. "Right now, our automated loader sand trucks

work in a zone that is completely isolated from People and other equipment. We have safety sensors that activate the machine's brakes if there's anything in its path, Kokkonen

says "In the future we envision automated loaders and trucks operating safely in the same part of a mine as conventional equipment and people.

"In the future, there will be reduced reliance on the diesel engine," Scrivens says "Focus will shift towards electrification of the driveline and use of electric loaders and battery technology, working together with automation" And the future is not so far away with projects like Borden Lake in Ontario, Canada. Sandvik is partnering with gold producer.

NEED FOR CYBER SECURITY IN INDIA

C.YUVASRI

P.ASWINI

P.SOWANDARIYA

II-YEAR ECE B

INTRODUCTION:

In 2009, compared to physical theft fraudulent money transfers has exceeded in bank branches of United States. Crimes have gone up by 60% every year, in 2012, 3500 cases and 2070 in 2011 reported in India. As per report from National Crime records Bureau (NCRS), Maharashtra reports 561 cases, Andhra 454 cases, Karnataka 437 cases in the year 2012 crimes which are done by age group of 18 to 30[18]. Haryana registered 3 cases in 2011 but 116 in the year 2012 which is a drastic raise. Compared to other crimes, this Cyber Crime doesn't require much investment and can be done in various locations.
These crimes originate from various sources and exhibits socio-educational/economic and technological factors including addiction which also includes counterfering, economic crimes, money laundering, child pornography, sexual exploitation, drug trafficking, human trafficking, terrorism, fraud etc.

WHAT IS CYBER SECURITY?

The dictionary meaning says that Cyber Security is state of being protected against the criminal or unauthorized use of electronic data, or the measures taken to achieve this. It is the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organization and user's assets. Organization and user's assets include connected computing devices, personnel, infrastructure, applications, services, telecommunications systems, and the totality of transmitted and/or stored information in the cyber environment.

WHY CYBER CRIME IS MORE NOWDAYS?

There are 5 common trends which give chances to Cyber Crime:

1.More online transactions and digital data. Transaction and customer information, results of product launches, and other market information are easily available. Creating valuable intellectual property online is an attractive target.

2.ComparativelyCorporation and companies are expected to be more transparent than before. Majority of people want to access to corporate networks through their mobile devices for day-to-day activities. Though smarter technology device increases connectivity and but present latest types of security threats. Hackers can crack these securities and get an easy entry in to corporate networks.

3.Malicious Software like viruses and spyware are strong enough to take the partial control of main applications.

4.In business, customer and vendors are joined to the networks to increase their business profits. In December 2010, a famous E-business website was attacked by dozens of people claiming to be part of the unnamed group. They attempted to perpet rate a denial of service attack in retaliation for website to shut down payment services to other websites. More than a dozen hackers were arrested in that crime.

5.There is more technology advanced hackers, professional Cyber Crime organization. For example, hacker receives payment to infect end user device with malware. Today's Malwares are difficult to trace and they steal data for financial gain. Some people think that they get more money if they become hackers compared to securers.

CHALLENGES IN CYBER SECURITY:

Cyber security has been considered as one of the most urgent national security problems. Are port says, in a speech during his presidential campaign, President Obama promised to "make cyber security the top priority that it should be in the 21st century...and appoint a National Cyber Advisor who will Report directly" to the President.

Cyber security must address not only deliberate attacks, such as from disgruntled employees, industrial espionage, and terrorists, but inadvertent compromises of the information infrastructure due to user errors, equipment failures, and natural disasters. Vulnerabilities might allow an attacker to penetrate a network, gain access to control software, and alter load conditions to destabilize a network in unpredictable ways.

Thedefenseofcyberspacenecessarilyinvolvestheforgingofeffectivepartnershipsbetweenthe publicorganizations charged with ensuring the security of cyberspace and those who manage the use of this space by myriad users like government departments, banks, infrastructure, manufacturing and service enterprises and individual citizens. The defense of cyberspace has a special feature. The national territory or space that is being defended by the land, sea and air forces is well defined. Outer space and cyber space are different. They are inherently international even from the perspective of national interest.

METHODS OF ATTACKS AND AVOIDANCE:

The most popular weapon in cyber terrorism is the use of computer viruses and worms. That is why in some cases of cyber terrorism is also called 'computer terrorism'. The attacks or methods on the computer infrastructure can be classified into three different categories.

(a) Physical Attack. The computer infrastructure is damaged by using conventional methods like bombs, fire etc.

(b) Syntactic Attack. The computer infrastructure is damaged by modifying the logic of the system in order to introduced lay or make the system unpredictable. Computer viruses and Trojans are used in this type of attack.

(c) Semantic Attack. This is more treacherous as it exploits the confidence of the user in the system. During the attack the information keyed in the system during entering and exiting the system is modified without the user's knowledge in order to induce errors.

The first step in protecting yourself is to recognize the risks and become familiar with some of the terminology associated with them.

•   Viruses-This type of malicious code requires you to actually do something before it infects your computer. This action could be opening an email attach mentor going to a

particular webpage.

•   - Worms propagate without user intervention. They typically start by exploiting a software vulnerability (a flaw that allows the software's intended security policy to be violated), then once the victim computer has been infected the worm will attempt to find and infect other computers. Similar to viruses, worms can propagate via email, web sites, or network-based software. The automated self-propagation of worms distinguishes them from viruses.

•   Trojan horses - A Trojan horse program is software that claims to be one thing while in fact doing something different behind the scenes. For example, a program that claims it will speed up your computer may actually be sending confidential information to are mote intruder.

•   Hacker, attacker, or intruder - people who exploit weaknesses in software and computer systems for their own gain. Though they do it for curiosity, their actions are typically in violation of the intended use of the systems. The results can range from creating a virus with no intentionally negative impact to stealing or altering information.

•   Malicious code- This category includes code such as viruses, worms, and Trojan horses. Although some people use these terms interchangeably, they have unique characteristics.

•   E-Mail Related Crime- Certain emails are used as host by viruses and worms. E-mails are also used for spreading disinformation, threats and defamatory stuff.

•   Denial of Service-These attacks are aimed at denying authorized persons access to a computer or computer network.

•   Cryptology-Terrorists have started using encryption, high frequency encrypted voice/data links etc. It would be a Herculean task to decrypt the information terrorist is sending by using a 512 bit symmetric encryption.

NEED FOR CYBER SECURITY IN INDIA:

9.4% houses in India have computer (any of Laptop or Desktop).Chandigarh(U/T),Goa and NCT of Delhi are top three stats/union territories with highest computer usage.

According to 2011 Census, Only 3.1 percent of total houses have Internet access in India. The censuscovered24,66,92,667(246.7million)houses in India and foundonly76,47,473 (3.1%)of this houses use Internet. The Internet includes both broad band and low-speed connections.

According to Internet World Stats on June 30 2012, there were 2.4 billion internet users (2,405,510,175) worldwide. China was the largest countries in terms of internet users with over 538 million users.

CYBER SECURITY INITIATIVES IN INDIA:

ISO 27001 (ISO27001) is the international Cyber security Standard that provides a model for establishing, implementing, operating, monitoring, reviewing, maintaining, and improving an Information Security Management System.

India's legal frame work for cyber security.

1.   IndianITAct,2000

Section 65 - Tampering with computer source code, Section 66 - Hacking & computer offences, Section43–Tampering of electronic records

2.   Indian Copyright Act

States any person who knowingly makes use of an illegal copy of computer program shall be punishable. Computer programs have copy right protection, but no patent protection.

3.   Indian Penal Code

Section 406 - Punishment for criminal breach of trust and Section 420 - Cheating and dishonestly inducing delivery of property.

4.   Indian Contract Act,1872 Offers following remedies in case of breach of contract, Damages and Specific performance of the contract.

OTHER INDIAN GOVERNMENT INITIATIVES:

Indian government released National Cyber Security Policy on July 2, 2013. This policy addressing the growth of information technology, increasing number of cyber crimes, plans for social transformation [6]. It has 14 objectives which includes enhancing the protection of India's Critical infrastructure to investigation and prosecution of cyber crime, developing 50,000 skilled cyber security professionals in next five years.

- Cyber Security Research And Development Centre Of India(CSRDCI)

- Cyber Crimes Investigation Centre Of India

- National Intelligence Grid(NATGRID)

- National Critical Information Infrastructure Protection Centre (NCIPC) Of India Indian Government Initiatives for Education on Cyber Security

Information security awareness–This is launched from over a five years period. One of the objectives is to create awareness about information security to children, home users and non-IT professionals in a systematic way. C-DAC Hyderabad has been assigned this project.

Information security education and awareness project- Objectives are to train System Administrators by offering Diploma Course in Information Security, Certificate Course in Information Security, 6-weeks/2-weeks training programme in Information Security, train Government Officers of Center and State on Information Security issues and Education Exchange Programme

National Initiative for Cybersecurity Education (NICE) - The goal of NICE is to establish an operational, sustainable and continually improving cyber security education program for the nation to use sound etc.

CONCLUSIONS:

As there is a drastic growth in the e-commerce, internet or cyber security is a major issue in the growing countries like India. According to recent survey , which announced in TOI that India will require five lakh cyber security professionals by 2015 to support its fast growing internet economy as per an estimate by the Union ministry of information technology. The financial sector alone is expected to hire over 2 lakh people while telecoms, utility sectors, power, oil & gas, airlines, government (law & order and e-governance) will hire the rest. Employment news says- Based on academic background and work experience, ethical hackers can don the roles of network security administrators, network defense analysts, web security administrators, application security testers, security analysts, forensic analysts, penetration testers and security auditors. the job role would be to develop and test IT products and services of organizations and ensure that they are as secure as possible. Secure programming, authorized hacking and network security surveillance are specializations in this domain.

BLUE BRAIN – THE FUTURE GENERATION

**ELAKKIYA
CAUVERY
KOWSHIKA
III YEAR ECE**

INTODUCTION:

Human brain, the most valuable creation of God.   The man is called intelligent because of the brain. But we loss the knowledge   of a   brain when the body is destroyed after the death. "BLUEBRAIN"-The name of the world's first virtual brain. That means a machine that can function as human brain. The Blue Brain Project is an Attempt   to reverse   engineer the   human brain and recreate it at the cellular level inside a computer simulation. This data is used to build biologically realistic models of neurons and networks of neurons in the cerebral cortex. The   simulations   are carried out on a Blue Gene super computer built by IBM. Hence the name "Blue Brain".

WHAT IS BLUE BRAIN?

It would be the world first virtual brain.

The IBM is now developing a virtual brain known as the Blue brain. It would be the world's first virtual brain. Within 30 years, we will be able to scan ourselves into the computers. We can say it as Virtual Brain i.e. an artificial brain, which is not actually a natural brain, but can act as a brain. It can think like brain, take decisions based on the past experience, and respond as a natural brain. It can take decision. It can think. It can response. It can keep things in memory.
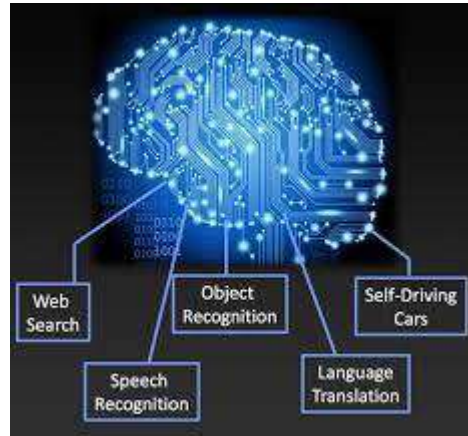
SENSORY INPUT:

Sesory input: When our eyes see something or our hands touch a warm surface, the sensory cellns, also known as Neurons, send a message straight to your brain. This action of getting information from your surrounding environment is called sensory input because we are putting things in your brain by way of your senses.

NEED OF VIRTUAL BRAIN

Today we are developed because of our intelligence. Intelligence is the inborn quality that cannot be created. Some people have this quality, so that they can think up to such an extent where other cannot reach. Human society is always in need of such intelligence and such an intelligent brain to have with. But the intelligence is lost along with the body after the death. The virtual brain is a solution to it. The brain and intelligence will be alive even after the death. We often face difficulties in remembering things such as people names, their birthdays, and the spellings of words, proper grammar, important dates, history facts, and etcetera. In the busy life everyone wants to be relaxed. Can't we use any machine to assist for all these? Virtual brain may be a better solution for it. What will happen if we upload ourselves into computer, we were simply aware of a computer, or maybe.

### NATURAL BRAIN VS SIMULATED BRAIN

Natural Brain:

Input:

In the nervous system in our body the neurons are responsible for the message passing. The body receives the input by sensory cells. This sensory cell produces electric impulses which are received by neurons. The neurons transfer these electric impulses to the brain.

Output:

Based on the states of the neurons the brain sends the electric impulses representing the responses which are further received by sensory cell of our body to respond neurons in the brain at that time.
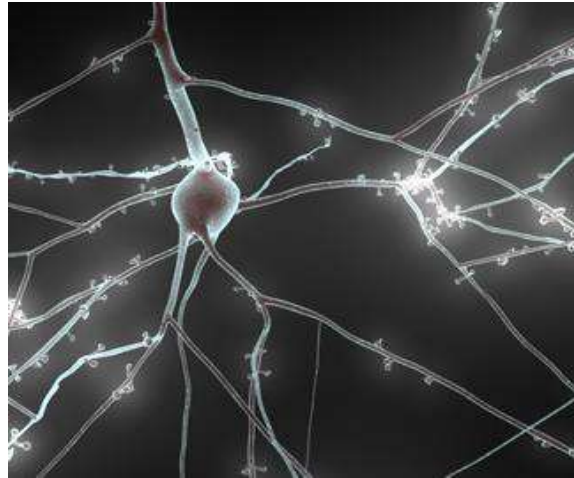
STIMULATED BRAIN:

Input:

In a similar way the artificial nervous system can be created. The scientist has created artificial neurons by replacing them with the silicon chip. It has also been tested that these neurons can receive the input from the sensory cells. So, the electric impulses from the sensory cells can be received through these artificial neurons.

Output:

Similarly based on the states of the register the output signal can be given to the artificial neurons in the body which will be received by the sensory cell.

UPLOADING HUMAN BRAIN

The uploading is possible by the use of small robots known as the NANOBOTS. These robots are small enough to travel throughout our circulatory system. Will monitor activity of brain by traveling into the spine and brain They will provide an interface with computer.

OBJECTIVES

The project will search for insights into how human beings think and remember. Scientists think that blue brain could also help to cure the Parkinson's disease. The brain circuitry is in a complex state of flux, the brain rewiring itself every moment of its existence. If the scientists can crack open the secret of how and why the brain does it, the knowledge could lead to new breed of super computers.

ADVANTAGES

We can remember things without any effort.

Decision can be made without the presence of a person. Even after the death of a man his intelligence can be used. Improvements in processing speed and memory could make entire human brain simulated. The activity of different animals can be understood. Help deaf and mad people

DISADVANTAGES

We become dependent upon the computer systems.

Others may use technical knowledge against us. Computer viruses will pose an increasingly critical threat. Possibilities of human cloning. If in future surrogates to humans are developed then, there will be no human interaction and the world will run on computers only.

CONCLUSION:

In conclusion, we will be able to transfer ourselves into computers at some point. Most arguments against this outcome are seemingly easy to circumvent. They are either simple minded, or simply require further time for technology to increase.

The only serious threats raised are also overcome as we note the combination of biological and digital technologies. While the road ahead is long, already researches have been gaining great insights from their model.

Using the Blue Gene supercomputers, up to 100 cortical columns, 1 million neurons, and 1 billion synapses can be simulated at once. This is roughly equivalent to the brain power of a honey bee.

Humans by contrast, have about 2 million columns in their cortices. Despite the sheer complexity of such an endeavor, it is predicted that the project will be capable of this by the year2023.

Very soon this technology will be highly accepted whole over the world but wisdom lies in right use. "Technology does not create Brain but Brain creates Technology" We will be able to transfer ourselves into computers also me point & this is just the beginning…
 ....!

LI-FI TECHNOLOGY

DURGA.D

SUSHMITHA. S

III YEAR ECE

INTRODUCTION

Communication technology, specifically wireless communications, is one of the fastest growing technologies in History. In just a few decades, we move d from heavy large devices used only for voice communications, to Small smart devices that are capable of doing multiple Functions which include accessing the Internet and video Streaming. The main difference between wireless mobile Generations is the data rate. As we able to increase the Data rate, wireless devices will be able to do more Functions.

This advancement in wireless communications functions has accompanied by increasing the number of wireless devices. It is envisioned that the next generation of Wireless communication, 5G, will have a new era in Wireless communications functions and technologies, as We expect such technologies: smart cars, e-health and Smart grids, and so on.

Furthermore, the integration of the physical and the digital word, which is known as the Internet of Things (IOT), will be realized. As a result, more Wireless smart devices will be deployed in the future and High amount of wireless data will be exchanged.

Therefore, Cisco forecasts that from 2017 to 2020, the Global wireless data traffic will increase by more than 20 extra bytes which is equivalent to increase by200%, As illustrated. It is also expected that smart Devices will   cause   98   %   of   the   wireless   data communication in2020.

These smart devices require wide bandwidths and High data rates. However, most of the radio frequency (RF) spectrum has been utilized or assigned for certain Applications, and it becomes more difficult to accommodate more wireless devices.One of the proposed solutions that can tackle this issue and provides high data rate is the Li-fi technology, which uses the visible light spectrum. For wireless communications, instead of the radio spectrum. This is a recent technology introduced by Prof Harald Hass in 2011,6 years ago.

TECHNOLOGY DESCRIPTION

The Li-fi term is an abbreviation of light fidelity, which Means transmitting wireless digital data through the illumination of light. The term was selected to represent the Optical version of the Wi-Fi technology. Instead of using The RF band to modulate the digital data and transmit it through an antenna, the data is modulated in the light frequency band and sent through the LED light.When the Light is ON, digital 1 is sent, whereas digital 0 is sent if the light is OFF. The light seems as always ON because the variation between zeros and ones is done very quickly for
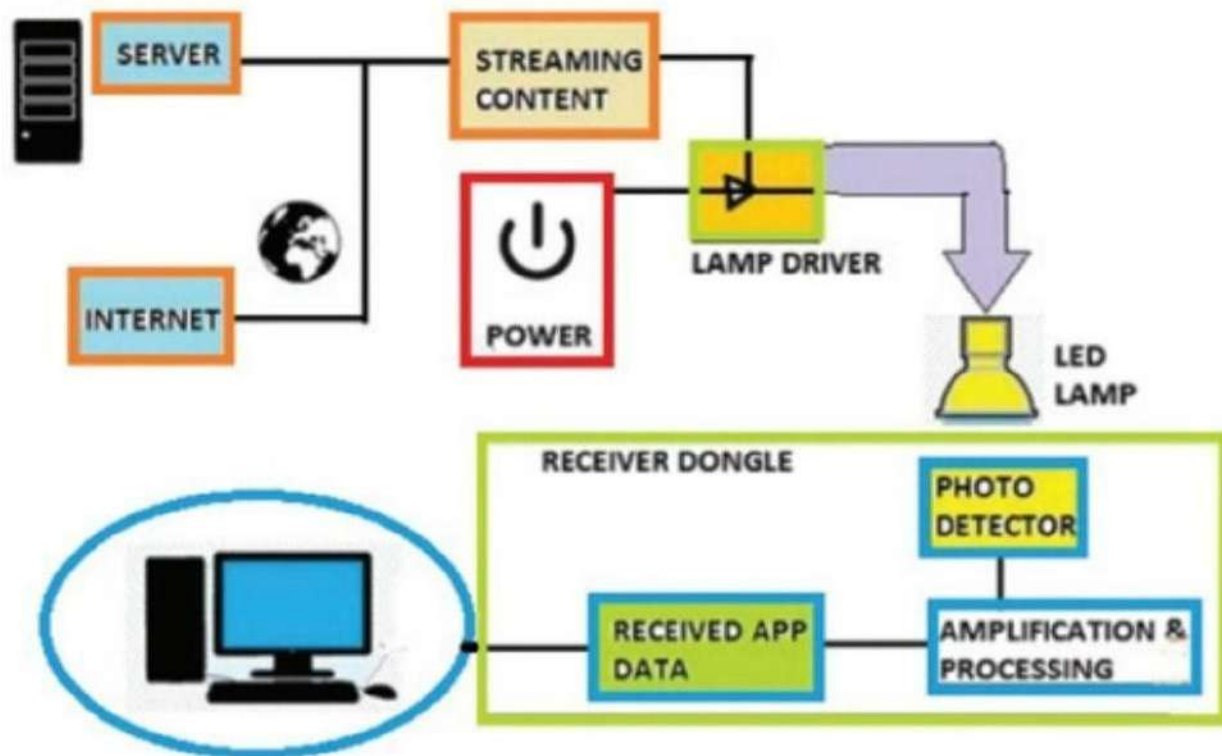
the human eye to be detected. Instead of using single Data stream, it is possible to use parallel transmission or use an array of LEDs to transmit thousands of data Streams and thus we can achieve very high data rate

APPLICATIONOF LIFITECHNOLOGY

Places where using RF is limited Or restricted

Because light signal is safe and available everywhere It can be used to provide wireless communication in Places where the use of RF signals is limited due to the Potential dangers. Example such places are include hospitals, airplanes etc.

Traffic management

If the cars' headlights and backlights are replaced by LED Lamps, the Li-fi network can be established between cars. Cars can communicate each other in order to reduce Chances of car accidents.

Underwater application:

For underwater remotely operated vehicles, radio communications such as Wi-Fi fails completely. Such vehicles Use long cables for communications. By using high powered lamps with li-fi technology, we can get rid of these Cables and thus the vehicles can move easily to explore larger areas, and send the data wirelessly.

ADVANTAGES OF LI-FI TECHNOLOGY

- Capacity
- Free spectrum
- Efficiency
- Security
- Complexity

LIMITATIONSOFLI-FITECHNOLOGY

For every technology, besides knowing its advantages, we have carefully to realize its limitations in order to Better suggest possible applications of this technology.

In this section, a brief description of some challenges of Li-fi technology compared to radio technology will be Presented. Some possible solutions for these limitations Will be introduced.

High path loss

The path loss of any communication system is proportional to the square of the operating frequency (PL α f 2).The frequency of visible light waves is much higher than the frequency of radio electromagnetic waves. The maximum RF is in the range of giga hertz (109), whereas the Lightwave is in the range of terahertz (1012). Therefore, typically the light signal is subjected to higher attenuation than the radio signals. As a result, the Li-Fi technology will be difficult to use for long distances.

Blockages

The light signal is more sensitive to blocks and obstacles Than the radio signal. In indoor situations, unlike radio Signals, light signals cannot pass through walls. This is Coverage disadvantage, but security advantage at the Same time. In outdoor communication environments, the quality degradation of data transmission will be Severely affected by using light waves instead of radio Waves.

NLOS issues

The Li-fi system will be less reliable when there is no line-of-sight between transmitting source and receivers. Therefore, the number of transmitters should be increased in order to increase the possibility of LOS between transmitters and receivers**.**
Conclusion

Li-fi is a recent technology that uses LED lambs for wireless communications. It uses the visible

light band instead of the radio spectrum. Unlike RF systems, where antennas Are used for transmission and receivers, Li-fi systems use LED lamps for transmission and photodetectors in the Receivers. In addition to the conventional modulation Schemes used in RF, Li-fi has its unique modulation techniques, such as CSK and MM.

Since the visible light band is 10,000 times wider than the radio band, Li-fi can provide very high data rate. Also, the visible light band is unlicensed and free to use. Besides these two benefits of Li-fi technology, it is an Energy efficient system based on lighting, which is available everywhere.

Also, it has a simple circuit with naturally a security feature, since light cannot pass through Walls. Furthermore, unlike RF systems, Li-fi does not suffer from multipath fading problem. In addition, the Li-fi systems are safer and more cost-effective than RF systems.

MEDICAL ELECTRONICS & HEALTH CARE APPLICATIONS

YOSHANA.G
YASMEEN FATHIMA SH
II YEAR ECE B

DA VINCI ROBOT: The Da Vinci robotic surgery System is designed to replace traditional surgery with a Minimally invasive procedure. It allows the surgeon to Perform precise, controlled movements through a small Incision by using robotic technology. Used in application such as:

- **Colorectal surgery....**
- **General surgery....**
- **Gynaecology surgery....**
- **Head and neck surgery....**
- **Thoracic(chest)surgery....**
- **Urology surgery.**

MICRO GRIPPERS: The microgripper is a microsystem component that could be used in bio medical and biological applications where it can manipulate or isolate individual cells, microbes, blood vessels or carryout localized cell probing. Microgrippers are commonly used for micromanipulation of micro-objects from 1 to 100µm.

OPTO ELECTRONIC SENSORS

Medical applications that use optoelectronic sensors include pulse oximetry, measuring the amount of oxygen in the blood, heart-rate monitors; blood diagnostics, such as blood glucose monitoring; urine analysis; and dental color matching.
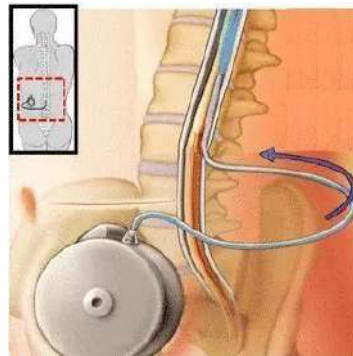
BIO PLOTTERS:

It can be used in a variety of biomedical applications including bone regeneration, drug releases, soft tissue printing, cell printing, organ printing, and cartilage fabrications.

NEURO STIMULATOR:

To relieve pain.

Neural stimulator relieves from the pain signals between the spinal cord and the brain. It generates electrical impulses and soothes your body quickly.

Advantages of Neuro Stimulator
- No need to go for surgeries and therapy
- Stimulates spinal cord
- Can be implanted indifferent parts of the body easily

DIGITAL STETHOSCOPE :

Digital Stethoscope is **a** measuring instrument used to listen sounds generated in the body, especially the heart and respiratory lungs.

Applications of Digital Stethoscope

- Telemedicine
- Hearing aid for impaired personnel
- Recording heart and lung sounds

IOT IN AGRICULTURE

SUJITHKUMAR.R.S

IIYEARECE

What Is IOT?

For a last couple of years are we all have experienced a term IOT. But what does it really mean? IOT means Internet Of Things. "It is simple concept of connecting the non-living objects through internet and enabling them to act automatically according to the data given". By connecting to the internet the object or appliance scan communicate with each other and perform a particular or multiple task without any human interactions.
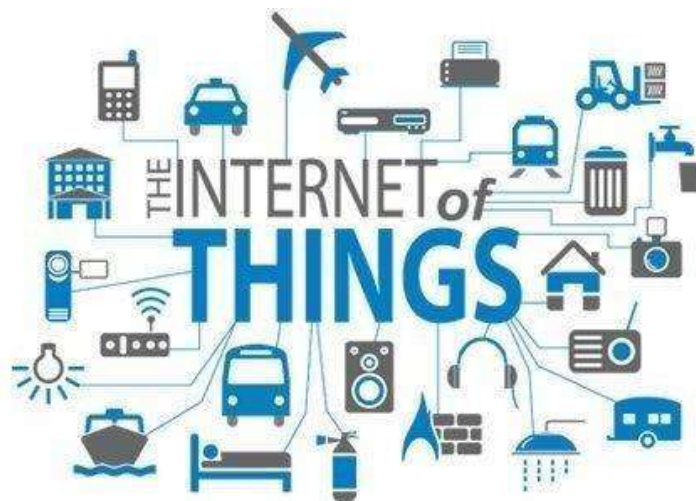
Why IOT?

We have seen what is IOT, But what is the reason or why we want to use IOT? Now-a-Days all are internet based and we all are using internet in our day-to-day life. So internet plays a vital role in our lifestyle. As our demands arises more, new and positive inventions

will come into pledge. As a result, we are in new era of IOT. We all like automation, for example: autonomous cars. When we think how to implement automation, IOT comes into play. If you want to automate your house gate to open automatically when car arrives and close automatically when car departures, it can be done by using IOT. It is not just used for basic purposes but also in larger scale, like industries. By recent years industries are also preferring automation to avoid many affecting factors like unavailability of manpower, human errors and so on.

Applications Of IOT

As we seen earlier IOT has a wide range of Applications.
Let us state some of the major application of IOT,

- ➢ Agriculture
- ➢ Home automation
- ➢ Autonomous cars
- ➢ Health
- ➢ Waste management
- ➢ Smart city
- ➢ Industrial internet
- ➢ Security

Why In Agriculture

Every field is getting development every day. But agriculture is one of the least scope Profession. It is because the risk of loss in economic vision.

The main need for mankind is agriculture. So to find a better way to take agriculture further in future, we are introducing IOT in agriculture.

Smart Agriculture

smart farming and smart agriculture are mostly used to refer to the application of IoT solutions in agriculture. Such applications include farm vehicle tracking, livestock monitoring, storage monitoring, and more

The coming years will see the increasing use of these smart farming and other technologies. In fact, IoT device installations in the agriculture world are projected to experience a compound annual growth rate of 20 percent, and according to a January 2016 machine are search report, the number of connected agricultural devices is expected to grow from 13 million at the end of 2014 to 225 million by 2024.

IoT solutions are focused on helping farmers close the supply demand gap, by ensuring high yields, profitability, and protection of the environment. The approach of using IoT technology to ensure optimum application of resources to achieve high crop yields and reduce operational costs is called precision agriculture. IoT in agriculture technologies comprise specialized equipment, wireless connectivity, software and IT services.
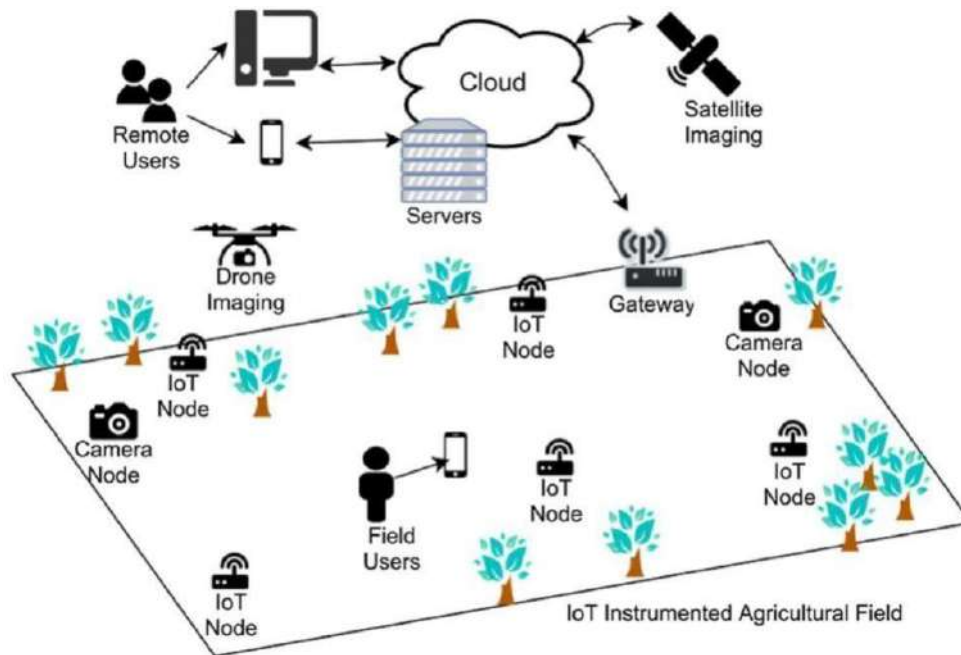
Advantages Of IOT In Agriculture

- Precision Farming

    IoT agriculture solutions help farmers understand the enterprise's operations. Optimize your processes and make your data work for sustainable growth.

- Smart Irrigation

    Reduce water waste and improve yields through connected, sensor-based water monitoring and management. Sensor data and analytics help farmers manage irrigation to keep up with demand and conserve natural resources
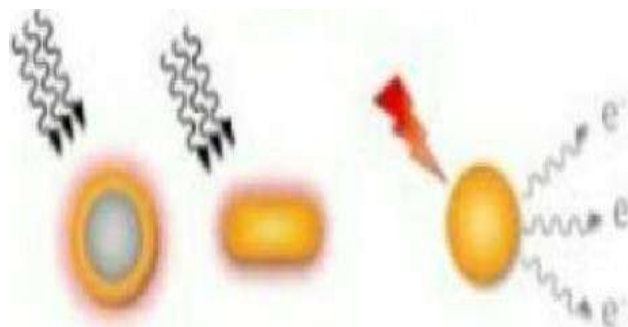
- Remote Sensing

    Stay abreast of conditions across the entire farm with remote sensing technology and connected devices.   Sensors generate real-time data to evaluate current practices and improve efficiency and effectiveness.

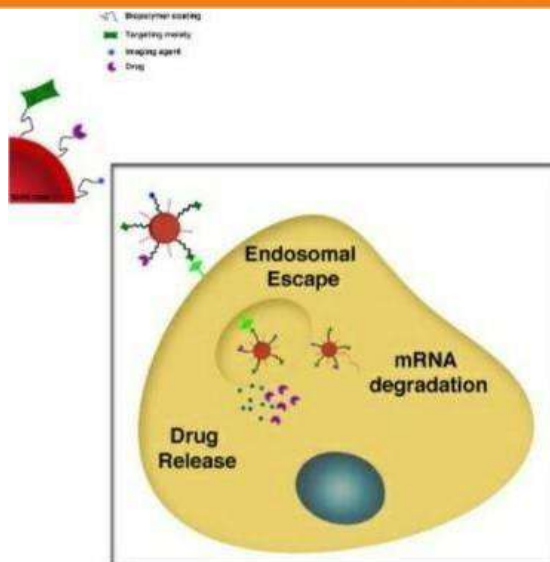# GOLD NANO PARTICLES

SANTHOSHKUMAR A

IIYEARECE-B
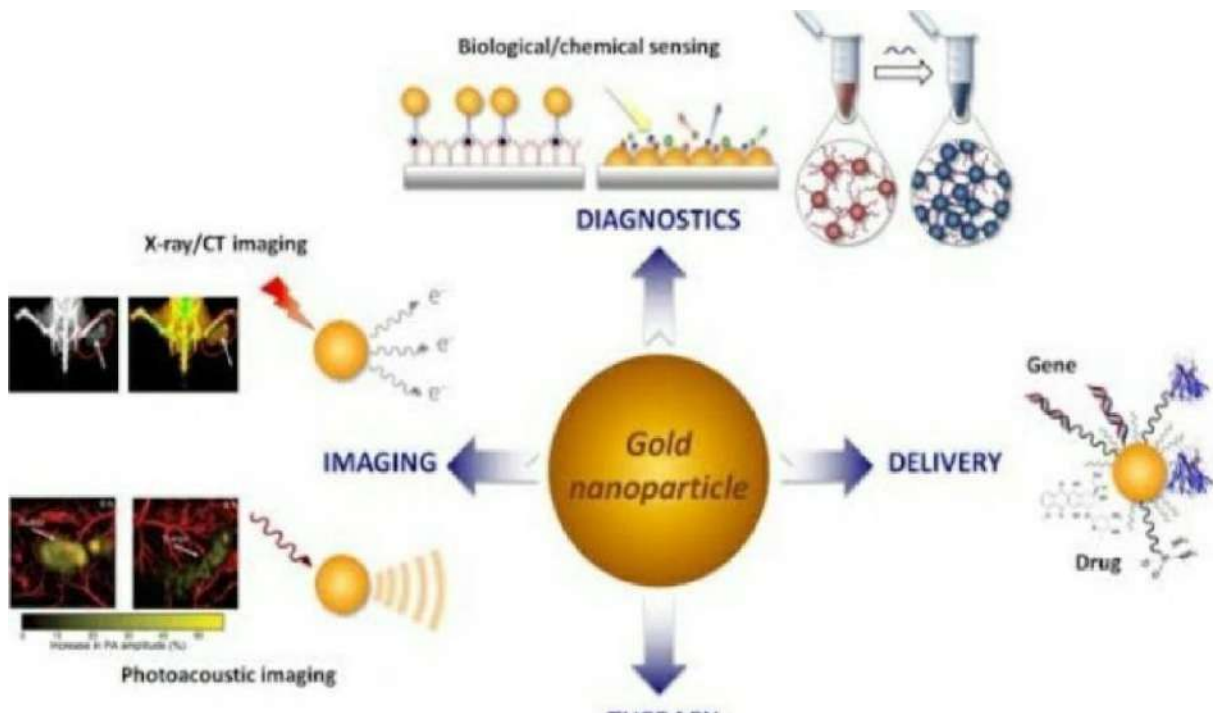
THERAPY

Photothetmaitherapy Radiation therapy

GOLD DRUG DELIVERY IN NANO PARTICLE

Nano particles can easily enter cells although the mechanism(s) involved are not well understood. The nanoparticle influx occurs by endocytosis; the particles are inserted and diffused through the lipid bilayer of the cell membrane. Furthermore, these nano particles were shown to be able to enter the cells even after linkage to proteins such as antibodies. Nano particles conjugated with antibodies against exclusive cancer cell surface receptors have been used to specifically bind with cancerous cells; the functionalized nano particles have also been used for targeted entry into cells. Phthalq cyanine-stabilized gold nanoparticles have been shown to be a potential delivery vehicle for photo dynamic therapy. Gold nano particles with a size of 20nm have been conjugated to various cellular targeting peptides to provide functional nano particles that penetrate the biological membrane and target the nucleus.

Various nanoparticles have also applied as targeted bio markers and drug-delivery agents for diagnosis and medical treatment of cancer. Gold nanoparticles have been in active use in the identification of chemical and biological agents. Electron microscopy (predominantly, transmission electron microscopy — TEM) has historically remained the predominant means to detect Pips peqifiq interactions using colloidal gold particles (due to their high electron density). It is not by happen stance that the first three-volume publication about the application of colloidal gold was chiefly devoted to TEM using GMP. The use of high resolution instruments (high-resolution transmission electron microscope.and systems of digital recording and the processing of images are

examples of the modern application of electron microscopy equipment.
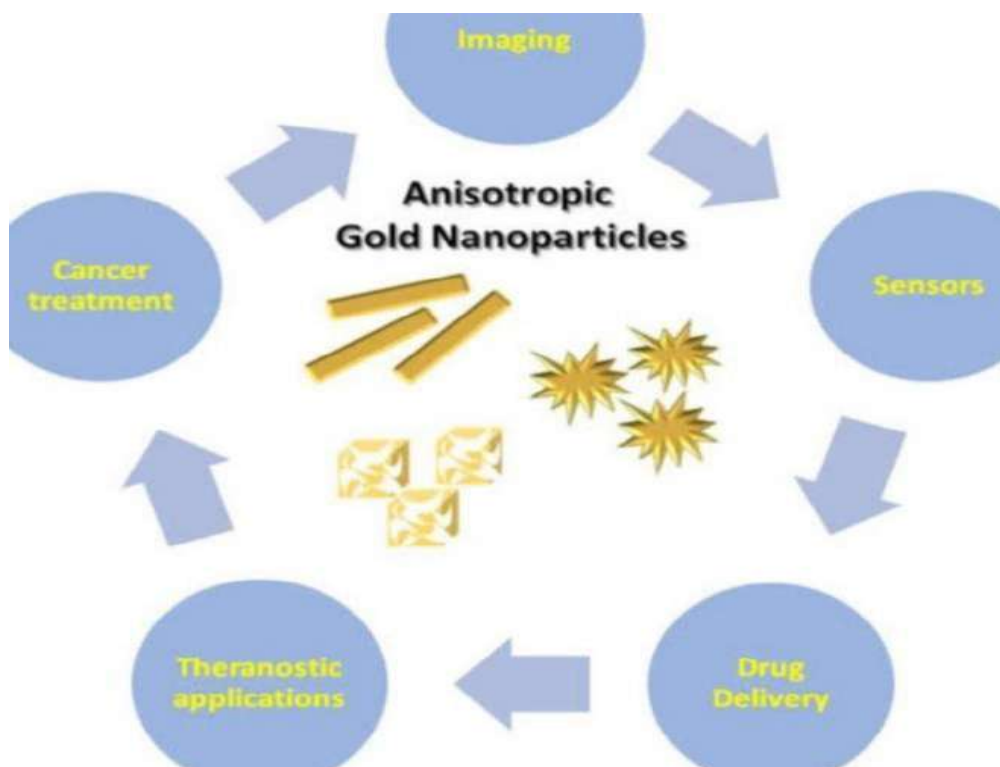
The main practical use of immune electron spectroscopy in modern medico-biological studies is for the identification of causative agent so infectious diseases and their surface antigens.

GOLD NANO PARTICLES IN THERAPHY
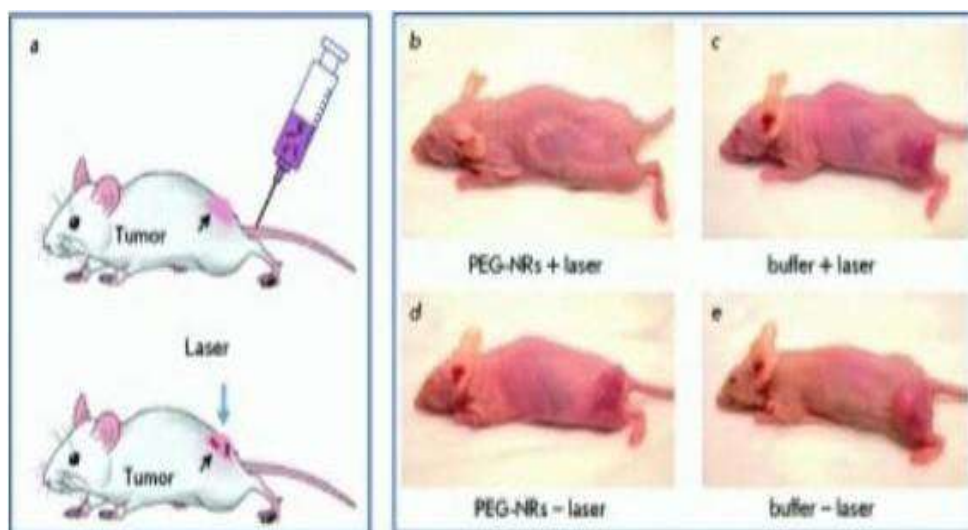
Photothermal cell damage is a promising direction in both tumor therapy and the therapy of infectious diseases, which has been intensively developing. The essence of this technique is as follows: gold nanoparticles reach their absorption maximum in the visible or near-infrared region and become hot when irradiated at the corresponding light wavelength. If they are located inside or around the target cells (which can be achieved by conjugation of gold particles with antibodies or other molecules), these cells die.

Thermal exposure has been used in tumor therapy since the 18th century. To do that, both local heating (using microwave, ultrasound, and radio radiation) and hyperthermia of the entire organism (heating to $41—47^{O}C$ for 1 h) were applied. Upon local heating to $70^{0}C$, the duration of the procedure can be reduced to 3—4min. Local and general hyperthermia result in irreversible cell damage caused by the disruption of the cell's membrane permeability and protein denaturation. Healthy tissues are also clearly damaged in this process. All this imposes considerable restrictions on the application of this method.

The revolution in cancer thermotherapy was triggered by the use of laser radiation, which made controlled and directed damaging of tumor tissues possible. The combination of laser radiation with f/>er-optic waveguides gave excellent results and was named interstitial laser hyperthermia. The disadvantages of laser therapy include the low selectivity associated with the necessity of using powerful lasers for the efficient stimulation of tumor cell death.

4.GOLD NANO PARTICLES IN IMAGINIG
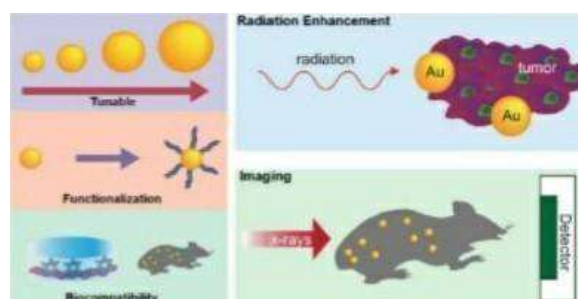
X-ray imaging was invented by Wilhelm Röntgen in 1895. It utilizes high-energy electromagnetic radiation to create images of internal structures. Today it is the most widely used method of medical imaging, accounting for 50—75% of all medical imaging done X-ray imaging is considered safe

and cost effective if the radiation dose is monitored and limited over the lifetime of the patient. An important breakthrough in1973 resulted in the development of CT, which allows for 3-dimensional(3D) reconstructions of X-ray images by rotating the detector and the X-ray source about the imaged body.

Ray beams can have several different interactions with matter, but it is worth highlighting the two that predominate at clinically relevant levels of energy. Photoelectric absorption occurs when an X-ray photon interacts with an inner-shell (K or L) electron of an atom. If the energy of the incident photon is greater than that of the electron, then the electron is ejected and the atom absorbs the photon completely. The inner-shell vacancy causes a cascade of electrons as outer-shell electrons fill inner shell vacancies, releasing secondary radiation in the process. The ejected electron is absorbed by the surrounding tissue and is a main cause of biological damage in X-ray imaging. The energy threshold required to eject an inner-shell electron is referred to as the absorption edge. A spike in the mass attenuation of the bulk material is observable at these thresholds. The K-edge of several common contrast agents is within clinical CT range, including iodine (33.2 key), barium (34.7 Key), and gold (80.7). K-edge imaging, the detection of contrast agents using measurements of their characteristic Xray attenuation profiles, has been used to detect BUN? Sgbirra utilized this property to create high contrast particles for CT scanning. 120mn polysorbate cores with a lipid encapsulation were used to entrap2—4nm   Formulated particles provided high contrast in CT phantoms and in vivo studies. This material property can be exploited to increase signal-to-noise ratio.

5G WIRELESS TECHNOLOGY

SHANMUGAVEL.M

II YEAR ECE

OVERVIEW

- Evolutionfrom1Gto 4GSystem

- Problemsin4G

- 5GWireless System

- Features of5GTechnology

- Applicationsof5G
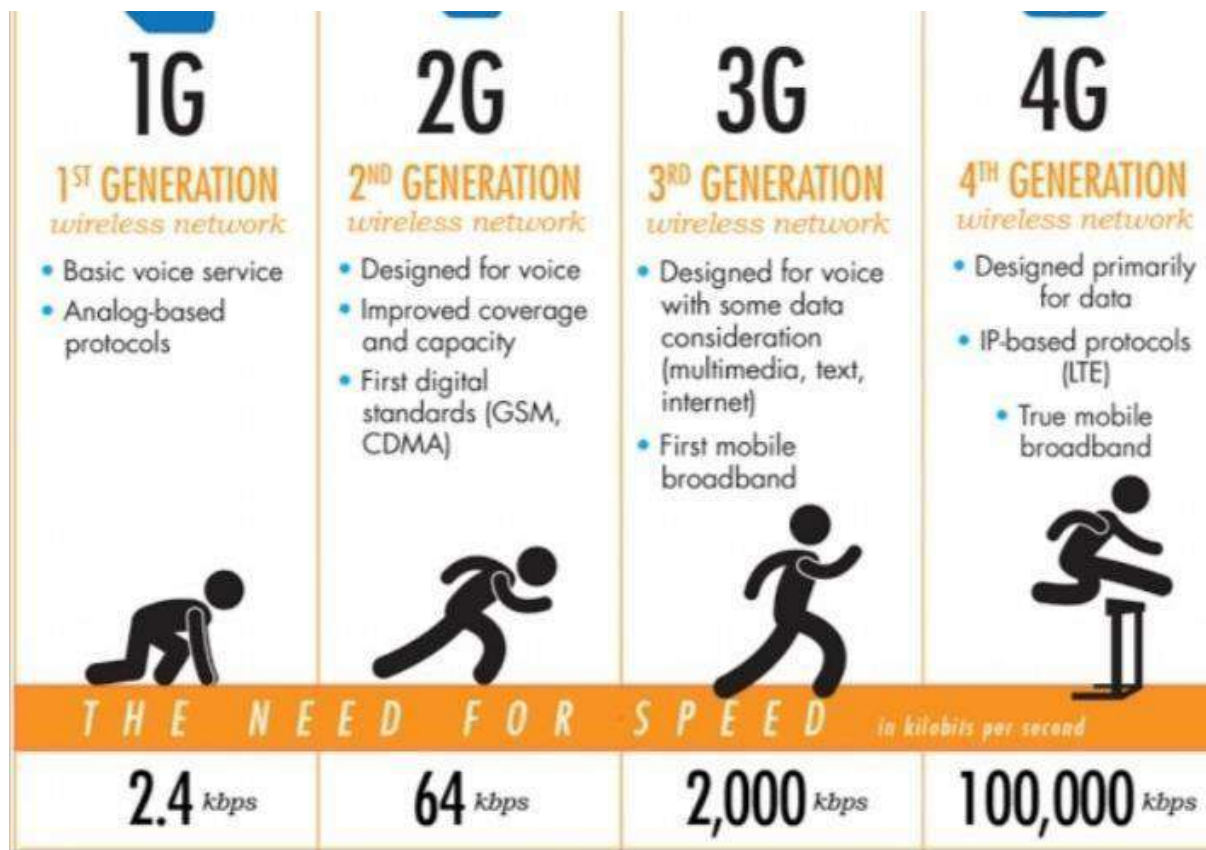
1G WIRELESS SYSTEM

- Developed in1980's and completed inearly1990's.

- 1G was old analog system and supported the 1st generation of analog cellphones speed up to 2.4kbps.

- Advance mobile phone system was first launched by the US and is a1G mobile system.

- Allows users to make voice calls in1country.

2G WIRELESS SYSTEM

- Fieldedinthelate1990's and finished in the late 1998's.

- Planned for voice transmission with digital signal and the speeds up to 64kbps.

- 2G was the digital handsets that we are used today, with 2.5G representing handsets with data capabilities over GPRS, SMS.

3G WIRELESS SYSTEM

- Developed in 2002 with large capacity and broad band capabilities.

- Allows the transmission of 384kbps for mobile systems and up to 2Mbps.

- Increased spectrum efficiency– 5Mhz.

- In 2005,3Gisready to live up to its performance in computer networking and mobile devices area.

4G WIRELESS SYSTEM

- Developed in 2010. It offers both cellular and broad band multimedia services everywhere.

- Faster and more reliable Multi-standard wireless system.

- 100Mb/s

- Used instead of CDMA.

- Lower cost than previous generations.

PROBLEMS IN 4G

- SMS- very low rate, highly delay- tolerate& requires more reliability than voice.

- E- mail – very low rate, highly delay- tolerate& requires more reliability.

- The potential high level of traffic variation across the area of networks coverage.

- The fluctuations in traffic demand will be at unprecedented levels in future networks, which will result in tremendous stress to wireless operators.

5G WIRELESS SYSTEM

- 5G is next major phase of mobile telecommunications standards beyond the 4G.

- 10 times more capacity and broadband capabilities than other.

- Expected speed1GB/S.

- More fast and more reliable than 4G.

- Mobile Multimedia Communication.

- Anywhere, Anytime with Anyone.

- Global Mobility Support.

- Integrated wireless solution.

- Customized personal service.

- Multi-standard wireless system.

- Lower cost than previous generations.

FEATURES OF 5G TECHNOLOGY

- 100%coverage.

- 90%reductioninnetworkenergyusage.

- Milli second latency.

- Up to 100x number of connected devices per unit area.

- 1000 x bandwidth per unit area.

- 99.999% availability.

Applications of 5G

- Satellite internet.

- Entertainment and multimedia.

- High-speed mobile network.

- Internet of things- connecting everything.

- 5G will give artificial intelligence to boost up.

- Improved remote education.

FIRE FIGHTING ROBOT

S.DHARANI

IIYEAR ECE-A

Firefighting is important but dangerous occupation. Robots are designed to find a fire, before it rages out of control, could one day work with fire fighters greatly reducing the risk of injury to victims. l Fire Fighting Robot Competition is a contest purposely to simulate the real-world operation of an autonomous robot rescuing 10victims (table tennis balls) and stop 5 fires (emergency candles) in a house within three minutes. The robot development is consisting of three elements which is the hardware, electronic, and programming. The robot have three DC motor, two for driving system and another single DC motor for ball suction subsystem and the fire blowing subsystem. Various sensors are also interfaced with PIC16F877A as a feedback to the robot such as photoelectric sensors, fiberoptic sensor and RGB color sensors.


Introduction

Firefighting is the act of extinguishing destructive fires. A firefighter must be able to stop fire quickly and safely extinguish the fire, preventing further damage and rescue victims to a safer location from the hazard. Technology has finally bridged the gap between firefighting and machines allowing for a more efficient and effective method of firefighting. Robots were designed to find a fire, before it rages out of control. The robots could one day work with firefighters in reducing the risk of injury to victims.

To simulate the dangerous firefighting works, the Fire Fighting Robot Contest 2010 that was organized by University Malaysia Perlis (UNIMAP) in the first Malaysia University Robot Contest (MUROC). Fire Fighting Robot is a game based on an imaginary fire fighter rescuing the victims and stops the fires.

The Fire Fighting Robot will autonomously move around the house (field) as in Figure 1 to rescue the victims (table tennis ball) as much as possible and stop the fire (standard emergency candle) in the given time.

Fig.1 The Fire Fighting Robot game field
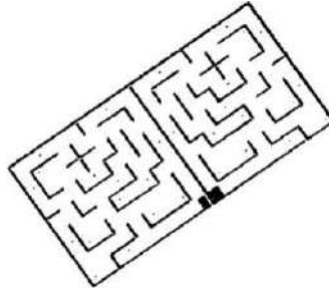
Correspondence: w.h.w.zuha, Department of Electrical and Electronic Engineering, University Putra Malaysia43400 Serdang, Malaysia.

email:wan@eng.upm.edu.my

1. Design Concept

To make sure the robot capable to complete the entire task and achieve "rescue", the robot need to be designed by following the MUROC's rules. According to the rules, the size of the robot is limited to a volume of 40cm x 15cm x 15cm and the maximum weight is5Kg . On top of that, the robot is needed to suck table tennis balls into the designed robot and able to stop five fires with the minimum and maximum height of standard emergency candle from 2inch to6inch respectively. The robot also needs to navigate itself in the maze without problems.

This project is divided into three sections. The first section of the project is the mechanical part, followed by electronic part and the final section is the programming part.

2. Mechanical Design Structure

Before starting the robot construction, the robot was design and simulated using the CAD drawing using the Solid Work software, this important to analyze the advantage and disadvantages of the design. Other than that, by using CAD it also helps to reduced time and cost because there will be less prototype fabrication.

To make sure the structure of the robot is durable and the weight is not exceeding 5kg, the main used materials for building this robot are the PCB board for the main structure and

transparent Perspex for the tennis ball container. These materials are light weight and easy to shape.

2.1 Main structure

The robot to need archive "rescue" within less than 3minutes. Thus, the robot needs to travel fast in the maze without problems. To ensure that the robot move perfectly when moving straight, and taking turn smoothly inside the maze, the robot need to be built in "disk" shape with 15cm in diameter. The completed fire fighting robot's structure is shown in figure2.The wheels are mounted at the middle of the disk but this will make the robot to be unstable because it tends to fall to the front or to the rear side. To overcome the stability problems, several trans-wheels mounted around the robot's base.
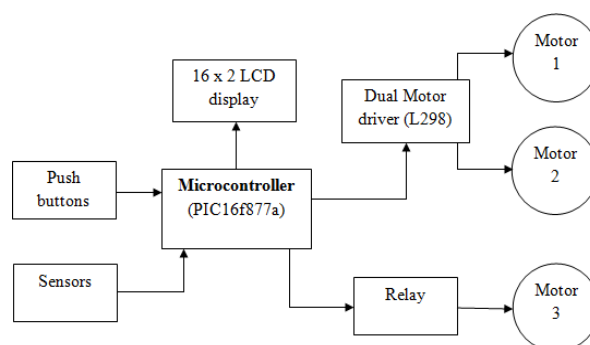

Fig.2FireFightingRobot

2.2 Ball suction and fire blowing system

The fire blowing system issue to stop the fire from the emergency candle. These two systems are using the same mechanism driven by a centrifugal fan connected to the DC motor as in Figure 3. The combination of the high speed DC motor and the centrifugal fan connected to the table tennis ball container will make a miniature vacuum thus make any light weight object will be sucked into the container including the table tennis ball.

Fig. 3Centrifugal fan connected to the DC motor By using the air flow from the centrifugal fan, it is More than enough to stop the fire from distance.

3. Electronic Design and Development

The electronic part is one of the important parts in building the Fire Fighting robot. It includes the several types of sensors, push button, power supply, DC motor driver, DC motor and the most important in the autonomous robot is the microcontroller. These entire components are connected together to become a system. The electronic system of the Fire Fighting robot can be simplified as in Figure4.

Fig. 4 The electronic system of the Fire Fighting robot.

3.1 Sensors

The Fire Fighting robot needs to navigate the maze without any direct human control, thus the robot is equipped with three types of sensors as feedback such as photoelectric sensor,

RGB color sensor and Digital fiber sensor. Generally, all the sensors used in this project have digital TTL output and requires 12V of DC supply.

There are six photoelectric sensors are attached around the robot used for robot's wall following method. All of the photoelectric sensors are manufactured by SUNX.

For junction counting purpose, a fiber optic sensor as in is attached either at the right side or at the left side of the robot according to the played game field as in If the robot plays at the red game field, the fiber optic sensor is attached at the left side of the robot and if the robot plays at the blue game field, the same fiber optic sensor will be attached to the right side of the robot.

For the color-differentiating sensor, there are two RGB color sensors are attached to the robot. One is for detecting the present of the candle's base and the other one is for distinguishing the floor color.

3.2 Microcontroller circuit

PIC16F877A is used for the robot controller. It decodes the sensors output signal and gives correct output signal for LCD display, motor driver and relay circuit.

A 16x2 LCD display as in is connected to the PIC externally to become a useful interface for the user. The LCD is used to display the current action taken by the microcontroller and to show the information from the sensors.

To make the robot move, the motor driver used in the project is L298 IC. The robot is using differential drive method in other word the robot is using two motors. By using the L298, it can control two motor simultaneously. The driver allows the motor to be driven neither forward or reverse direction and sometimes brake by applying appropriate signal from the PIC

For this project, a relay circuit is also used to control a DC motor for suction sub-system to for on and off switching control only.

3.3 Circuit simulation

Before fabricating the circuit, the microcontroller circuit must undergo simulation. The simulation process is using the ISIS Professional simulation software.Using this approach, it can reduce the hardware development cost and it also able to reduce the time for troubleshooting and testing the hardware circuit.

3.4 Printed Circuit Board (PCB)Fabrication

The fabrication is design using ARES7 Professional software. For this project, the PCB fabrications are divided by three circuit, which is the microcontroller circuit, driver circuit and control board circuit.

4. Programming

Programming is the core element in building an autonomous robot which able it to make its own decisions using sensors as feedback. The program code is written using C language and compiled using CCSPCWC-Compiler software .Once the program code compiled, the program is downloaded into the PIC16F877A using PICkit2 software, linked by Cytron's USBUIC00A downloader.

5. Robot Behavior

The aim of the project is to make the robot to move around in the maze using the wall follower method, junction counting method and able to rescue the victim and stop the fire. The planning of the behavior is starts by configuring the major movement probability of the robot such as following the right wall and following the left wall subroutine.

After that, the route of the robot must also be planned M to make sure the robot will pick the table tennis ball and stop the fire as much as possible using shorter route. In order to archive this, the robot needs to perform several programmed subroutines such as wall following, strategy 1, strategy 2, and strategy 3 subroutine. Then, these subroutines are combined in a main program where the strategy button is configured.

5.1 Main program

The main program is written to link all the sub program using strategy buttons selection to become a complete Fire Fighting robot program code.
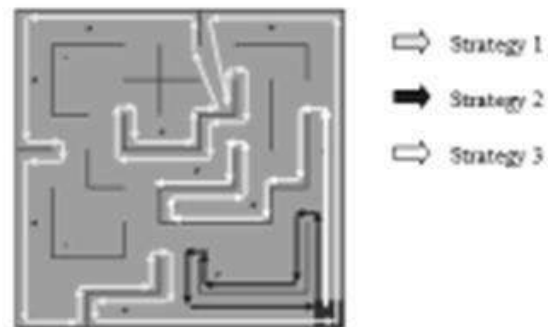
5.2 Wall follower

The robot is using wall follower method to move in the maze, the method generally consist of several behavior such as move straight, turn left, turn right and more according from the sensor input regardless whether the robot is following the right wall or the left wall. The sensors are given a name that refers to its output pin connection to the microcontroller pin. Table 1 and Table 2 show the robot action depending on the sensors input for right wall follower and left wall follower method respectively.

Strategies

There are four strategies programmed to the Fire Fighting robot determined either using strategy switch or the starting point counters. Figure 5 shows the robot path inside the house or game field.

Fig.5 The robot path inside the game field

Sensor Input							Robot Action
A_0	A_2	A_3	A_4	A_5	A_6	A_7	
0	0	0	0	x	X	x	Turn left
0	0	0	1	x	X	x	Turn left
0	0	1	1	x	X	x	Follow Right wall
0	1	1	1	x	X	x	Right U-turn
1	1	0	0	x	X	x	Escape Manoeuvre
1	1	1	1	x	X	x	straight

Strategy 1
Strategy 2
Strategy 3

6. Conclusion

Overall, an autonomous firefighting robot has been successfully built. All the fundamental wall follower action such as moving forward, reverse, turn left and turn right function flawlessly. The robot has been able to pick up the table tennis ball and stop the fire. Besides that, the robot also has been able to count the maze junction and make its own decision based on the counted junction. Other than that, the robot has been able to distinguish the game field color different either red and green or red and blue. With this ability, the robot can change the current strategy to a new strategy. Other than, the robot also capable to avoid its structure from touching the fire source that can cause point deduction. As a conclusion, the project entitled

"The Fire Fighting Robot" has archived its aim and objective successfully.

References

[1] UniversityMalaysiaPerlis,UNIMAP,"FireFighting Robot Competition, Theme & Rules",2009.

[2] Veselý, "Implementation of Micromouse ClassRobot".

[3] WilliamDubel,HectorGongora,KevinBechtoldand Daisy Diaz, "An Autonomous FirefightingRobot".

[4] John Iovine, "PIC Robotics: A Beginner's Guideto Robotics Projects Using the PICmicro", McGrawHill, 2004.

[5] Ea Ai Choon, "Dc Motor Speed Control UsingMicrocontrollerPIC1Ff877A",UniversitiTeknologiMalaysia, 2005.

[6] Proteus PCB Design Packages,"http://www.labcenter.co.uk/products/vsm_overview.cfm"

[7] Custom Computer Cervices,"http://www.ccsinfo.com".

[8] UIC00A USB ICSP PIC Programmer,"http://www.cytron.com.my/usr_attachment/UIC00A_&_UIC-S_User_Manual.pdf".

MODULATION AND CODING DESIGN FOR SIMULTANEOUS WIRELESS INFORMATION AND POWER TRANSFER

AMALA
JASMINE.IKANIS
HKA.K
IIYEAR ECE

Abstract

In order to satisfy the power demands of IoT devices and thus extend their lifespan, radio frequency(RF) signal aided wireless power transfer (WPT) is exploited for remote charging. Carefully coordinating both the WPT and wireless information transfer (WIT) yields an emerging research trend in simultaneous wireless information and power transfer (SWIPT). However, SWIPT systems designed by assuming Gaussian distributed input signals may suffer from a substantial performance degradation in practice, when the finite alphabetical input is considered. In this article, we will provide a design guide of coding controlled SWIPT and study the modulation design in both single-user and multiuser SWIPT systems. We hope this guide may push SWIPT a step closer from theory to practice.

Introduction

In this article, we would like to highlight the importance of both the coding and modulation design in the SWIPT system by introducing their theoretical fundamentals and by providing brief design guides. The main contributions are summarized as follows In the imminent Internet of Things (IoT) era, a massive number of sensors and IoT devices will be deployed for various applications. These miniature devices are normally powered by embedded batteries. Frequent energy-consuming operations may quickly drain their batteries. Due to its high flexibility and low investment in infrastructure, carefully controlled wireless power transfer (WPT) relying on radio frequency (RF) signals [1] can be invoked for remotely charging these low-power devices. Coordinating wireless information transfer (WIT) and WPT in the same RF spectral band thus yields the research of simultaneous wireless information and power transfer (SWIPT).

Inspired by these promising applications, intense efforts have been invested in SWIPT recently. Chen*et al.* maximized the harvested power by optimally designing the transmit

covariance matrix in a point-to-point multiple-input-multiple-output (MIMO) aided SWIPT system. Lv *et al.* [4] proposed an optimal time-domain resource allocation scheme among the multiple receivers for controlling SWIPT in the downlink and for maximizing sum-throughput and fair-throughput in the uplink. However, either as the constraint [3] or as the objective [4], the attainable WIT throughput is always evaluated by the classic Shannon-Hartely channel capacity, which is achieved by assuming the infinite Gaussian distributed input. In contrast, in any of the practical communication systems, only a finite alphabet can be transmitted due to the modulation schemes having limited constellation points and the coding scheme having limited code words. As a result, the attainable WIT throughput can only be evaluated by the discrete-input-continuous-output mutual information. Therefore, Kim*et al.*

• The popular transceiver architecture of the SWIPT is introduced.

• A design guide of coding controlled SWIPT is provided by considering the battery state at the receiver. The case studies of applying. The unary code and the run-length-limited (RLL) code in SWIPT is provided for illustrating the trade- off between the attainable WIT and WPT performance.

• The impact of wireless channels and hardware constraints on the practical modulation design in the SWIPT system is studied for a single user scenario.

The principle of the modulation design in multi-user SWIPT systems relying on the superposition symbols is introduced
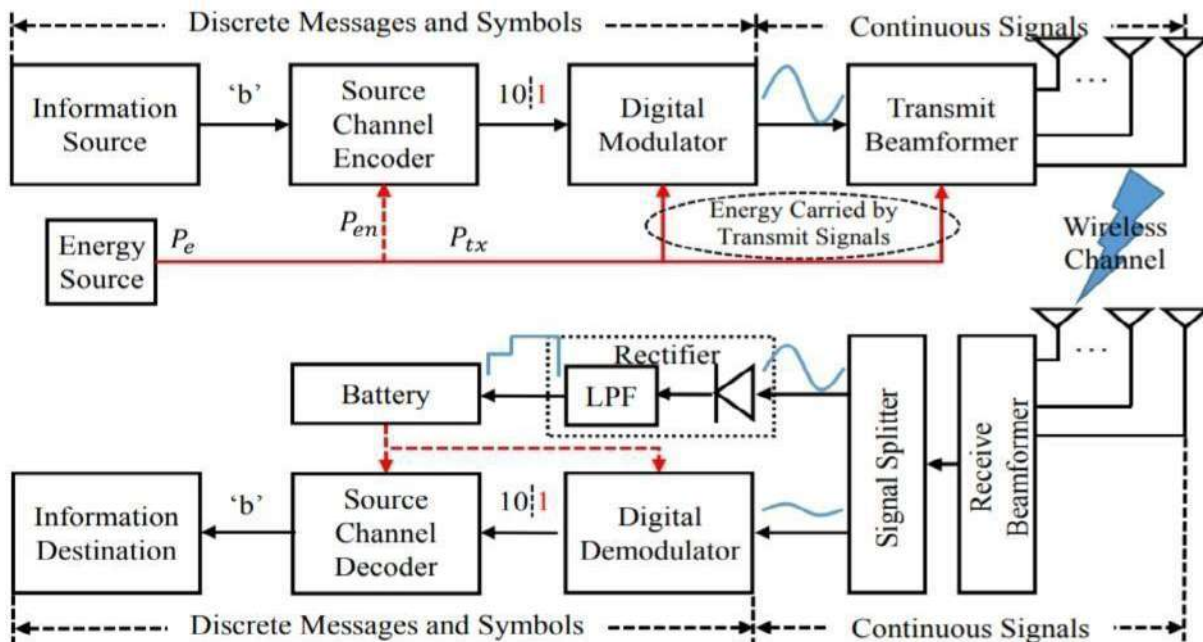
- Open problems concerning the modulation and coding design in the SWIPT system are envisioned.

Transceiver Architecture

In a SWIPT system, we may have SWIPT users, which extract information and energy from the same RF signals. We may also have dedicated WIT users and WPT users, which receive information and power requested, respectively, by exploiting the broadcast nature of the wireless channel.

SWIPT Transceiver

A typical SWIPT transmitter is illustrated in the top half of Fig. 1, which consists of an energy source, an information source, a source and channel encoder, a digital modulator and a transmit beam former.

The energy source powers the other functional modules of the transmitter. The power allocated to the digital modulator and the transmit beam former constitutes the actual transmit power carried by the RF signal. A typical SWIPT receiver is portrayed in the bottom half of Fig. 1, which is constituted by a receive beamformer, a signal splitter, a WPT receiver and a WIT receiver. Either power- splitter or a time-switcher is exploited for splitting the received RF signal into two portions [8].A portion of the received RF signal flows into the WIT receiver for demodulation and decoding. The recovered

information bits finally arrive at the information destination. The other portion of the received RF signal is converted by a rectifier to the direct current (DC) and it is finally stored in the battery. The rectifier and the battery constitute a typical WPT receiver. The current research [1–6] mainly focuses on the design of the front ends of the transceiver by only considering the continuous signals, while largely overlooking the impact of the discrete messages and symbols induced by the coding and modulation of the SWIPT system, as illustrated in Fig. 1.

Non-Linear Rectifier

As portrayed in Fig.1, a simplified rectifier consists of a diode and a low-pass-filter. The rectifier's non-linearity exhibits in the following perspectives:

• The circuit of the rectifier can only be activated when the input power of the RF signal is higher than a threshold [9]. This activation threshold is also regarded as the sensitivity of the rectifier.

• The output DC of the rectifier in Fig.1ccanbeformulatedasapolynomialof the input RF signal's power [10], which indicates that a higher input power may result in a higher RF-DC conversion efficiency. These characteristics of the rectifier should be taken into account in the coding and modulation design of the SWIPT system.

## Coding Controlled SWIPT

Fundamental

The landmark work in [7] first maximized the mutual information of the discrete-input-discrete-output channel by optimizing the distribution of the discrete input messages, while ensuring that the energy carried by the output messages is higher than a pre-defined threshold. The energy carried by a binary code word is jointly decided by the following factors:

The percentage of bit "1" and that of bit "0"in a binary code word, which is regarded as the structure of the code word.

The mapping from binary bits to modulated symbols. For example, a binary sequence"1111" is mapped to a symbol carrying the highest energy inthe16-QAM.Inthissection, we mainly focus on the design of the codeword structure by adopting

the on-off-keying (OOK) based modulation, where only a binary bit "1" carries a of the
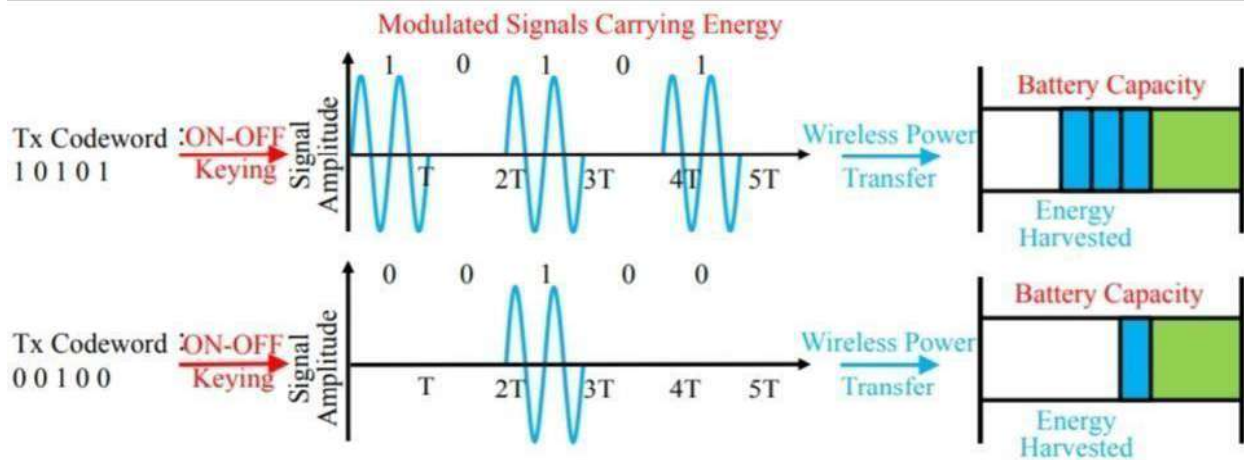
code word.

•

• The mapping from binary bits to modulated symbols. For example, a binary sequence"1111" is mapped to a symbol carrying the highest energy inthe16-QAM. In this section, we mainly focus on the design of the codeword structure by adopting the on-off-keying (OOK) based modulation, where only a binary bit "1" carries a single unit of energy, as portrayed in Fig.2.There is an obvious trade-off between the WPT and the WIT performance. For example, if the channel input always generates an all-one binary sequence, the mutual information is zero, although the maximum energy can be transferred. If the channel input is optimized for only maximizing the mutual information, the energy carried by the channel output is a certain value, which might not satisfy the energy request of the receiver. The basic principle is to generate codewords with a certain structure in order to simultaneously satisfy certain requirements of both WIT and WPT performance. The following coding schemes can be opted for reaching this design target [11].

Compensation Energy Coding:

Dummy binary bits are directly concatenated behind information bits in order to guarantee that the resultant codeword has a certain percentage of bit "1". This coding approach has the lowest complexity.

However, the dummy bits do not carry any information, which may thus degrade the WIT performance.

Inverse Source Coding:

A classic source encoder takes non-equi-probable messages to generate binary sequences having equi-probable binary bits. By contrast, an inverse source encoder takes equi-probable messages to generate binary sequences having certain structures for satisfying the WPT requirement. However, the asynchronization between the encoder and the decoder imposes difficulties in the efficient decoding design.

Constraint Coding:

Some constraint coding techniques have degrees of freedom to change the codeword structure for satisfying the WPT requirement. Since they do not include any dummy bits, the WIT performance may not suffer significant degradation. Furthermore, the efficient symbol-level trellis can be adopted for decoding the constraint code. We will then introduce a pair of typical constraint codes, namely the unary code and the RLL code for the SWIPT purpose.

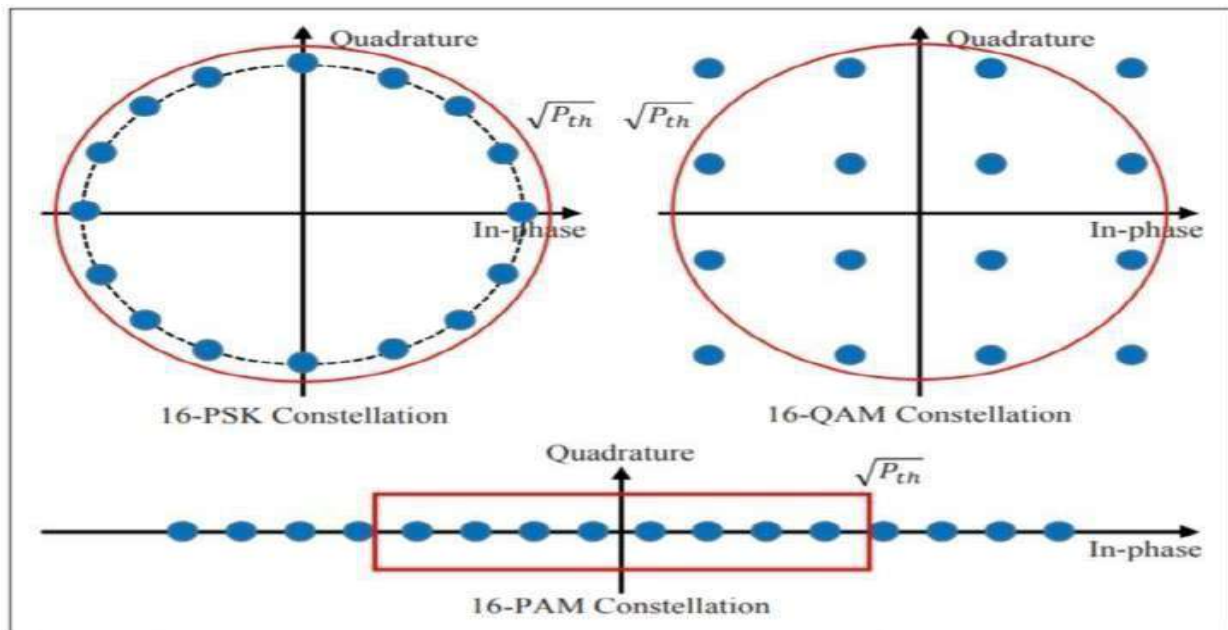### SWIPT with Modulation: Single-User

Figure 4. The input constellations at the WPT receiver. All the constellations have the same average power. The activation threshold of the WPT receiver is denoted as P_{th}.

In a practical communication system, the coded information is then modulated by a specific symbol from a finite alphabet. Therefore, the mutual information of the M-Quadrature-Amplitude-Modulation(M-QAM) finally converges to a constant, as the transmit power continuously increases. For example, as we increase the transmit power of the modulated RF signal, the mutual information of the 16-QAMconverges to 4 bit/channel use, while that of the 256-QAM converges to 8 bit/channel use. Hence, more transmit power should be allocated for the WPT purpose, when the WIT performance converges. Different modulation schemes exhibit diverse WPT performance when the non-linearity of the rectifier is considered. We exemplify the received constellations of 16-phase-shift-keying(16-PSK), 16-QAMand 16-pulse-amplitude-modulation (16-PAM) in Fig. 4. If the rectifier can only be activated by a received power higher than its activation threshold, which is illustrated by the red circle/rectangle in Fig. 4a, we observe that all the symbols

of 16-PSK have been filtered by the rectifier. As a result, theenergy carried by the 16-PSK symbols cannot be harvested. In the case of 16-QAM, although 12symbols are filtered by the rectifier, we still have four symbols capable of delivering the energy to theWPTreceiver.Furthermore,16-PAMperforms best in terms of the WPT, since it still has eight symbols capable of delivering the energy. If the rectifier threshold is lower than the average power of these modulationschemes,16-PSK may have the best WPT performance. Furthermore, a higher order modulation scheme has a better WPT performance, since it has more symbols carrying higher energy. Note that when we consider the non-linear RF-DC conversion efficiency, the modulation schemes may exhibit a similar trend in terms of the WPT performance, since a higher input power may result in a higher RF-DC conversion efficiency.
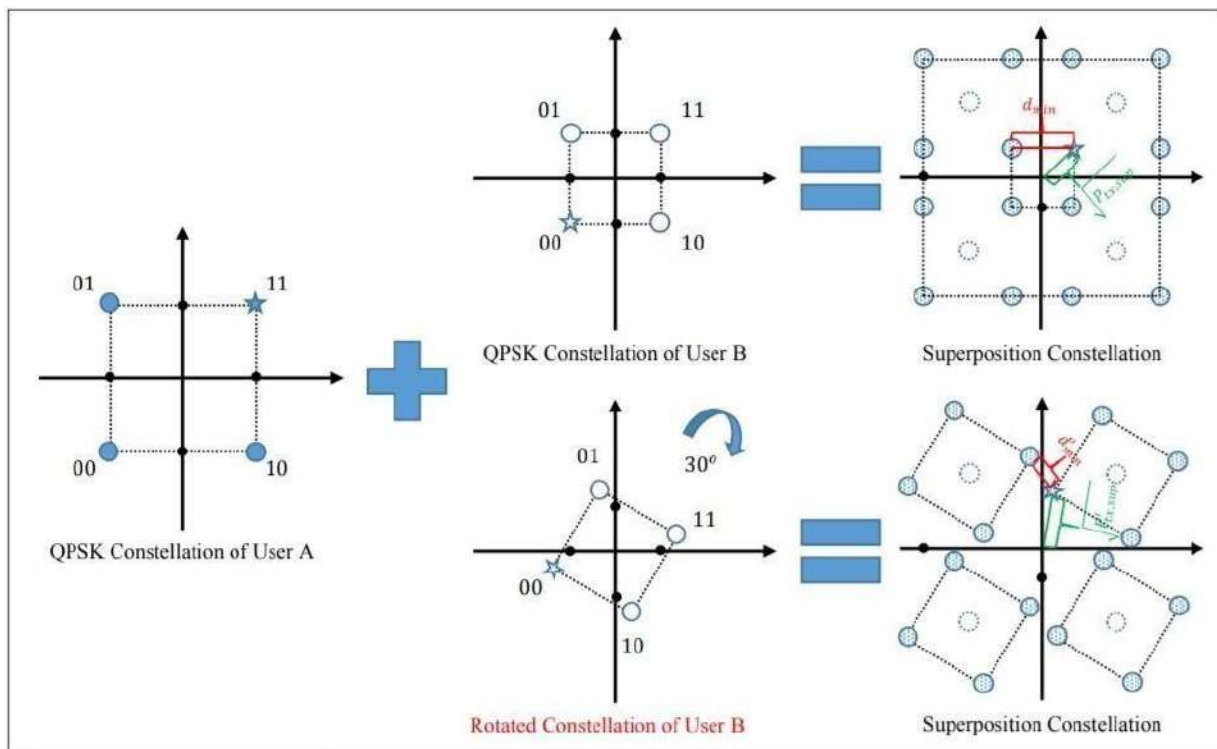

Figure 5. Conventional modulation and constellation rotation based modulation for the SWIPT. The symbols requested by the WIT user pair are denoted by the stars. The Euclidean distance between the superposition symbol and the origin is the square root of the actual transmit power.

MIMO Aided Modulation

The beam former/ precoder design of the MIMOSWIPTsystemhasbeenstudiedbyconsideringthediscrete-input-continuous-output mutual information with a finite alphabet [13], where the spatial multiplexing gain is exploited for realizing SWIPT. Furthermore, the implementation of multiple antennas is capable of facilitating modulation in the spatial dimension. A specific antenna (or a subset of antennas) can be activated for transmitting a specific information symbol by exploiting the information-driven antenna-switching mechanism, which is regarded as spatial-modulation (SM)or space-shift-keying (SSK). The difference of the channel response impulse is relied upon

for identifying the transmit antenna at the receiver for the demodulation. The SM/SSK may substantially reduce the number of RF chains in order to increase the energy efficiency. Since the SM/SSK system relies on the activation of a limited number of antennas for WIT, the rest of the idle antenna scan be exploited for gleaning the energy of the ambient RF signals and recycling the energy transmitted by the activated antennas. As a result, the energy efficiency of the SM/SSK system can be further increased.

Hardware Constraints

In order to improve WPT performance, a high-order modulation scheme has to be adopted. However, it may impose great challenges on both the transmitter and the receiver:

• A high-order modulation scheme normally has a high peak-to-average-power-ratio(PAPR). For example, given the same average power, the PAPR of 256-QAM is 25/17times higher than 16-QAM.The transmitter thus requires a power amplifier having a very large linear region in order to avoid energy leakage. As a result, the characteristic of the practical power amplifier has to be considered in the modulation design.

• For the demodulation of the high order modulated symbol, the receiver requires accurate channel state information (CSI) for carrying out coherent detection. In order to avoid energy consumption in CSI acquisition, non-coherent detection based differential modulation [14] can be adopted by the IoT devices in the SWIPT system. However, differential modulation may sacrifice both the WIT and WPT performance to some extent, since high-order differential modulation is still a technical blank in the literature.

SWIPT with Modulation: Multi-User Superposition Symbol

In order to further improve spectral efficiency, the symbols requested by multiple users may be super imposed with each other in the same resource block. For example, in power-do main non-orthogonal-multiple-access (NOMA), the symbols destined to different users are differentiated by their transmit power. Then, the superposition symbol can be demodulated by

exploiting successive-interference-cancellation (SIC). In sparse-code-multiple-access (SCMA), a symbol is decomposed for modulating onto different sub-carriers. The reconstructed superposition symbol on a specific sub-carrier can be demodulated by the message-passing-algorithm. In the network coded cooperative network, the symbols of different users are superimposed at the hub, which is then broadcast to the users and demodulated. The energy carried by the superposition symbols can be harvested by WPT users due to the broadcast nature of wireless channels. In all the above-mentioned scenarios, we should constructively superimpose the symbols destined to different WIT users in order to achievetherequiredWPTperformanceoftheWPTusers.in the SWIPT system. In the following example, we consider a pair of dedicated WIT users and a single WPT user.

Constellation Rotation

In the conventional signal superposition, as exemplified in the top half of Fig. 5, the symbols requested by this WIT user pair are destructively combined. The resultant superposition symbol suffers from a substantial energy loss when compared to the original symbols. WPT performance is thus significantly degraded. If we rotate the WIT users' constellation for a certain angle, as exemplified in the bottom halfofFig.5, the energy carried by the superposition symbol can be increased in order to satisfy the WPT requirement. However, constellation rotation may result in the reduction of the minimum Euclidean distance between adjacent superposition symbols, as portrayed in Fig. 5, which may deteriorate WIT performance. An optimal constellation rotation angle should be chosen. Therefore, a new symbol block consisting of the superposition symbols is generated and broadcast in the wireless channel. The constellation rotation angles should be optimized in order to maximize the total power carried by the superposition symbol block, while satisfying a specific WIT constraint. For example, if the maximum likelihood based multi-user detect or is invoked by WIT users, the minimum Euclidean distance of the superposition constellation after the optimal rotation should be higher than a predefined threshold.

Future Challenges and Conclusions

The following open problems still need our further investigation.

Concatenated Code: A concatenated encoder consisting of a source encoder, channel encoder and an energy encoder should be carefully designed, while a powerful iterative decoder is also required for processing the sophisticated concatenated codewords. Coded Modulation: The bit-to-symbol mapping from the binary bits to the modulated symbols has to be designed by jointly considering the code word structure and the modulation characteristic in order to satisfy both the WIT and WPT etc.
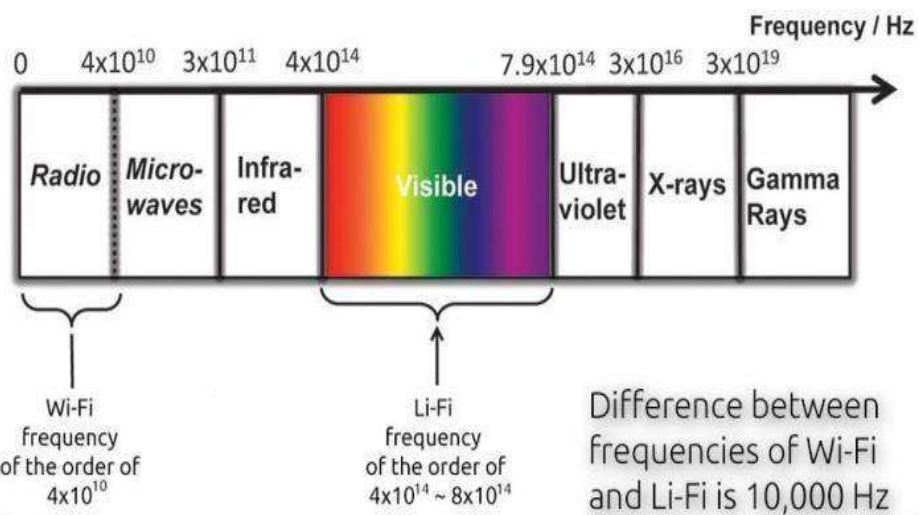
LI-FI TECHNOLOGY & IT'S APPLICATIONS

IHSARATHY SIMMAN.G

BHARATH.D

BALACHANDIRAN.D

II YEAR ECE-A

Professor Harald Haas, the Chair of Mobile Communications at the University of Edinburgh, is recognized as the founder of Li-Fi. He coined the term Li-Fi and is the co-founder of pure Li Fi. He gave a demonstration of a Li-Fi prototype at the TED Global conference in Edinburgh on 12th July 2011. He used a table lamp with an LED bulb to

transmit a video of a blooming flower that was then projected onto a screen. During the talk, he periodically blocked the light from the lamp with his hand to show that the lamp was indeed the source of the video data. Li-Fi can be regarded as light-based Wi-Fi, i.e. instead of radio waves it uses light to transmit data. In place of Wi-Fi modems, Li-Fi would use transceivers fitted with LED lamps that could light a room as well as transmit and receive information. It makes use of the visible portion of the electromagnetic spectrum which is underutilized. Li-Fi can be considered better than Wi-Fi because there are some limitations in Wi-Fi. Wi-Fi uses 2.4 – 5 GHz radio frequencies to deliver wireless internet access and its bandwidth is limited to 50-100 Mbps. With the increase in the number of Wi-Fi hotspots and volume of Wi-Fi traffic, the reliability of signals is bound to suffer. Security and speed are also important concerns. Wi-Fi communication is vulnerable to hackers as it penetrates easily through walls. In his TED talk, Professor Haas highlighted the following key problems of Wi-Fi that need to be overcome in the near future:

a) Capacity: The radio waves used by Wi-Fi to transmit data are limited as well as expensive. With the development of 3G and 4G technologies, the amount of available spectrum is running out.

b) Efficiency: There are 1.4 million cellular radio masts worldwide. These masts consume massive amounts of energy, most of which is used for cooling the station rather than transmission of radio waves. In fact, the efficiency of such stations is only 5%.

c) Availability: Radio waves cannot be used in all environments, particularly in airplanes, chemical and power plants and in hospitals.

d) Security: Radio waves can penetrate through walls. This leads to many security concerns as they can be easily intercepted.

Li-Fi addresses the afore mentioned issues with Wi-Fi as follows:

a) Capacity: The visible light spectrum is 10,000 times wider than the spectrum of radio waves. Additionally, the light sources are already installed. Hence Li-Fi has greater band width and

equipment which is already available.

b) Efficiency: LED lights consume less energy and are highly efficient.

c) Availability: Light sources are present in all corners of the world.Hence,availabilityisnotanissue.Thebillionsoflightbulbsworldwi deneed only be replaced by LED.

Parameter	LI-FI	WI-FI
Speed	High	High
Spectrum	10,000 times broader than that of Wi-Fi	Narrow spectrum
Data density	High	Low
Security	High security due to non-penetration of light through walls	Less secure due to transparency
Reliability	Medium	Medium
Bandwidth	High due to broad spectrum	Low
Transmit/receive power	High	Medium
Ecological Impact	Low	Medium
Device-to-device connectivity	High	High
Obstacle interference	High	Low
Bill of materials	High	Medium
Market maturity	Low	High
Latency	In the order of microseconds	In the order of milliseconds

General Working Principle

Light emitting diodes (LEDs) can be switched on and off faster than the human eye can detect since the operating speed of LEDs is less than 1 μs, thereby causing the light source to appear to be continuously on. This invisible on-off activity enables data transmission using binary codes. Switching on an LED is binary '1', switching it off is binary '0'. It is possible to encode data in light by varying the rate at which LEDs flicker on and off to give different strings of 1s and 0s. Modulation is so rapid that humans cannot notice it. A light sensitive device (photodetector)then receives the signal and converts it back into original data.

This method of using rapid pulses of light to transmit information wirelessly is technically referred to as Visible Light Communication (VLC).The term Li-Fi has been inspired due to its potential to compete with conventional Wi-Fi. The VLC uses visible light between 400 THz(780nm) and 800THz(375nm)as the optical carrier for data transmission and for illumination.

Data rates of greater than 100 Mbps can be achieved by using high speed LEDs with adequate multiplexing. Parallel data transmission using arrays of LEDs where each LED transmits a separate stream of data can be used to increase the VLC data rate. Though the lights have to be kept on in order to transmit data, they can be dimmed to the point that they are not visible to humans but still be capable of transmitting data.

Implementation of Li-Fi:

The main components of a simple system based on Li-Fi are:

a) High brightness LED which acts as the communication source
b) Silicon photo diode which serves as the receiving element

Data from the sender is converted into an intermediate data representation i.e. byte format and then converted into light signals which are emitted by the transmitter. The light signal is received by the photodiode at the receiver side. The reverse process takes place at the destination computer to retrieve the data back from the received light.

LEDs are employed as the light sources. The model transmits digital signal by means of direct modulation of the light. The emitted light is detected by an optical receiver.

Source Computer: Data Reading Module☐ Data Conversion Module☐ Transmitter

Module Destination Computer:

Receiver Module☐ Data Interpretation Module☐ Data Display (GUI) The different

components serve the following functions:

Data Conversion Module–converts data into bytes so that it can be represented as a digital signal. It can also encrypt the data before conversion.

Transmitter Module–generates the corresponding on-off pattern for the LEDs.

Receiver Module– has a photodiode to detect the on and off states of the LEDs. It captures this sequence and generates the binary sequence of the received signal

Data Interpretation Module–converts data into the original format. If encryption was done, it also performs decryption.
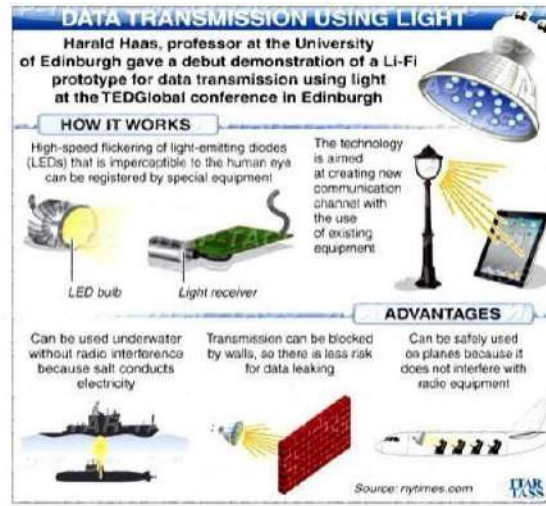
(i) Medical and Healthcare

Due to concerns over radiation, operating rooms do not allow Wi-Fi and even though Wi-Fi is in place in several hospitals, interferences from computers and cell phones can block signals from medical and monitoring equipment. Li-Fi solves these problems. Lights are an essential part of operating rooms and Li-Fi can thus be used for modern medical instruments. Moreover, no electromagnetic interference is emitted by Li-Fi and thus it does not interfere with any medical instruments such as MRI scanners.

(ii) Airlines and Aviation

Wi-Fi is often prohibited in aircrafts. However, since aircrafts already contain multiple lights, thus Li-Fi can be used for data transmission.

(iii) Underwater Explorations and Communications

Remotely operated underwater vehicles or ROVs work well except in situations when the tether is not long enough to fully explore an underwater area or when they get stuck. If instead of the wires, light were used then the ROVs would be freer to explore. With Li-Fi, the head lamps could also then

be used to communicate with each other, data processing and reporting findings back to the surface at regular intervals, while also receiving the next batch of instructions. Radio waves cannot be used in water due to strong signal absorption. Acoustic waves have low bandwidth and disrupt marine life. Li-Fi offers a solution for conducting short-range underwater communications.

(iv) Traffic

Li-Fi can be used for communications between the LED lights of cars to reduce and prevent traffic accidents. LED headlights and tail-lights are being implemented for different cars. Traffic signals, signs and street lamps are all also transitioning to LED. With these LED lights in place, Li-Fi can be used for effective vehicle-to-vehicle as well as vehicle-to-signal communications. This would of course lead to increased traffic management and safety.

(i) Giga Speed Technology

The Li-Fi Consortium provides the fastest wireless data transfer technology presently available. Our current solutions offer effective transmission rates of up to 10 Gbps, allowing a 2 hour HDTV film to be transferred in less than 30 seconds. This can be extended to several 100Gbps in future versions.

(ii) Mobile Connectivity

Laptops, tablets, smart phones and various other mobile devices can interconnect with each other using Li-Fi, much like they interconnect today using Wi-Fi. These short range links provide very high data rates as well as increased security.

NIGHT VISION TECHNOLOGY

VISHNU

PRIYA.M

IIYEAR ECEB

Night vision is a spy or action movie you've seen, in which someone straps on a pair of night-vision goggles to find someone else in a dark building on a moonless night. With the proper night-vision equipment, you can see a person standing over 200 yards (183m) away on a moonless, cloudy night. Night vision can work in two very different ways, depending on the technology used.

"Image enhancement- This works by collecting the tiny amounts of light, including the lower portion of the infrared light spectrum, that are present but may be imperceptible to our eyes, and amplifying it to the point that we can easily observe the image.

" Thermal imaging - This technology operates by capturing the upper portion of the infrared light spectrum, which is emitted as heat by objects instead of simply reflected as light. Hotter objects, such as warm bodies, emit more of this light than cooler objects like trees or buildings.

To study about night vision technology we should first know about light.

The amount of energy in a light wave is related to its wavelength: Shorter wavelengths have higher energy. Of visible light, violet has the most energy, and red has the least.

Just next to the visible light spectrum is the infrared spectrum.

Night vision technology consists of two major types: light amplification(or intensification) and thermal(infrared).

Most consumer night vision products are light amplifying devices. All ITT Night Vision products use light-amplifying technology.

This technology takes the small amount of light that's in the surrounding area (such as moonlight or starlight), and converts the light energy(scientists call it photons) into electrical energy(electrons). These electrons pass through a thin disk that's about the size of a quarter and contains more than 10 million channels. As the electrons go through the channels, they strike the channel walls and thousands more electrons are released. These multiplied electrons then bounce off of a phosphor screen which converts the electrons back into photons and lets you see an impressive nighttime view even when it's really dark.

In night vision, thermal imaging takes advantage of this infrarede mission.

Thermal imaging works as

1. A special lens focuses the infrared light emitted by all of the objects in view.

2. The focused light is scanned by a phased array of infrared-detector elements. The detector elements create a very detailed temperature pattern called a thermogram. It only takes about one-thirtieth of a second for the detector array to obtain the temperature information to make the thermogram. This information is obtained from several thousand points in the field of view of the detect or array.

3. The thermogram created by the detect or elements is translated into electric impulses.

4. The impulses are sent to a signal-processing unit, a circuit board with a dedicated chip

that translates the information from the elements into data for the display.

5. The signal-processing unit sends the information to the display, where it appears as various colors depending on the intensity of the infrared emission. The combination of all the impulses from all of the elements creates the image.

Types of Thermal Imaging Devices:

Most thermal-imaging devices scan at a rate of 30 times per second. They can sense temperatures ranging from- 4 degrees Fahrenheit(-20degreesCelsius) to3,600F(2,000C), and can normally detect changes in temperature of about 0.4F(0.2C).

There are two common types of thermal-imaging devices:

• Un-cooled-

This is the most common type of thermal-imaging device. The infrared-detector elements are contained in a unit that operates at room temperature. This type of system is completely quiet, activates immediately and has the battery built right in.

• Cryogenically cooled-

More expensive and more susceptible to damage from rugged use, these systems have the elements sealed inside a container that cools them to below 32 F (zero C). The advantage of such a system is the incredible resolution and sensitivity that result from cooling the elements. Cryogenically - cooled systems can "see" a difference as small as 0.2F(0.1C) from more than 1,000ft(300m) away, which is enough to tell if a person is holding a gun at that distance!

While thermal imaging is great for detecting people or working in near-absolute darkness, most night-vision equipment uses image-enhancement technology.

3.IMAGE ENHANCEMENT

Image enhancement technique is used in night vision technology. In fact, image-enhancement systems are normally called night-vision devices (NVDs). NVDs rely on a special tube, called an image-intensifier tube, to collect and amplify infrared and visible light.
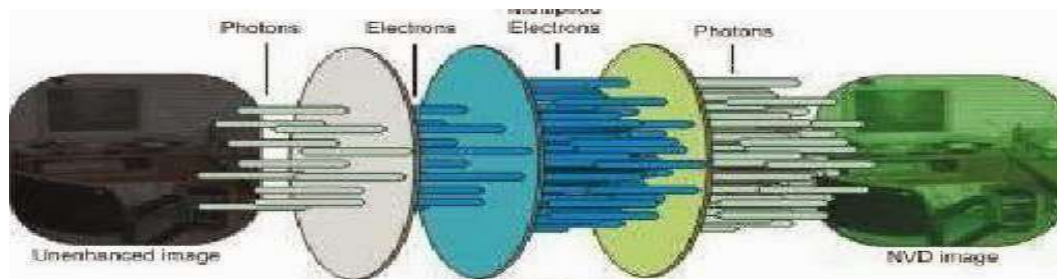
The image-intensifier tube changes photon to electrons and back again.

HOLOGRAM

VINOTH KUMAR.G

PRANAVARSAN.E

GURUCHARAN.P

IIYEAR ECEB

OVERVIEW AND HISTORY

The Hungarian-British physicist Dennis Gabor(in Hungarian: Gábor Dénes) was awarded the Nobel Prize in Physicsin1971 "for his invention and development of the holographic method".

His work, done in the late 1940s, was built on pioneering work in the field of X-ray microscopy by other scientists including Mieczysław Wolfke in 1920 and William Lawrence Bragg in 1939.This discovery was an unexpected result of research into improving electron microscopes at the British Thomson-Houston Company (BTH) in Rug by, England, and the company filed a patent in December1947(patent GB685286).The technique as originally invented is still used in electron microscopy, where it is known as electron holography, but optical holography did not really advance until the development of the laser in 1960. The word holography comes from the Greek words ὅλος (holos;"whole") and γραφή (graphē; "writing" or "drawing").

A hologram is a recording of an interference pattern which can reproduce a 3D light field using diffraction. The reproduced light field can generate an image which still has the depth, parallax, and other properties of the original scene.[5] A hologram is a photographic recording of a light field, rather than an image formed by a lens. The holographic medium, for example the object produced by a holographic process (which may be referred to as a hologram) is usually unintelligible when viewed

under diffuse ambient light. It is an encoding of the light field as an interference pattern of variations in the opacity, density, or surface profile of the photographic medium. When suitably lit, the interference pattern diffracts the light into an accurate reproduction of the original light field, and the objects that were in it exhibit visual depth cues such as parallax and perspective that change realistically with the different angles of viewing. That is, the view of the image from different angles represents the subject viewed fro similar angles. In this sense, holograms do not have just the illusion of depth but are truly three-dimensional images.

Holograms and how they work simple terms, a hologram technology is a three-dimensional projection which can be seen without using any special equipment such as cameras or glasses. The image can be viewed from any angle, so as the user walks around the display the object will appear to move and shift realistically.
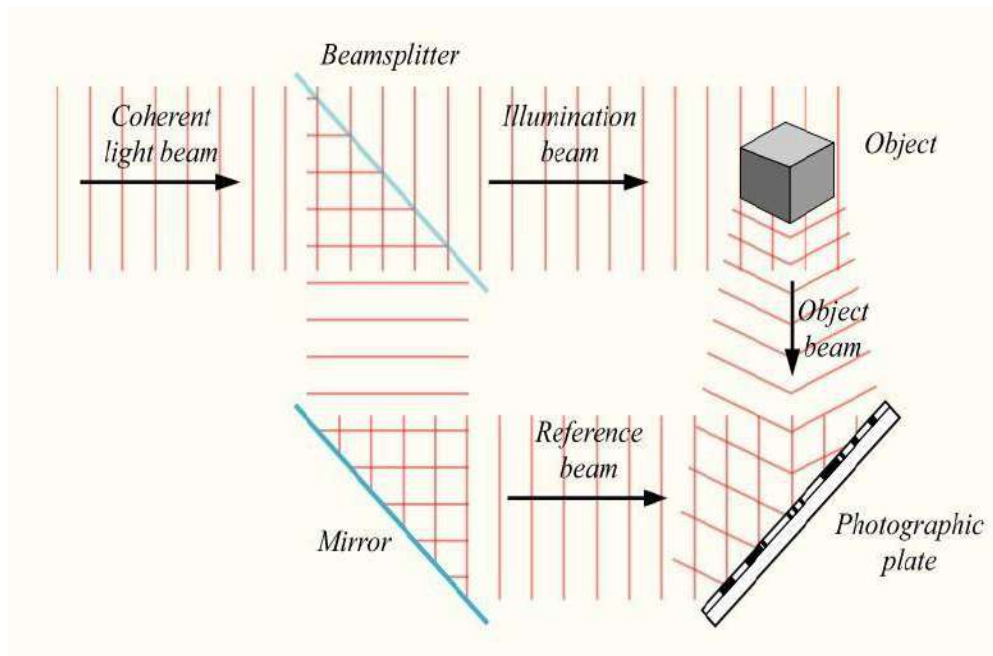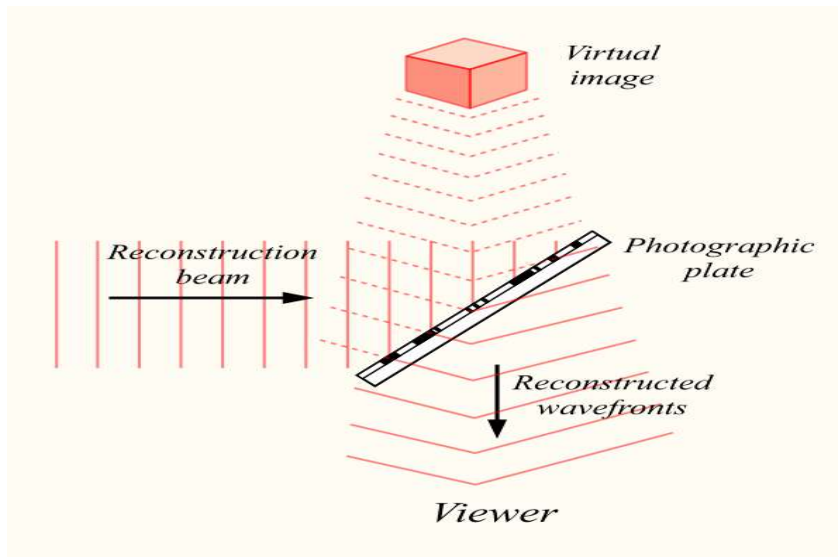
Hologram Overview

HOLOGRAM PATENTS

• Patentnumber:11275034

Abstract: An inspection apparatus includes: a light source that generates and outputs light; a stage on which an inspection target is arranged; an irradiation optical system that irradiates light from the light source to the inspection target; a detect or that receives the light diffracted from the inspection target and generates diffraction image; and a detector moving device configured to move the detect or on az- axis, which is an optical axis of the light, and an x -y plane perpendicular to the z-axis. Furthermore, while the detector moves on the x-y plane and the z-axis through the detector moving device, the detector generates a plurality of the diffraction images with different positions on the x-y plane and the z-axis with respect to the inspection target, and thus simultaneously implements phase retrieval and super resolution of diffraction images.

Type: Grant

Filed: September16,2020

Date of Patent: March15,2022

Assignee: SAMSUNG ELECTRONICS CO., LTD.

Inventors: Kyungwon Yun, Taewan Kim, Seungbeom Park, Jaehyeon Son, Myungjun Lee, Jaehwang Jung

DATA IN INTERNET OF THINGS

SOWMIYA.A

SWETHA.R

II YEAR ECE B

In a data-overloaded environment, companies mays Tuggle to fully leap the benefits of Industry 4.0 technologies. Understanding data utilization can help transform process datasets into decision-making assets the chemical process industries (CPI) have been realizing for sometime that information is of strategic importance for the survival of any organization. Colloquially, data have been called a new natural resource every part of an organization is making decisions daily, based on data they collect, process, analyze and review. The global pandemic has further driven the awareness of digital transformation for any company, and manufactures are no exception to this. the rise of Industry 4.0technologieshasfuítheí driven this trend, and with more and more data available, organizations are struggling to reap the benefits of these data.

WHATIS INTERNET OF THINGS:

Well, the internet has been around for a while but it's been mostly the product of people. So all the data and images and recordings and games, books and all was created by people, for people and about people . Internet is one of the most important and transformative technology ever invented.

"Internet is a digital fabric that's woven into the lives of all of us" and now there's a new internet emerging to change the world again, its internet of things. Internet is about connecting people, here its is about connecting and that's why it named internet of things.

HOW IT WORKS :

☐ Internet is not just about connecting, its about connecting things and it named the internet of things. Things start to share experience with other things. Its like we take things and then we add the ability to sense and communicate and touch and control. Here you get the opportunity for things to interact and collaborate with other things as we human beings interact with environment with our senses (i.e, see, hear, touch, feel, Smell & taste)

AN REAL TIME EXAMPLE:

A typical morning in internet of things that I am sleeping blissfully and I have my bracelet on and the beauty is it senses my sleep cycle and it knows the correct moment to gracefully wake up by gently vibrating and blinking a light and the my bracelet sends message toother things in my home, here the chain of event starts and the things communicate and talking with other things like and it turns on air conditioner, my coffee maker starts up, the heater get son, and after all the schedule I get a message from my phone about the todays schedule and the process continues…..

The internet of things has the ability to sense, communicate, acquire data and so on will help us build systems that will Deliver better healthcare through remote diagnostics and Monitoring and bringing safer environment with early Warning systems for tsunami or earthquake, etc…

QUICK QUIZ

NAVEEN KUMAR.E

SATHASIVAM. P

RAJADIVYA.G

II YEAR ECE B

1-From which material integrated circuit is made up of?

HINTS:

Answer-**Silicon Wafers**

2- Give an example for Transducer

HINTS:

Answer- **Microphone**

3-Which Amplifier does not draw any current?

HINTS:

Answer: **Operational Amplifier**

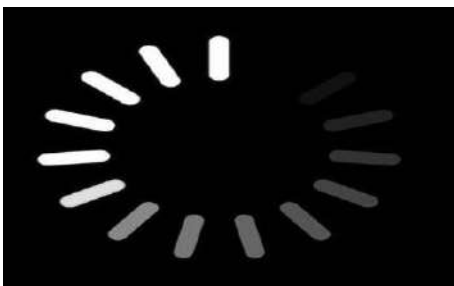**4-Which motor is not suitable for use as a DC machine?**

HINTS:

Answer-Squirrel cage motor

5-Which is used to obtain output position in a position control system?

HINTS:

Answer-Load Cell

6-At room temperature current In an Intrinsic semiconductor is due to-

HINTS:

Rearrange the following:

EOLSH&TRONSLECE

Answer: **Holes & Electrons**

7-The Geographical Representation of a satellite antenna radiation is:

HINTS:

Rearrange the following:

TOOFTRINP

Answer: **Footprint**

8-What is the Smallest beam Of a Satellite antenna radiation?

HINTS:

Rearrange the following:

POTSMEAB

Answer: **Spot Beam**

9-The Sensor generally used in Incremental optical encoder-

HINTS:

Rearrage the following:

OTOPHEDOID

Answer:**PhotoDiode**

10-The Only Button which is Used in industries-

HINTS:

Rearrange the following:

HUPS TTONBU

Answer: **PushButton**

TECHNO FACTS

DIVYADHARSHINI.J.A

SENTHAMIL SELVI.D

III YEARECE

a. Flexible PCBs are built o flexible high-temperature plastic like Kapton.

b. According to Moore's Law, microchips double in power every18to 24 months. Gordon E. Moore, a founder of Intel, proposed the concept in 1965.

c. Printed circuit boards are almost green because they are made from a glassy-epoxy, which is naturally green.

d. Walking across a carpet can generate up to 35,000 V of static electricity.

e. Surface mount PCBs are up to one tenth of the size of through-hole circuits.

f.   **WIRELESS ELECTRONICS** has been around for a longer time flooded 100 years indeed. The pioneer of truly supplying valuable things without using cables was Nicola Tesla, who began exhibiting remote-controlled streetlamps in the 1890s, and even tested in grid less force generators throughout the city.

g. One Google search produces about 0.2 g of CO_2 . But since you hardly get an answer from one search, a typical search session produces about the same amount of CO_2 as does boiling a teakettle. Google handles about 1 billion search queries per day, releasing some 200tonsofCO2perday.

h. QWERTY keyboard was designed to slow down the typing speed**.**

i. **Normally a mouse wheel scroll goes vertically up and down. If you hold the shift key and scroll the wheel it goes horizontally.**

j. **Instead of wires, PCBs use copper traces to transport electrons.**

k. **50V of static electricity is enough to compromise a small electronic device.**

l. **Some manufacturers have mist machines, which humidifies the dry air during the winter months. The mist evaporates before it hits the ground.**

m. **It takes 530lbs of fossil fuel,48lbs of chemicals, and 1.5 tons of water to manufacture one computer and monitor.**

n. **Before the original design for an iPhone, Apple patented a phone design in the shape of an actual apple. It was a flip phone that, when closed, would look like the Apple logo.**

o. **Alexa is always listening to your conversations. Alexa stores all of your dialogue history in the cloud to improve the Alexa experience.**

TECHNICAL QUIZ

SARANYAA TT
PALLAVINI T
IIYEARECEB

Questions:

1) Who is the father of modern electronics?_____
2) First enemy of electronics is_____
3) To prevent a DC return between source and load, it is necessary to use _____
4) Which of the oscillators is suitable for frequencies in the range of mega hertz _____
5) A device which converts BCD to seven segment is called_____
6) The basic storage element in a digital system is_____
7) Who is the father of modern communication?_____
8) First enemy of communication_____
9) The number of noise sources in a BJT are_____
10)The range of a cordless telephone is about _____

ANSWERS

1) SirJohn Ambrose Fleming
2) Heat
3) Capacitor between source and load
4) Hartley
5) Decoder
6) Flipflop
7) Alexander Graham Bell
8) Noise
9) Three
10)100m

Editorial Board

Dr.B.R.Tapas Bapu,HOD/ECE

Ms.P.Sasireka,Asst.Prof/ECE

Mr.M.MariaRubiston, Asst.Prof/ECE

Mr.M.Bharath ,IV year ECE

Ms.C.Haripriya, ,IV year ECE

Ms.J.Dhivyadharshini III Year ECE

Ms.M.Dhivya Bharathi,III year ECE

Ms.Saranya,II Year ECE

THANK YOU