# S.A. ENGINEERING COLLEGE

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# CHENNAI-77

# SAANKETHIKA2K21

***Annual Magazine, May 2021***

## DEPARTMENT OF
## ELECTRONICS AND COMMUNICATION ENGINEERING

# DEPARTMENT OF ELECTRONICS & COMMUNICATION

*Electronics and Communication Engineering is one of the most upcoming areas of Research & 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 technologies in Electronics and communication to meet the needs of the industry. The Department is well-equipped with laboratories i.e. Digital Design, Digital Signal Processing, Microprocessor, Electronic Circuits Analog & Digital Communications, RF &Microwave ,Computer Networks and VLSI Design which cater to program needs.The M.E degree course in communication systems was started in the academic year 2006-07.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.*

# MESSAGE

*It's gives me immense pleasure to see the creative expressions of students who had contributed to "**SAANKETHIKA 2K21**".It aims at providing a platform to the students to explore their latent capabilities and talent ,to express their creativity in writing articles.I acknowledge my heartful thanks to HoD,Faculty members and Edtitorial team members for their contribution and their hard efforts to bring out this magazine.At last,iam very much thankful to all the authors who had sent their article for **SAANKETHIKA 2K21**. My Heartfelt Wishes to all.*

**Thiru.D. Dasarathan**

**Secretary**

**S.A.Engineering College**

# MESSAGE

*I am really glad to know that ECE department is bringing out its magazine "**SAANKETHIKA 2K21**" with dedicated team of staff and students. It is the platform for the student to explore their talents. The magazine is not only informative but also has great educational value. I applaud the editorial team for the hard work and dedication they have invested in realizing this goal, and wish my dear students success in all future endeavors.*

**Dr. G.S.KUMARASAMY,**
**Principal,**
**S.A.Engineering College.**

# MESSAGE

I am proudly publish the ECE department magazine **"SAANKETHIKA 2K 21**"which strives to brings out the talents of our students. I am really elated to tell that the department stands on the strength of experienced and well qualified faculty who are very dedicated to teaching and research. This e-magazine is surely a channel to prove the hidden talents of our students. We intend to continue presenting the talent and creativity of our staff and students through our magazine every year.My Best Wishes to all.

**Dr.B.R.Tapas Bapu,**

**Head/ ECE Department**

**S.A.Engineering College**

# INSTITUTION

## Vision

*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 Staff and Students to realize their full potential thus enabling them to contribute positively to the community.*

# 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 to ECE 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 engineering problems.*

***f.*** *To apply* ***reasoning knowledge*** *for providing engineering solutions to societal 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 to technological changes.*

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# FUTURE TECHNOLOGY DEPENDS ON GRAPHENE

**PRADEEP.K**

**MAHA.S**

**IV YEAR ECE**

## BORN OF GRAPHENE

Graphite archaically referred to as plumbago, is a crystalline form of the element carbon with its atoms arranged in a hexagonal structure. It occurs naturally and is the most stable form of carbon under standard conditions. Graphene is a single layer of graphite. The remarkable thing about it is that its crystalline structure is two-dimensional.

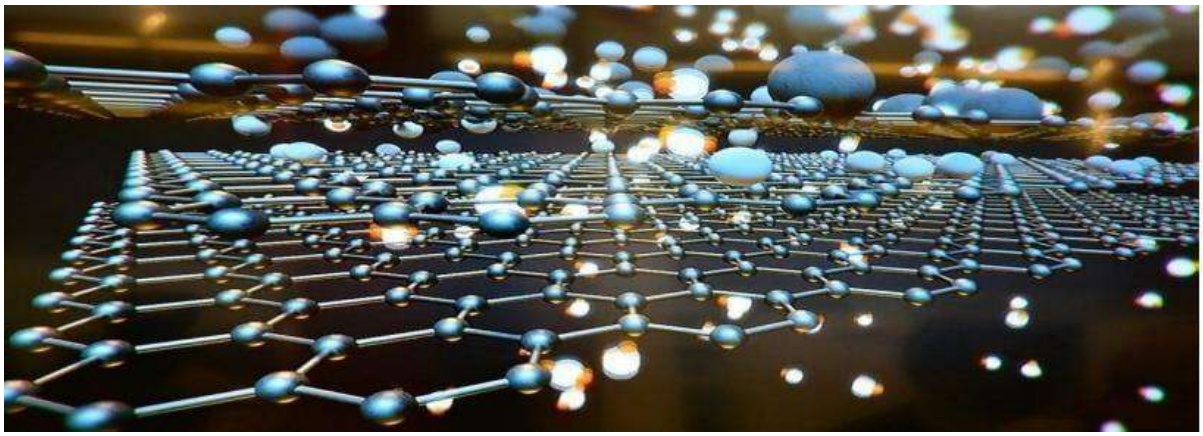


Figure no1: Layers of Graphite

Generally it is difficult to peel of a single layer of Graphite, But in 2004, two scientists at the University of Manchester conducted a deceptively simple experiment with potentially world changing consequences. The researchers, Andre Geim and Konstantin Novoselov, were playing around with graphite. Graphite is made of super-thin sheets of pure carbon stacked on top of each other. Geim and Novoselov wanted to see if they could isolate a single sheet of graphite, an impossibly thin layer of carbon measuring just one atom thick. So, they grabbed a roll of sticky tape. The sticky-tape method worked! By isolating a single-layer sheet of carbon, Geim and Novoselov were credited with discovering a brand-new material called graphene that's now believed to be the strongest, lightest and most electrically conductive substance on Earth. In 2010,Geim and Novoselov shared the Noble Prize in Physics for discovering graphene.

# GRAPHENE – THE SUPERMATERIAL

Graphene gets its superpowers from its structure. If you could zoom in close enough, you'd see that a sheet of graphene looks like an atomic-scale honeycomb. Individual carbon atoms are arranged in a hexagonal pattern. Each carbon atom in a sheet of graphene is covalently bonded to three other carbon items, which gives the material its incredible strength.

Figure No 2: Graphene can withness the bullet

➢ Graphene is 200 times stronger than the steel.

➢ Graphene is 1000 times lighter than the paper.

➢ Graphene is 98 percent transparent.

➢ Graphene conducts electricity at room temperature.

➢ Graphene is a superconductor.

# GRAPHENE TRANSFORM TECHNOLOGY

Graphene's value is mainly due to its incredible strength and the wide variety of industrial applications it possesses. This material consists of a single layer of carbon atoms connected to one another by six chemical bonds, creating a lattice.Not only is graphene extremely useful in scientific experiments due to its high reactivity and strength, it can also be added to all sorts of other materials to improve their strength or to make them more lightweight, such as concrete or metals. It is the most conductive material, making it invaluable for use as a heat sink in, for instance, LEDs or smartphones. It could also be used in battery technology, in paints, in sensors, and many more."By 2024, there will be a variety of graphene products on the market,"

says Ferrari, "including batteries, photonics, night vision cameras and more."

Figure No 3: Monocar made by Graphene Technology.

Consumers have been eagerly awaiting graphene-based batteries for years. The lithium ion batteries in all our gadgets are relatively slow to charge, lose their juice quickly and burn out after a set number of cycles. That's because the electrochemical process that powers lithium-ion batteries generates a lot of heat.

But since graphene is the world's most efficient electrical conductor, it produces a lot less heat when charging up or discharging electricity. Graphene-based batteries five times faster charging speeds than lithium-ion, three times longer battery life, and five times as many cycles before they need to be replaced.

Electronics companies like Samsung and Huwei are actively developing graphene-based batteries for smartphones and other gadgets. As for graphene batteries in electric cars — which could dramatically increase their driving radius — that's still a few years off. An entire industry has been built on lithium-ion technology and it won't change overnight.

Figure no 4: Foldable OLED mobile using Graphene

"The battery industry is very conservative," says Jesus de la Fuente, CEO of Graphene, a company that manufactures and sells pure graphene and graphene-based chips to academic researchers and R&D departments. "It might change the composition of batteries a few times every five to ten years, which makes it very difficult to introduce new products in this industry."

Biosensors are a big deal. Imagine an incredibly thin and flexible chip that can be injected into the bloodstream to monitor real-time health data like insulin levels or blood pressure. Or a graphene interface that sends signals back and forth to the brain to detect an upcoming epileptic seizure or even prevent it. Thin, stretchable sensors can also be worn on the skin or woven into the fabric of clothes.

Filtration is yet another promising application of graphene. Simple Water purification is built with graphene polymers can bind to organic and inorganic contaminants in drinking water. Researchers at the Graphene Flagship have also created desalinization technologies based on graphene diodes that can remove over 60 percent of salt water from seawater for agricultural and other uses.

# EMBEDDED WEB TECHNOLOGY

GILDA KERENSA J

III YEAR ECE

Embedded Web Technology (EWT) is regarded as the 'marriage' of web technologies with embedded systems. In other words, the software developed for embedded systems is applied by making use of the internet. Embedded technology has been around for a long time and its use has gradually expanded into the PC market. Speed, accuracy, reliability were the reasons why embedded technology entered computers. With a great market size of billions in the next coming years, the future is embedded. Embedded systems contain processors, software, input sensors and output actuators, which work as the controls of a device and are subject to constraints. These Embedded systems may not have disk drives, keyboards, display devices and are typically restricted in terms of power, memory, GUIs and debugging interfaces. The central building blocks are microcontrollers, i.e. microprocessors integrated with memory units and specific peripherals for the observation and control of these embedded systems. On the other hand, Web technologies employ client-server models.

## Introduction of Embedded Web Technology:

The embedded Web system works on the same principle as that traditional Web request-response systems. Web pages from the embedded system (server) are transmitted to the Web browser (client), which implements the user interface (Presentation layer). In other cases, the embedded system dynamically generates the pages to convey the current state of the device to the user at the centralized location. These end users can also use the Web browser to send the information to the embedded system for the configuration and control of the device. Web-enabled devices use the HTTP (Hyper Text Transfer Protocol) standard protocol to transmit Web pages from the embedded system to the Web browser, and to transmit HTML (Hyper Text Markup Languages) which form the data from the browser back to the device. The devices require a network interface such as Ethernet, TCP/IP software, embedded Web server software, and the Web pages (both static and generated) that make up the device-specific GUI. The HTTP protocol engine takes the request from the Web browser and sends it on the TCP/IP. The HTTP protocol Engine phrases the request and sends it to the embedded application for processing. After producing the results, the embedded application generates the HTML code and feeds it to the HTTP Engine, which sends it back to the client using TCP/IP.

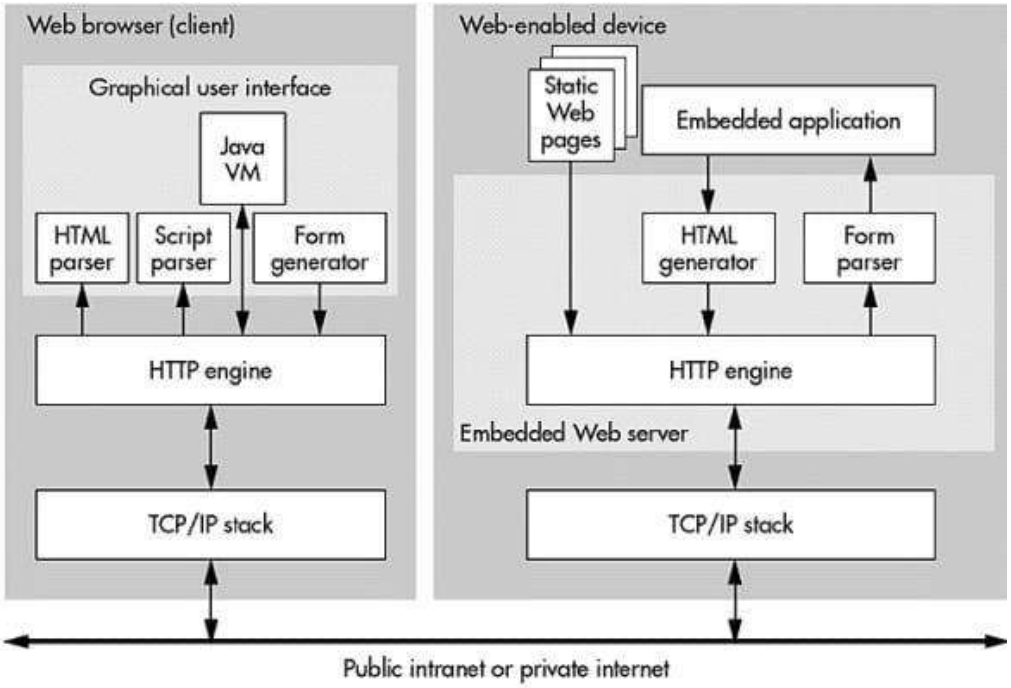
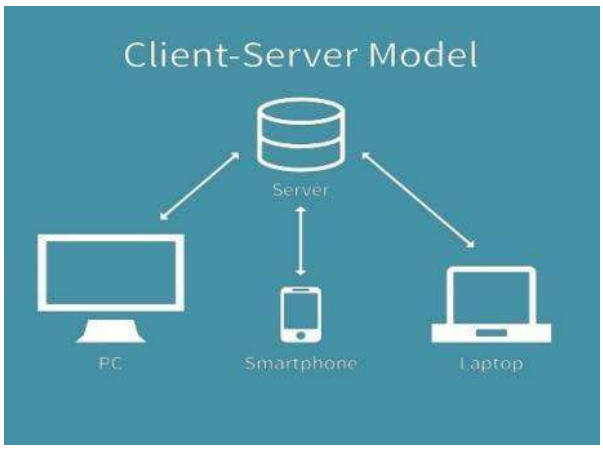



Figure 1: Web-enabled devices use the HTTP standard protocol to transmit

Web pages from the embedded system to the Web browser, and to transmit HTML form data from the browser back to the device. Embedded Web Technology is an enabling, or platform technology. This means that it is relevant to a wide variety of applications, many of which have not yet been identified. NASA have promoted EWT through workshops, participation in shows, and one-to-one consultations with our partners.

**Embedded Software:**

The Internet is the dominant method of information access. People are using universal clients such as Web browsers and email readers to connect to any system, from anywhere, and at any time. With the use of embedded Internet technology, innovative companies are building products that let people use these same universal clients to manage embedded devices.



Using Web or email technologies in a networked device delivers user control with any Web browser or email client. This approach eliminates the need to build custom management applications and provides access to the device using the Internet tools that everyone is familiar with. Embedded software space is vast and wide open. Newer embedded systems can require different software based applications.

These software based applications are:

- Database applications,
- Internet applications,
- Mobile office productivity tools and
- Personal applications.

# LIFI TECHNOLOGY

HARIPRIYA R

JERISHA JERALD S J

III YEAR ECE

Li-Fi (also written as LiFi) is a wireless communication technology which utilizes light to transmit data and position between devices. The term was first introduced by Harald Haas during a 2011 TED Global talk in Edinburgh.

In technical terms, Li-Fi is a light communication system that is capable of transmitting data at high speeds over the visible light, ultraviolet, and infrared spectrums. In its present state, only LED lamps can be used for the transmission of data in visible light.


In terms of its end use, the technology is similar to Wi-Fi — the key technical difference being that Wi-Fi uses radio frequency to induce a voltage in an antenna to transmit data, whereas Li-Fi uses the modulation of light intensity to transmit data. Li-Fi can theoretically transmit at speeds of up to 100 G bit/s. Li-Fi' s ability to safely function in areas otherwise susceptible to electromagnetic interference (e.g. aircraft cabins, hospitals, military) is an advantage. The technology is being developed by several organizations across the globe.

Li-Fi is a derivative of optical wireless communications (OWC) technology, which uses light from light-emitting diodes (LEDs) as a medium to deliver network, mobile, high-speed

communication in a similar manner to Wi-Fi. The Li-Fi market was projected to have a compound annual growth rate of 82% from 2013 to 2018 and to be worth over $6 billion per year by 2018.

Technologies that allows as roaming between various Li-Fi cells, also known as handover, may allow to seamless transition between Li-Fi. The light waves cannot penetrate walls which translates to a much shorter range, and a lower hacking potential, relative to Wi-Fi Direct line of sight is not necessary for Li-Fi to transmit a signal; light reflected off walls can achieve 70 Mbit/s.

Li-Fi has the advantage of being useful in electromagnetic sensitive areas without causing electromagnetic interference . Both Wi-Fi and Li-Fi transmit data over the electromagnetic spectrum, but whereas Wi-Fi utilizes radio waves, Li-Fi uses visible, ultraviolet, and infrared light.

# What is LiFi?

LiFi is a wireless optical networking technology. Specifically, it is a form of visible light communications (VLC) system that makes use of light-emitting diodes (LED) for data transmission. LiFi has a special distinction from other VLC systems. Similar to WiFi, LiFi is the only form of VLC that allows the bidirectional transmission of light. However, instead of the radio spectrum, it makes use of the visible light spectrum through LED light bulbs outfitted with a special chip.

# Why do we need LIFI?

In so many ways, Li Fi is considered more superior to Wi Fi. Data transmission tests have reached speeds of up to 224 G bps, roughly 100 times faster than Wi Fi. It provides many available frequencies to which tasks can be offloaded, freeing up much-needed space for 5G.

# How LiFi works

LiFi uses visible light as a medium for the transmission of data. As a type of VLC system, it requires two components: a photodiode and a light source. The photodiode acts as a transceiver that receives light signals and transmits them back. The light source transmits data using emitted light as the medium. In this case, light emitting diodes (LED) serve as the light source. They are outfitted with a chip that serves as the signal processing unit.

LED light bulbs are semiconductors. This means current supplied to the bulb can be modulated, which in turn, modulates the light they emit. This process occurs at extremely high speeds that are unperceivable to the human eye. Data is fed into the light bulb and sends the data at extremely high speeds to the photodiode. It converts the data received into a binary data stream perceivable by humans such as video and audio applications.

# How data is transmitted over light

To send data over light, LiFi systems require a strong, robust light source like LED bulbs. LEDs are different from halogen or filament bulbs as they do not need to warm up. As previously stated, they are semiconductors. They start up quickly and emit light according to the current passed through them.Within the light, the intensity of the colors red, green, and blue (RGB) is finely modulated to embed data into the LED light.This fine modulation of RGB can be better described as a form of code. Once the light is received by a photodiode, the light is demodulated. The information received is either relayed to a cloud server or transcribed by the receiver itself. Content is then displayed according to the code obtained.

# Advantages

- Speed: Perhaps the biggest selling point of LiFi technology is that it is able to transmit data at far greater speeds than WiFi. During lab tests, researchers were able to reach bidirectional transfer speeds of 224 gigabits per second. Of course, it would be difficult to reach those speeds in a real-world setting.

- Versatility: It is easily integrated into areas that already use LED lighting systems. The internet is readily-accessible wherever there is light and can be used in a variety of applications that require an internet connection.
- Cost: Because LED lamps are inexpensive to produce, analysts predict that the deployment of LiFi would be easier and ten times cheaper than WiFi. Plus, they are more energy-efficient than any other lighting technology.
- Availability: As the world looks to use green technology, LED light bulbs are becoming a staple everywhere. This means soon enough, high-speed internet connectivity will be as ubiquitous as there are light bulbs.
- Security: RF communication technology has always been vulnerable to eavesdropping, signal hijacking, or even brute force attacks. However, visible light is unable to permeate opaque surfaces. Signals emitted by LiFi as well as the data transmitted through it remain confined within the space.

Disadvantages

- Limitations: LiFi offers a limited range. Physical barriers limit its operational scope. In order to increase its scope, lamps or bulbs must be strategically placed in various rooms. In contrast, a single WiFi router has a wider, longer range, making them an ideal selection for public networks.
- Interference: LiFi signals are susceptible to light interferences, including sunlight. Receivers may have a difficult time to process signals when other sources of light are present. Moreover, because LED lamps must remain on to function, they can further contribute to light pollution.
- Infrastructure: Theoretically speaking, deploying LiFi systems are inexpensive because they only make use of LED lamps. In reality, the installation of LiFi systems can become expensive due to the lack of infrastructure. Additionally, due to its limited range, several LiFi routers will need to be installed for greater connectivity.

# HOLOGRAPHIC DATA STORAGE

KEERTHANA.B

1V YEAR ECE

Holographic data storage is a potential technology in the area of high-capacity data storage. While magnetic and optical data storage devices rely on individual bits being stored as distinct magnetic or optical changes on the surface of the recording medium, holographic data storage records information throughout the volume of the medium and is capable of recording multiple images in the same area utilizing light at different angles.

Additionally, whereas magnetic and optical data storage records information a bit at a time in a linear fashion, holographic storage is capable of recording and reading millions of bits in parallel, enabling data transfer rates greater than those attained by traditional optical storage.

## Recording data

Holographic data storage contains information using an optical interference pattern within a thick, photosensitive optical material. Light from a single laser beam is divided into two, or more, separate optical patterns of dark and light pixels. By adjusting the reference beam angle, wavelength, or media position, a multitude of holograms (theoretically, several thousands) can be stored on a single volume.

## Reading data

The stored data is read through the reproduction of the same reference beam used to create the hologram. The reference beam's light is focused on the photosensitive material, illuminating the appropriate interference pattern, the light diffracts on the interference pattern, and projects the pattern onto a detector. The detector is capable of reading the data in parallel, over one million bits at once, resulting in the fast data transfer rate. Files on the holographic drive can be accessed in less than 0.2 seconds.

## Longevity

Holographic data storage can provide companies a method to preserve and archive information. The write-once, read many (WORM) approach to data storage would ensure content security, preventing the information from being overwritten or modified. Manufacturers believe this technology can provide safe storage for content without degradation for more than 50 years, far exceeding current data storage options.

Counterpoints to this claim are that the evolution of data reader technology has – in the last couple of decades – changed every ten years. If this trend continues, it therefore follows that being able to store data for 50–100 years on one format is irrelevant, because you would

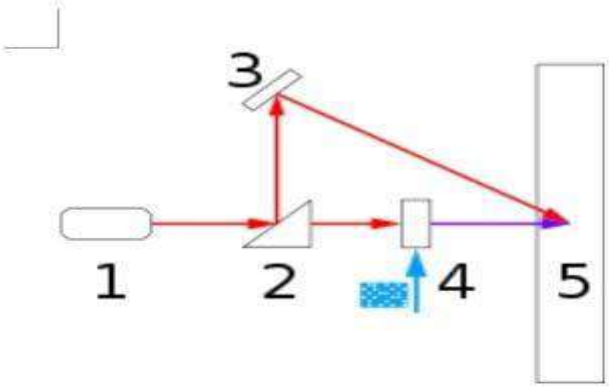
migrate the data to a new format after only ten years. However, claimed longevity of storage has, in the past, proven to be a key indicator of shorter-term reliability of storage media. Current optical formats – such as CD – have largely lived up to the original longevity claims (where reputable media makes are used) and have proved to be more reliable shorter-term data carriers than the floppy disk and DAT media they displaced.

# Terms used

Sensitivity refers to the extent of refractive index modulation produced per unit of exposure. Diffraction efficiency is proportional to the square of the index modulation times the effective thickness.The dynamic range determines how many holograms may be multiplexed in a single volume data.Spatial light modulators (SLM) are pixelated input devices (liquid crystal panels), used to imprint the data to be stored on the object beam.

# Technical aspects

Like other media, holographic media is divided into write once (where the storage medium undergoes some irreversible change), and rewritable media (where the change is reversible). Rewritable holographic storage can be achieved via the photorefractive effect in crystals:




•Mutually coherent light from two sources creates an interference pattern in the media. These two sources are called the reference beam and the signal beam.

•Where there is constructive interference the light is bright and electrons can be promoted from the valence band to the conduction band of the material (since the light has given the electrons energy to jump the energy gap). The positively charged vacancies they leave are called holes and they must be immobile in rewritable holographic materials. Where there is destructive interference, there is less light and few electrons are promoted.

•Electrons in the conduction band are free to move in the material. They will experience two opposing forces that determine how they move. The first force is the coulomb force between the electrons and the positive holes that they have been promoted from. This force encourages the electrons to stay put to move to areas where electrons are less dense. If the coulomb forces are not too strong, the or move back to where they came from. The second is the pseudo-force of diffusion that encourages them electrons will move into the dark areas.

•Beginning immediately after being promoted, there is a chance that a given electron will recombine with a hole and move back into the valence band. The faster the rate of recombination, the fewer the number of electrons that will have the chance to move into the dark areas. This rate will affect the strength of the hologram.

•After some electrons have moved into the dark areas and recombined with holes there, there is a permanent space charge field between the electrons that moved to the dark spots and the holes in the bright spots. This leads to a change in the index of refraction due to the electro-optic effect.

When the information is to be retrieved or read out from the hologram, only the reference beam is necessary. The beam is sent into the material in exactly the same way as when the hologram was written. As a result of the index changes in the material that were created during writing, the beam splits into two parts. One of these parts recreates the signal beam where the information is stored. Something like a CCD camera can be used to convert this information into a more usable form.

Holograms can theoretically store one bit per cubic block the size of the wavelength of light in writing. For example, light from a helium–neon laser is red, 632.8 nm wavelength light. Using light of this wavelength, perfect holographic storage could store 500 megabytes per cubic millimetre. At the extreme end of the laser spectrum, fluorine excimer laser at 157 nm could store 30 gigabytes per cubic millimetre. In practice, the data density would be much lower, for at least four reasons:

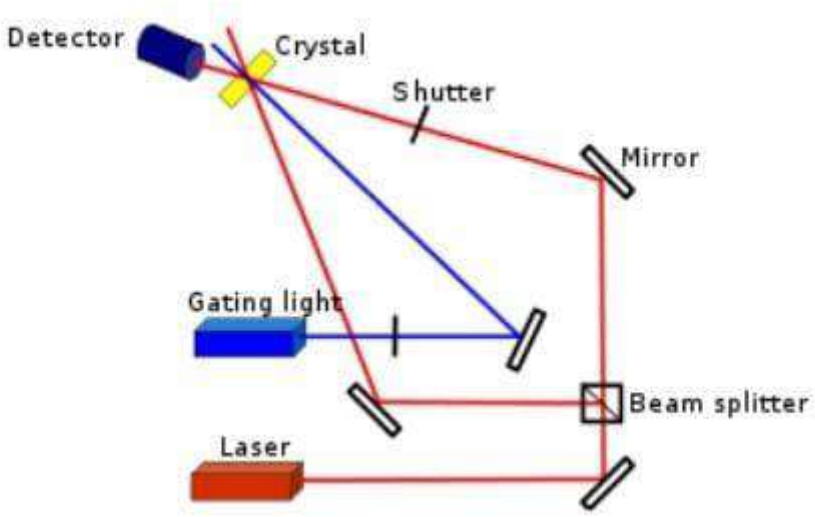
- The need to add error-correction
- The need to accommodate imperfections or limitations in the optical system
- Economic payoff (higher densities may cost disproportionately more to achieve)
- Design technique limitations—a problem currently faced in magnetic Hard Drives wherein magnetic domain configuration prevents manufacture of disks that fully utilize the theoretical limits of the technology.

Despite those limitations, it is possible to optimize the storage capacity using all-optical signal processing techniques.

Unlike current storage technologies that record and read one data bit at a time, holographic memory writes and reads data in parallel in a single flash of light.

For two-colour holographic recording, the reference and signal beam fixed to a particular wavelength (green, red or IR) and the sensitizing/gating beam is a separate, shorter wavelength (blue or UV). The sensitizing/gating beam is used to sensitize the material before and during the recording process, while the information is recorded in the crystal via the reference and signal beams. It is shone intermittently on the crystal during the recording process for measuring the diffracted beam intensity. Readout is achieved by illumination with the reference beam alone. Hence the readout beam with a longer wavelength would not be able to excite the recombined electrons from the deep trap centres during readout, as they need the sensitizing light with shorter wavelength to erase them.

Usually, for two-colour holographic recording, two different dopants are required to promote trap centres, which belong to transition metal and rare-earth elements and are sensitive to certain wavelengths. By using two dopants, more trap centres would be created in the lithium niobate crystal. Namely a shallow and a deep trap would be created. The concept now is to use the sensitizing light to excite electrons from the deep trap farther from the valence band to the conduction band and then to recombine at the shallow traps nearer to the conduction band. The reference and signal beam would then be used to excite the electrons from the shallow traps back to the deep traps. The information would hence be stored in the deep traps. Reading would be done with the reference beam since the electrons can no longer be excited out of the deep traps by the long wavelength beam.



# Effect of Annealing

For a doubly doped lithium niobate (LiNbO3) crystal there exists an optimum oxidation/reduction state for desired performance. This optimum depends on the doping levels of shallow and deep traps as well as the annealing conditions for the crystal samples. This optimum state generally occurs when 95–98% of the deep traps are filled. In a strongly oxidized sample holograms cannot be easily recorded and the diffraction efficiency is very low. This is because the shallow trap is completely empty and the deep trap is also almost devoid of electrons. In a highly reduced sample on the other hand, the deep traps are completely filled and the shallow traps are also partially filled. This results in very good sensitivity (fast recording) and high diffraction efficiency due to the availability of electrons in the shallow traps. However, during readout, all the deep traps get filled quickly and the resulting holograms reside in the shallow traps where they are totally erased by further readout. Hence after extensive readout the diffraction efficiency drops to zero and the hologram stored cannot be fixed.

# Development and Marketing

In 1975, Hitachi introduced a video disc system in which chrominance, luminance and sound information were encoded holographically. Each frame was recorded as a 1 mm diameter hologram on a 305 mm disc, while a laser beam read out the hologram from three angles.

Developed from the pioneering work on holography in photorefractive media and holographic data storage of Gerard A. Alphonse, In Phase conducted public demonstrations of the a prototype commercial storage device, at the National Association of Broadcasters 2005 (NAB) convention in Las Vegas, at the Maxell Corporation of America booth.

The three main companies involved in developing holographic memory, as of 2002, were In Phase and Polaroid spinoff Aprils in the United States, and opt ware in Japan.Although holographic memory has been discussed since the 1960s, and has been touted for near-term commercial application at least since 2001 it has yet to convince critics that it can find a viable market. As of 2002, planned holographic products did not aim to compete head to head with hard drives, but instead to find a market niche based on virtues such as speed of access.

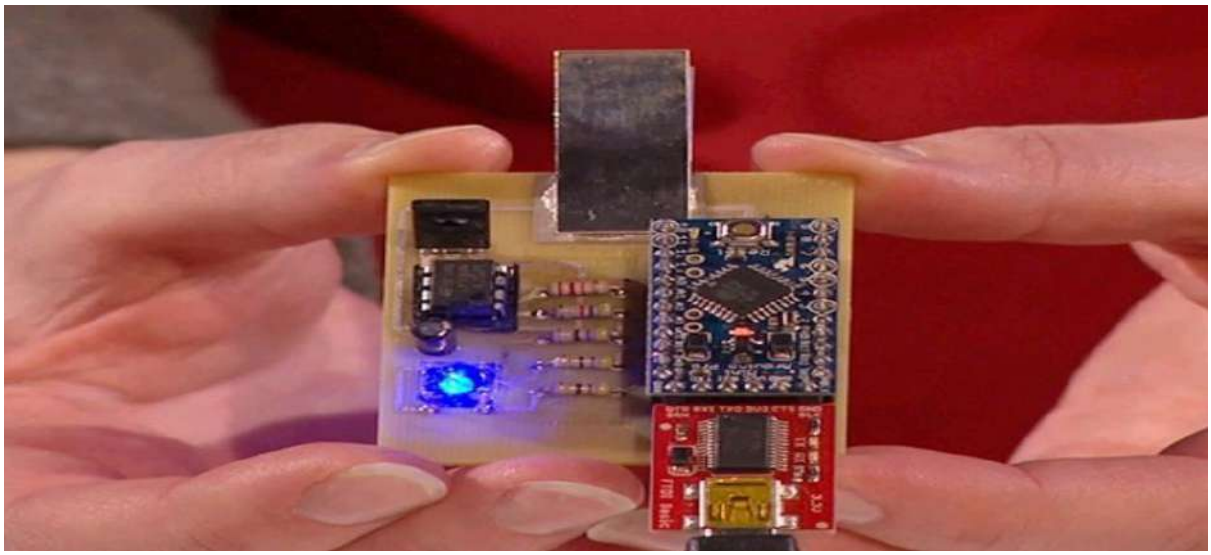
In Phase Technologies, after several announcements and subsequent delays in 2006 and 2007, announced that it would soon be introducing a flagship product. In Phase went out of business

in February 2010 and had its assets seized by the state of Colorado for back taxes. The company had reportedly gone through $100 million but the lead investor was unable to raise more capital. In April 2009, GE Global Research demonstrated their own holographic storage material that could allow for discs that utilize similar read mechanisms as those found on Blu-ray Disc players.

# Digital Lollipop - Taste Via Internet

**SARAN. T**

**III YEAR ECE**



Usually if you go to an Ice-cream parlour to buy some Ice-cream, they give you some samples to taste. Then it gives you some clarity about which one you are going to buy. But till date, it is not possible in case of Ordering food online. Whether you like it or not, you have to eat it. But now, Nimesha Ranasinghe and team from the University of Singapore developed a device named Digital Lollipop which allows you to sense tastes like saltiness, sourness, bitterness, sweetness and umami by placing a silver electrode against your tongue. If it came to market, who will not buy it. But how it is customized to a particular food taste? Read the full article.

## Working of Digital Lollipop

Signals that reproduce taste components are transmitted through silver electrode against your tongue, that uses electrical currents (magnitude, frequency & polarity: inverse current) and heat to stimulate different types of tastes.

“We have found noninvasive electrical and thermal stimulation of the tip of the tongue successfully generates the primary taste sensation.”

- Nimesha Ranasinghe.

Tastes are sensed by your taste buds, when it is reacted with different chemical compound.

- Sodium ions triggers your salt perception.
- Acidity triggers the sourness.
- For more, Google...

## Customizing Digital Lollipop

The developers also introduced Taste Over Internet Protocol (TOIP), so it is theoretically possible for an online food delivery website to trigger a specific taste sensation in their customer's mouth via internet.

The developers will leave the exact possibility of the taste to the users own imagination. And yes, it is an easy process if that product ever came to the market.

## Advantages of Digital Lollipop

- Nowadays, diabetics is like common cold. That person cannot take sugar in their prescribed diet. But with Digital Lollipop, they can taste sweetness without getting scold by their doctor and their blood sugar level will also remain same.
- As mentioned earlier, it can be used in online food delivery platforms for their customers to taste the food before ordering it.
- It is also used to retain taste for a cancer patient who lost their taste due to chemotherapy.

## Disadvantages of Digital Lollipop

- If this product came to market, restaurants will no longer provide free sample foods to eat.

## Conclusion

From tasting food in a restaurant to tasting food online. Hope this situation will not come to water.

# PILL CAMERA

**Divya. K**

**III YEAR ECE**

The technology is like an expanding universe. The main aim of this technology is to make products in a large scale for cheaper prices and increased quality. The current technologies have attained a part of it, but the manufacturing technology is at macro level. One such product manufactured is PILL CAMERA,which is used for the treatment of cancer, ulcer. The technology used to achieve it takes pictures of intestine and transmits the same to the receiver of the computer analysis of digestive system. As there is a great progress in manufacturing products, humans are still thinking more complex about innovative ideas. With our present technology we manufacture products by casting, milling, grinding, chipping and integrated fabrication. With these technologies we have made more things at a lower cost and greater precision than ever before. All manufactured products are made from atoms. The next step in manufacturing technology is to manufacture products at molecular level. The technology used to achieve manufacturing at molecular level is “NANOTECHNOLOGY”. Nanotechnology is the creation of useful materials, devices and system through manipulation of such miniscule matter (nanometer). Nanotechnology deals with objects measured in Nanometers. Nanometer can be visualized as billionth of a meter or millionth of a millimeter or it is 1/80000 width of human hair. These technologies we have made more things at a

lower cost and greater precision than before. Millions of assembler needed to build products. In order to create enough assemblers to build consumer goods, some Nano machines called explicators will be developed using self-replication process. Self-replication is a process in which devices whose diameters are of atomic scales, on the order of nanometers, create copies of themselves.

# OBJECTIVE OF USAGE

Pill Camera finds its most useful application in the field of Medicine, where it is used as a means of viewing the colon activities for a patient. Conventionally speaking, the previous method of achieving these includes Endoscopic Ultrasound (EUS). The limitations of the previous methods is the inability to go as far as the small intestine. The Pill Camera Provides a wireless transmission technology to achieve more and better result which is one of many of the likes that came with the advent of Nano technology. The pill that could travel through your body taking pictures, helping diagnose a problem which doctor previously would have found only through surgery. Scientific advances in areas such as nanotechnology and gene therapy promise to revolutionize the way we discover and develop drugs, as well as how we diagnose and treat disease.

# DESIGN OF PILL CAMERA

The envelope contains LEDs, a lens, a color camera chip, two silver- oxide batteries, a transmitter, an antenna, and a magnetic switch. The camera chip is constructed in complementary-metal –oxide-semiconductor technology to require significantly less power than charge-coupled devices. Other construction benefits includes the unit's dome shaped that cleans itself of body fluids and moves along to ensure optimal imaging to its obtained. For this application, small size and power efficiency are important. There are three vital technologies that made the tiny imaging system possible: improvement of the signal-to-noise ratio (SNR) in CMOS detectors, development of white LEDs and development of application- specific integrated circuits (ASICs).The silver oxide batteries in the capsule power the CMOS detector, as well as the LEDs and transmitter. The white- light LEDs are important because pathologists distinguish diseased tissue by color. The developers provided a novel optical design that uses a wide-angle over the imager, and manages to integrate both the LEDs and imager under one dome while handling stray light and reflections. Recent advances in ASIC design allowed the integration of a video transmitter of sufficient power output,efficiency, and band width of very small size into the capsule.The system's computer work station is equipped with software for reviewing the camera data using a variety of diagnostic tools. This allows physicians choice of viewing the information as either streaming or single video images.

# OPTICAL DOME

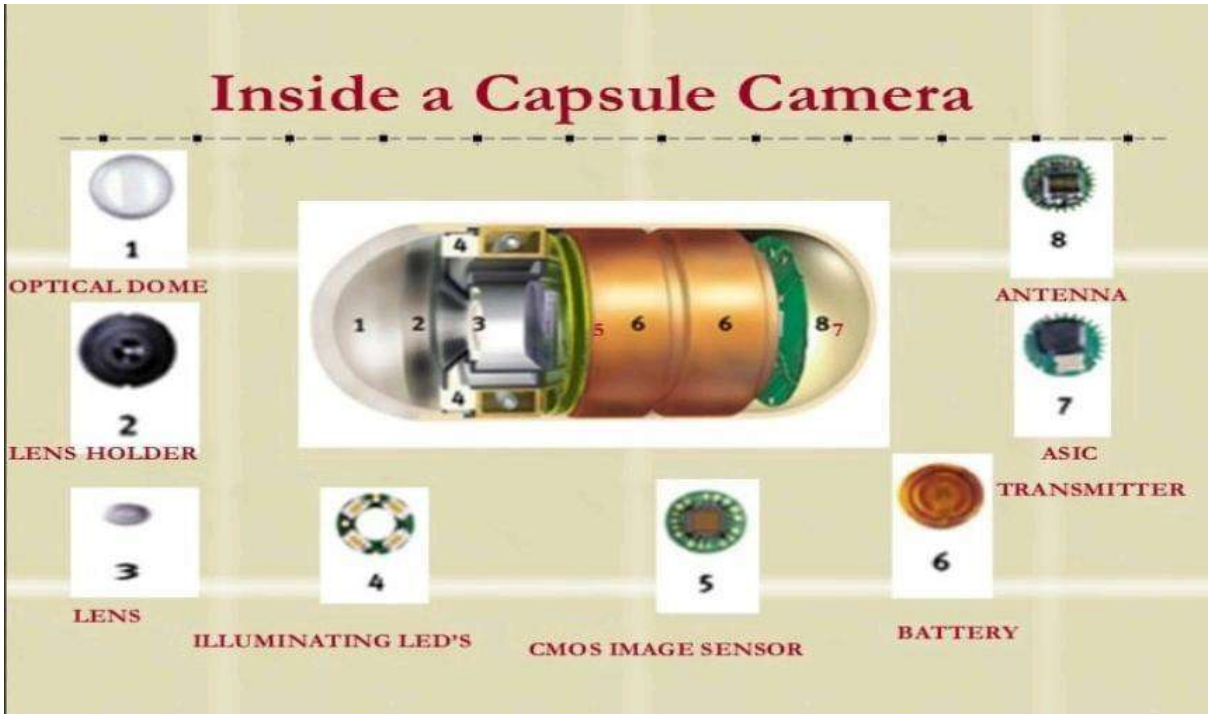
It is the front part of the capsule and it is bullet shaped. Optical dome is the light receiving window of the capsule and it is a non- conductor material. It prevent the filtration of digestive fluids inside the capsule.

# LENS HOLDER

This accommodates the lens. Lenses are tightly fixed in the capsule to avoid dislocation of lens.

# LENS

It is the integral component of Pill Camera. This lens is placed behind the Optical Dome. The light through window falls on the lens.




# ILLUMINATING LEDs

Illuminating LEDs illuminate an object. Non reflection coating id placed on the light receiving window to prevent the reflection. Light irradiated from the LED s pass through the light receiving window.

## CMOS IMAGE SENSOR

It have 140 degree field of view and detect object as small as 0.1mm. It have high precise

## BATTERY

Battery used in the Pill Camera is bullet shaped and two in number and Silver oxide primary batteries are used. It is disposable and harmless material.

## ASIC TRANSMITTER

It is application specific integrated circuit and is placed behind the Batteries. Two transmitting electrodes are connected to this transmitter and these electrodes are electrically isolate.

## ANTENNA

Parylene coated on to polyethylene or polypropylene antennas are used. Antenna received data from transmitter and then send to data recorder.

## COMPONENTS OF PILL CAMERA PLATFORM

In order for the images obtained and transmitted by the capsule endoscope to be useful, they must be received and recorded for study. Patients undergoing capsule endoscopy bear an antenna array consisting of leads that are connected by wires to the recording unit, worn in standard locations over the abdomen, as dictated by a template for lead placement. The antenna array is very similar in concept and practice to the multiple leads that must be affixed to the chest of patients undergoing standard lead electrocardiography. The antenna array and battery pack cam be worn under regular clothing. The recording device to which the leads are attached is capable of recording the thousands of images transmitted by the capsule and received by the antenna array. Ambulary (non-vigorous) patient movement does not interfere with image acquisition and recording. A typical capsule endoscopy examination takes approximately 7 hours.

## ADVANTAGES

- High quality images.
- Harmless material.
- Simple procedure.

- High sensitivity and specificity.

## DISADVANTAGES

- Very expensive and not reusable.
- It is not a replacement for any existing GI imaging technique; generally performed after a standard endoscopy and colonoscopy.
- If, for any reason, the camera gets stuck, it will require a surgical procedure to remove it.

## APPLICATION

- Pill Camera endoscopy is used to detect intestinal cancer, esophageal diseases like crohn's disease.
- It helps to provide visual imaging during the treatment of ulcer.
- Nano Robots can also be used in performing delicate surgical procedures.

## CONCLUSION

Nano Technology is gaining more acceptance in today's world. The future of invention and technological emancipation lie majorly on the depth of knowledge in the field. Pill Camera is just one of the success of the technology, more are still yet to be discovered and Nigeria as a fore country in Africa can leverage on the population resources and continental presence and relevance to claim some futuristic diversification in the field of Nano Technology.

# BIONIC EYE

K.PUVEEYARASI

IV YEAR ECE

## INTRODUCTION

Who knew that original body parts can be replaced by bionic body parts? Welcome to the new world of bionics. Traditional applications of bionics in healthcare, including artificial organs replacing, mimicking and even enhancing biological function when compared to native organic equivalents, is quite old. Recently there has been a new wave of bio-inspired treatments that act through the reorganization of the existing biological organs in an individual to enhance physiology.

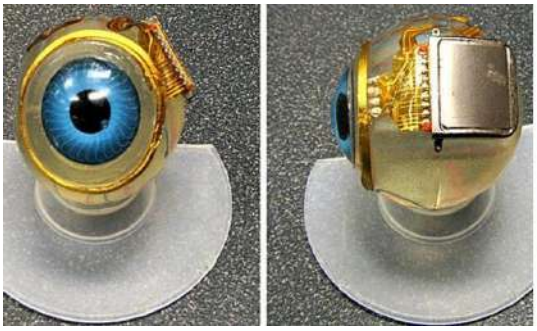
It is no secret that life is challenging for individuals dealing with blindness. For those of us who can see, we don't fully understand just how important is the gift of sight.

Researchers around the world have been working to cure this with various bionic solutions but none of them has yet been able to come to the market to help better people's lives. Well, it looks like one contender has come awfully close.

## WHAT DOES BIONIC EYE MEAN?

Bionic eye, electrical prosthesis surgically implanted into a human eye in order to allow for the transduction of light (the change of light from the environment into impulses the brain can process) in people who have sustained severe damage to the retina.

It is a design creates a visual pattern from combinations of up to 172 spots of light (phosphenes) which provides information for the individual to navigate indoor and outdoor environments, and recognize the presence of people and objects around them.



# INVENTION OF BIONIC EYE

The bionic eye dubbed 'Gennaris bionic vision system' has been under development for nearly a decade now.

Researchers have seen successful results in sheep with minimal side effects where it was safely implanted into their brains using a pneumatic inserter with a total of 200 hours of simulation. They are now preparing to take it to the next level for its first-ever human clinical trial that is expected to be conducted in Melbourne.

Researchers at Monash University in Melbourne, Australia have built a bionic eye that promises to bring back vision with the help of a brain implant. The team claims this is the world's first bionic eye.

Surgeons at Manchester and Moor fields made history in 2009 by delivering the world's first trial of the Argus II bionic eye implants in RP. Professor Stanga also performed the first ever bionic eye implant on a patient with age-related macular degeneration (AMD) in 2015.

In December 2016, it was announced that NHS England will provide funding for further testing of the Argus II, also known as the 'bionic eye', for ten patients with Retinitis Pigmentosa (RP), an inherited disease that causes blindness.

Five of the procedures will take place at the Manchester Royal Eye Hospital from 2017, with the other half at Moor fields Eye Hospital in London.

The first implantation of a rudimentary version of the bionic eye was reported in 2012. The patient, who suffered from profound vision loss as a result of retinitis pigmentosa, reported being able to see light but not being able to make distinctions within the environment. The first model was created by the Australian company Bionic Vision Australia. More-advanced technologies developed since then have been used in newer models implanted into patients whose vision was affected by retinitis pigmentosa. The improved models have allowed patients glimpses of their environments, enabling them to make out abstract images, though their vision has not been fully regained.

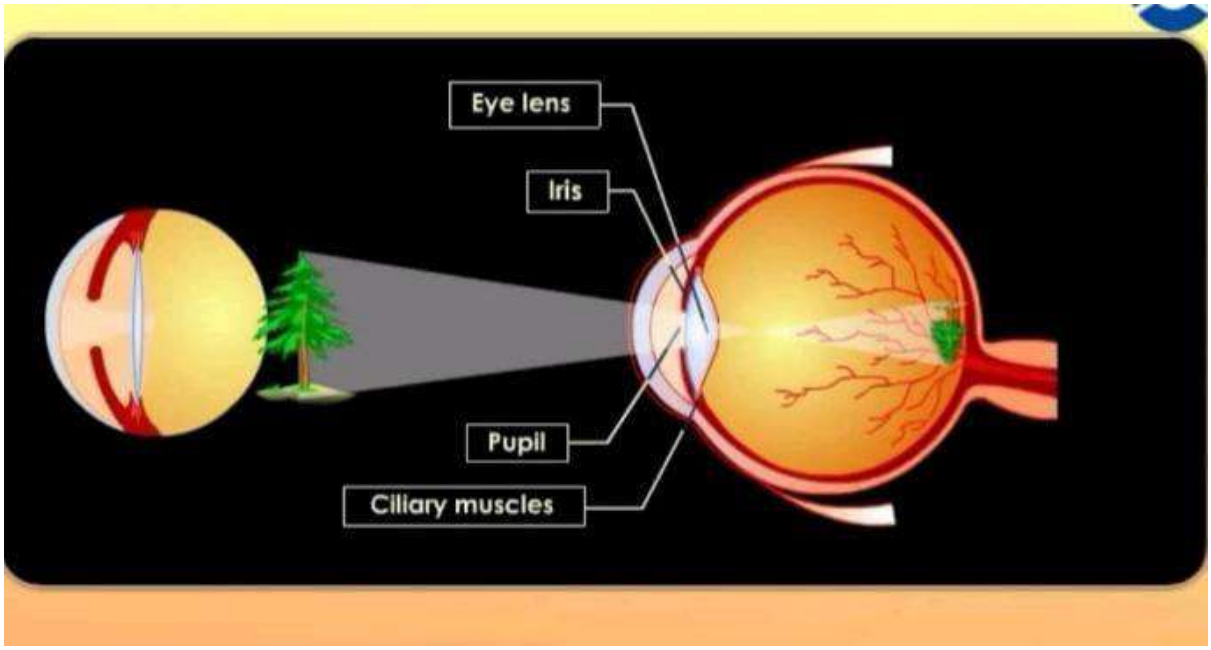
# PURPOSE OF ITS INVENTION

A bionic eye is a form of a neural prosthesis intended to restore lost vision or partially amplify existing vision.

Bionic eye, electrical prosthesis surgically implanted into a human eye in order to allow for the transduction of light (the change of light from the environment into impulses the brain can process) in people who have sustained severe damage to the retina.

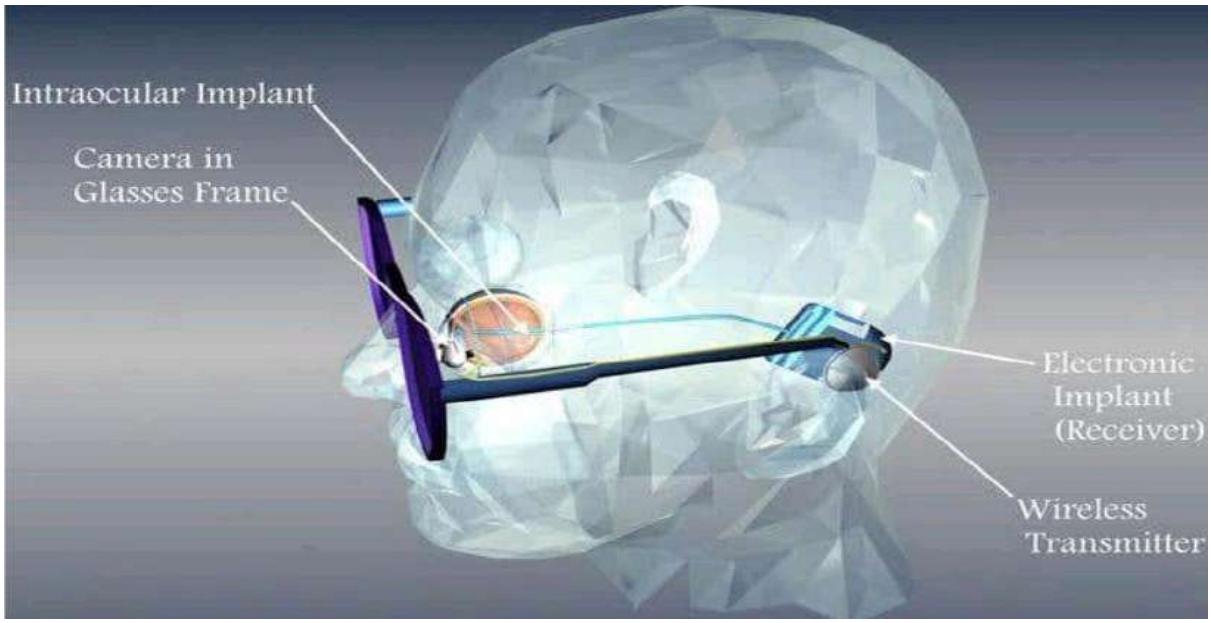
# HUMAM EYE

The retina is a light-sensitive tissue layer found within the inner eye that transforms images obtained from the outside world into neural impulses, which are then passed along the optic nerve to the thalamus and ultimately to the primary visual cortex (the visual processing centre), located in the occipital lobe of the brain.




## HOW IT IS IMPLANTED

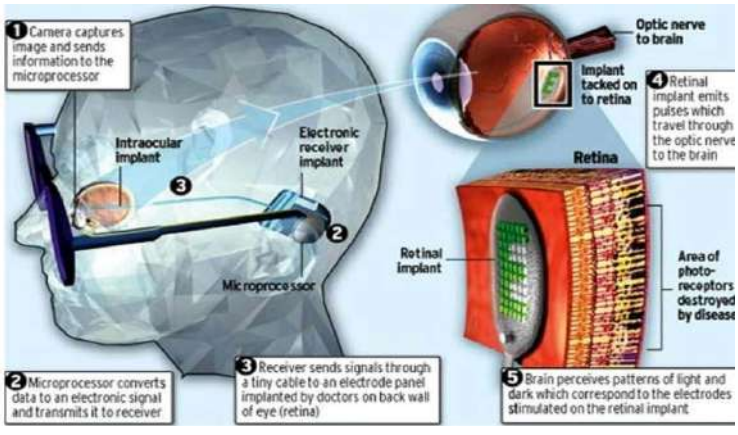
While the retina is damaged by diseases, there must be some retinal ganglion cells that remain intact in order for the bionic eye to function as intended. Affected individuals must have been able to see at some point in their lives in order to create the nerve connections in the brain for the device to function. Extensive damage to the optic nerve or visual cortex also renders bionic eye implantation useless.




# CONSTRUCTION AND ITS WORKING

The bionic eye comprises an external camera and transmitter and an internal microchip. The camera is mounted on a pair of eyeglasses, where it serves to organize the visual stimuli of the environment before emitting high-frequency radio waves. The stimulator microchip consists of an electrode array that is surgically implanted into the retina. That functions as an electrical relay in place of degenerated retinal cells. The radio waves that are emitted by the external camera and transmitter are received by the stimulator, which then fires electrical impulses. The impulses are relayed by the few remaining retinal cells and are transduced as normal to the optic nerve pathway, resulting in vision.

It works by bypassing damaged optic nerves to allow signals to be transmitted from the retina to the vision centre of the brain.



The user would have to wear a custom-designed headgear that has the camera and a wireless transmitter installed. A set of 9 millimetre tiles are implanted in the brain that receives the signals from the aforementioned receiver.

# WHO CAN USE

People who are most likely to benefit from a bionic eye are middle-aged or elderly with very poor vision associated with age-related macular degeneration (a condition that causes degeneration in the cells found in the centre of the retina) or retinitis pigmentosa (a group of hereditary diseases that destroy photosensitive rod and cone cells in the retina).

# ADVANTAGES

- The system is simple.
- The successful development of a bionic eye has the potential to change lives in a very real, very hands-on way.
- Restoring even basic sight to those with impaired vision may allow them to become more mobile and independent, and return to them some of the quality of life they lost when their vision disappeared.
- After years of darkness, imagine being able to once again read or to see your loved ones' smiles. As the technology improves, this may all be possible.

# DRAWBACKS

- High cost
- It is not suitable for all blind people (e.g., glaucoma); it is mainly for people who have retinal damage due to RP …etc.
- Although the Argus II system enables people to discern light, movement and shapes, it does not yet restore sight to the extent some might hope.
- This limitation is largely due to the fact that the current implant has only 60 electrodes. To see naturally, you'd need about a million.

# BIONIC EYE IN FUTURE

The device has the potential to transform the lives of millions worldwide: up to two million people live with retinitis pigmentosa and up to 196 million have age-related macular degeneration. While there are over a million Australians with macular degeneration, with the ageing population this is expected to almost double by 2030.

The researchers are now looking to secure funding to speed up the manufacturing process and distribution.

They are looking to advance their system to help people with untreatable neurological conditions like limb paralysis, quadriplegia, to help make their lives better.

It is also focused on providing vision to people with untreatable blindness and movement to the arms of people paralyzed by quadriplegia, transforming their health care.

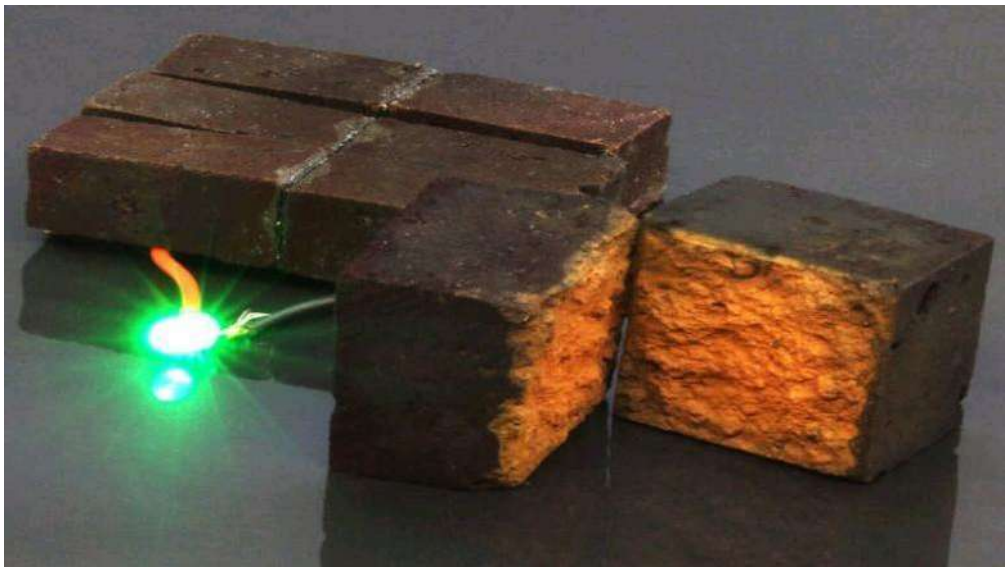
Further research could raise the level of acuity that the bionic eye provides, and different materials, such as diamond, are being tested for their effectiveness in the implant. Long-term effects of the implantation of a bionic eye remain unknown.

# ENERGY STORING BRICKS

KISHORE.V

III YEAR ECE

Red bricks are one of the strongest building materials that have been widely used in construction for more than 6,000 years. The term brick initially referred to the block that consisted of dry clay.



Currently, bricks are mainly utilized in walls and are usually joined together using mortar. Fired bricks are highly resistant to weather conditions. Moreover, they tend to absorb heat transferred during the day and release it during the night, a fact that is beneficial for preserving temperature conditions in a building. Nevertheless, according to a new study, published in Nature Communications, red bricks can also be used to store energy and act like batteries.

In particular, chemist researchers from Washington University in St. Louis, have created a technique that makes bricks capable of storing power and using it to power devices. The bricks can be connected to solar panels and store renewable energy.

Bricks have a porous structure that enables the storing process. Those pores are filled with an acid vapor which acts as a dissolved for the iron oxide (or rust) from which bricks are composed. A gas is transferred through the cavities of bricks which are filled with a sulfur-

based material that reacts with iron. As a result, a conductive plastic, polymer PEDOT, surrounds the bricks' porous.

“In this work, we have developed a coating of the conducting polymer PEDOT, which is comprised of nano fibers that penetrate the inner porous network of a brick; a polymer coating remains trapped in a brick and serves as an ion sponge that stores and conducts electricity,” Julio M. D'Arcy, co-author of the study and an Assistant Professor of Chemistry at the Washington University in St. Louis, stated.

According to the scientific team, the proposed method could generate substantial amounts of renewable energy. Researchers estimated that 50 capacitor bricks would take 13 minutes to charge and could provide enough energy to power the emergency lighting of a building for at least 50 minutes.

Among other advantages, D’Arcy mentioned that the brick capacitors can be recharged multiple times within short time periods without any deficiencies.

Researchers emphasize the fact that iron oxide, a waste material has been turned into a useful product that can be utilized in the process of generating renewable energy. "Inert materials hold the potential to be transformative in chemical manufacturing," the team suggested.

The team's future goals are to increase the capacity of the energy storage by, at least, 10 times and decrease the cost and time of producing the polymer-coated bricks.

# GOAL

The goal is to efficiently use the natural energy without doing any harm to the nature , This also helps to use the electric energy more efficiently . This technology uses the heat energy to generate electric energy . The heat energy received from the sun at day time is converted to electrical energy to use at night .

# ADVANTAGES

1. Saves energy .
2. Efficient use of natural energy .
3. No pollution .
4. Large amount of energy is generated .

# DISADVANTAGES

1. More heat is generated .
2. When it comes to safety peoples mostly go with strong bricks rather than weak electric bricks .

# Smart Food Labels

N.K.AKASH

III YEAR ECE

A smart label is a label that integrates technology that extends the functionality and contents of labels or packaging beyond conventional printing methods. This can come is a variety of forms from RFID tags, to QR codes, to near field communication

Dr Jonathan Coleman with the printable smart label. Picture: AMBER. Scientists at AMBER (Advanced Materials and Bio-Engineering Research) at Trinity College Dublin have created printed transistors from 2-dimensional nanomaterials for the first time.

## Introduction to Smart Food Label

Smart food labels facilitate consumers to get additional information on a packaged food product either by scanning a bar code or by doing an online search. Additionally, several other food labels also use sensing technology by a label that can change its colour, thereby letting the consumer know if the food is fit to eat. The change in the colour of smart food labels occur whenever the chemicals present in these labels detect any form of microorganisms growing inside the food packet.

## How Smart Food Labels Will Change the Future


One thing that you will see on almost every food item you buy is a label. The labels on food provide consumers with a range of information, such as the nutrition data, the ingredients of a product, allergy and storage advice, where the product is manufactured, and the weight. You might also see cooking instructions or suggestions on the packaging. A further piece of

information you will see is the dates that advise you of when the product is no longer at its best and the date by which you should use the product before you discard it. Now, things are all set to change with the introduction of smart food labels. Here is an overview of what smart food labels are and how they are beneficial for the future.

In short, smart labels are labels that change in appearance to let consumers know when food is no longer fit to eat. According to Ask Men, the label changes colour to either cloudy or blue when it detects that bacteria is starting to grow. The colour changes occur in response to changing levels of oxygen and bacteria within the packaging. The smart labels solve a few problems with the current labeling system. First, the best before and use by dates are only given as guidance. They are not always accurate and, in some countries, dates are not even regulated. In many cases, the food is still safe to eat for long after the use-by date says the food has expired. This means that people are discarding food completely unnecessarily.

# Problems

The dates do not take into account what may happen to the food between leaving the factory and arriving in the shop. If the food is stored incorrectly for even a short period, or if the packaging is damaged in any way during transit, then it is possible that the food may begin to grow bacteria much sooner and that the food will expire well before the stated date. It is not always possible for a consumer to tell if the food has been stored properly or there has been damage. Another problem is that the dates and other information on a label are not always legible. There are probably times you have looked at a label only to realize the ink is smeared or that a spillage in your grocery bags has caused a stain over the writing. Similarly, the print is often small and difficult to read clearly, which is a problem for many people.

# Benefits

There are many benefits to using smart food labels that have both short-term and long-term positive implications. According to Big Think, one of the main advantages is that using the labels will significantly reduce food waste, which is a global problem. People throw away billions of dollars of food every year that is perfectly good to eat. Another of the main advantages is preventing illnesses that are caused by bacteria growing on food. This includes both E. coli and salmonella, both of which are potentially fatal forms of food poisoning. If people can clearly see that the food is no longer safe to eat, then they will not contract serious bacterial infections.

# BATTERY THAT CAN CHARGE IN 10 MINS

**AARTHI.R**

**III year ECE**

Now a days electric cars and electric bikes reaching their heights , They certainly look like they might rule the transport world within few years . In this case all the scientists are working on building a battery that can fill its charge as fast as possible so that I will be helpful for long distance travelers to charge their battery in a nearby power station .

Scientists at Pennsylvania State University in America have developed new batteries for electric cars that can charge in just 10 minutes.

The batteries, which are made from lithium, also allow users to drive their cars for a distance of 250 miles before they'd need to be charged again.

This is a big development as electric car batteries are known for being difficult to charge quickly and existing options can also be very expensive. Batteries usually contain nickel and cobalt and are capable of overheating which could cause a risk to users. Cobalt is a metal that is found underground and it's very difficult to source in a sustainable way.

It's thought the alternative batteries could make electric cars cheaper and more accessible in the long run and it could also be a positive for the environment as electric vehicles produce no or fewer carbon emissions compared to cars

## How does the technology work?

Lithium iron phosphate (LFP) batteries are viewed as a cheaper and safer option for electric cars, but they don't tend to work as well when compared to nickel and cobalt batteries.

However, Chao-Yang Wang and his colleagues at Pennsylvania State have found that LFP batteries work a lot better if they're heated first.

The scientists warmed up the batteries to 60 degrees and maintained the temperature. They found they actually worked better compared to the more popular types of batteries at their standard cooler temperatures.

People who produce electric cars tend to opt for nickel-based batteries as they have something called a higher energy density, which means cars can be driven for much longer once they've been charged.

However, the researchers also discovered that if heated LFP batteries are charged often but only partially, this should enable cars to travel for much longer distances with no problems. The batteries can simply be cooled down when they're not being used.

The scientists at Pennsylvania State aren't the only ones looking into how to improve batteries for electric cars.

A company in Israel has developed a battery that can charge in just five minutes. Its lithium-ion batteries aim to deliver 100 miles of charge to a car battery in five minutes by 2025.

"The number one barrier to the adoption of electric vehicles is no longer cost, it is range anxiety," Doron Myersdorf, CEO of StoreDot told the Guardian.

"You're either afraid that you're going to get stuck on the highway or you're going to need to sit in a charging station for two hours. But if the experience of the driver is exactly like fuelling a petrol car, this whole anxiety goes away."

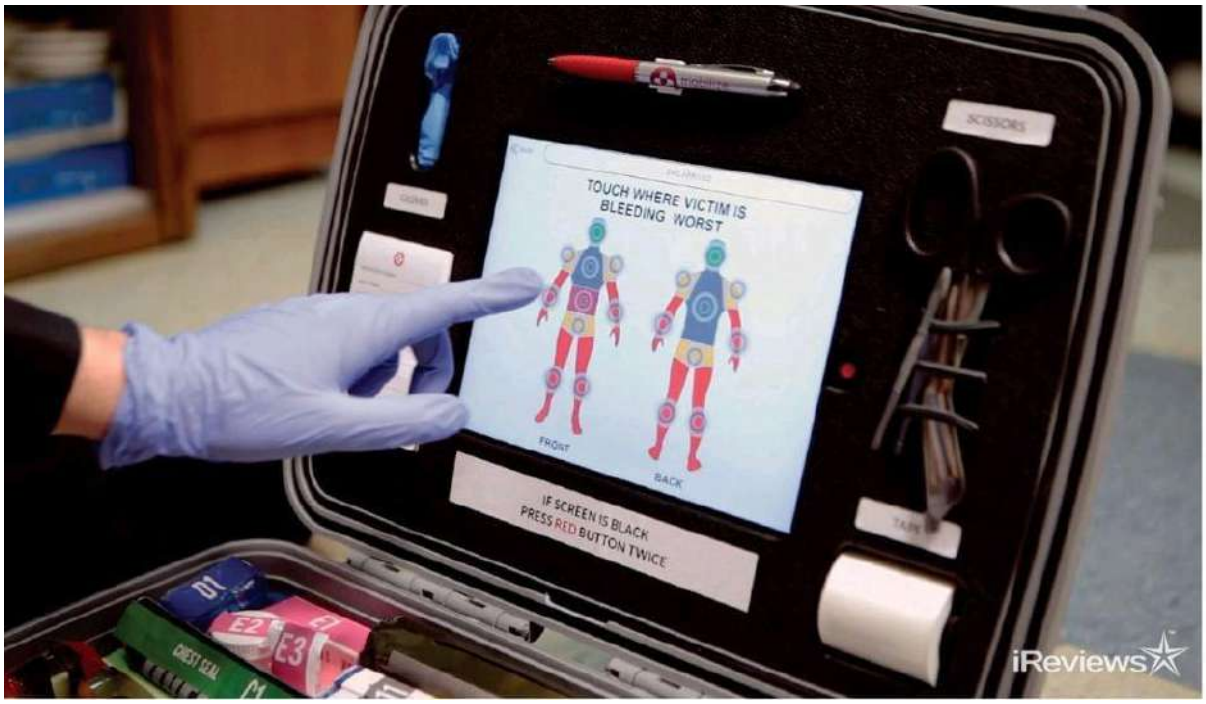
Tesla, which is owned by Elon Musk, and tech company Enevate are also working on similar technologies.

# SMART MED KIT

**VARUN.G**

**III year ECE**

We are living in a world where accidents happens often , where people need immediate first aid when there is delay it causes even death . In this world where everything getting smarter why not first aid




## The Future of First Aid: Smart Rescue Kits:

According to the American Red Cross, Automatic External Defibrillators (AEDs) could save up to 50,000 lives each year. It also suggests that Americans should always be within four minutes from an AED and someone trained to use it. So what makes AEDs so groundbreaking in First Aid? They're easily accessible, simple to use, and highly effective with just a little bit of training.

## Mobilize Rescue's First Aid Kit:

According to the Center for Disease Control (CDC), during the first half of life, more Americans die from injuries and violence, including falls, automobile crashes, and homicides, than any other cause."


Mobilize Rescue Systems, an emergency management startup made up of ER Physicians, military medics, and EMS providers has designed what it hopes to be the next-best-thing in First Aid. The Comprehensive Rescue System is an intuitive first aid kit that walks bystanders through life-saving procedures with step-by-step color-coded instructions. From bleeding wounds to heart attacks, Mobile Rescue's revolutionary kit is designed to empower the first aid provider during an emergency situation.

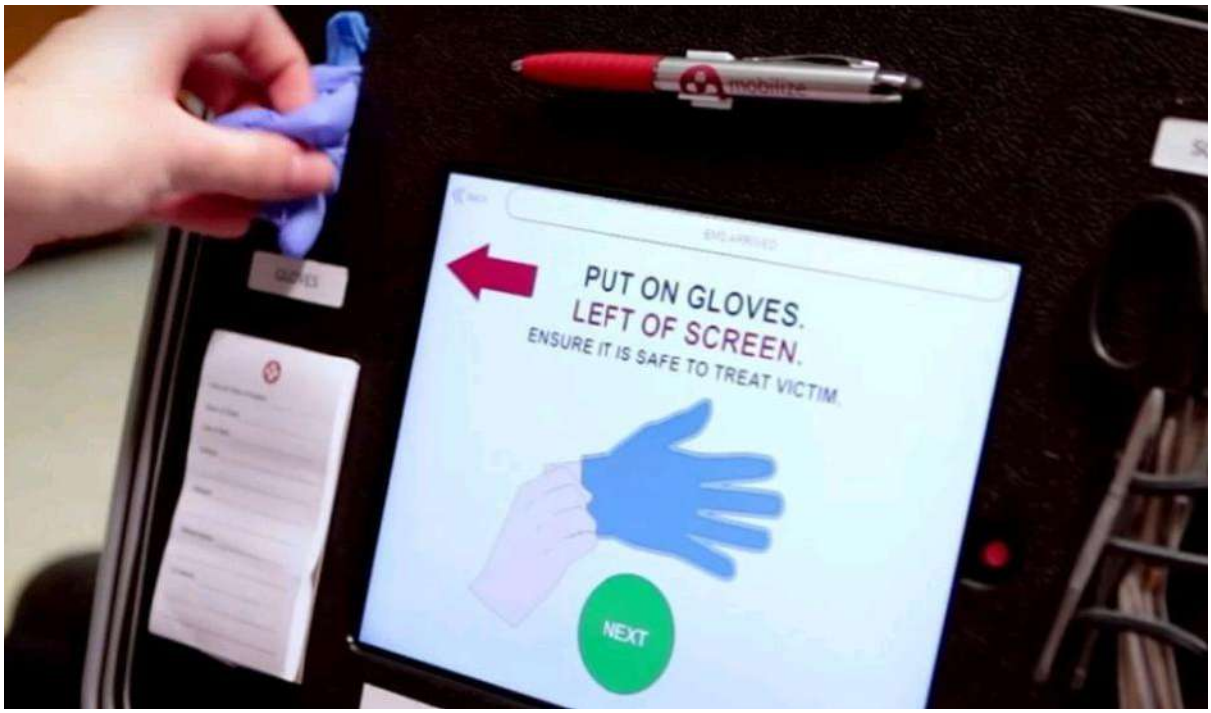
"Injury is the leading cause of death for people ages 1 and 44, beating out cancer, the flu, and HIV."

## Designed for Untrained Civilians:

Equipped with an interactive iPad armed with 1,600 pages of emergency response tutorials, the Comprehensive Rescue System delivers step-by-step instructions via its connected app. Whether it's QuickClot instructions or Chest Seals, the provider is assisted every step in the rescue process no matter how dire the situation. The user-friendly iPad screen, when opened, calmly illustrates the life-saving procedures through animations, color-coded sketches, and planograms – giving the exact location of the medical supplies inside your kit and how to administer them accordingly.

According to the National Academies of Sciences, Engineering, and Medicine, "of the 147,790 traumatic deaths in 2014, faster, more efficient medical care might have prevented 30,000 of them."

# Perfect for Emergencies in Remote Locations:




The Comprehensive Rescue System is strategically packed with each component positioned depending upon the time sensitive nature of the emergency. In other words, AED equipment is readily available when opening the kit. The same with QuickClot supplies. Mine Rescue trainer and overseer of the Colorado School of Mines' Energy, Mining, and Construction Industry Safety program, Collin Smith, in an interview with Wired, explained the importance of The Comprehensive Rescue System:

"On remote job sites, a paramedic is almost more than 20 minutes away. And depending on the injury, you may not have 20 minutes."

Even if a trained employee happened to be on the job site – carrying their American Red Cross First Aid certification – the chances of remembering their training and having the correct EMS equipment on hand is slim to none. "in a high-pressure scenarios, you might not remember what you were taught six months ago, so it helps to be guided through it," Smith said. That's what makes AEDs so incredibly useful. They walk the provider through every step of the process – removing the likelihood of freezing up when the pressure is on.

# Mobilize Rescue's Mission

Mobilize Rescue is in business to save lives. It wants to do this by empowering bystanders during emergency medical situations. Just like AEDs, this incredibly brilliant first aid system is designed to be user-friendly and fast-acting. Eric Garalnick, the medical director of emergency preparedness at Brigham and Women's Hospital, in an interview with Wired, said, "It's simple, clean, with clear descriptions. Comprehensive, too. It can do more than just hemorrhage control. It looks wonderful, very innovative and I think solutions like this are certainly the future of first aid. It's exciting. But now we have to do our due diligence and test it."

# BRAIN COMPUTER INTERFACE TECHNOLOGY

**CHARITRA.V**

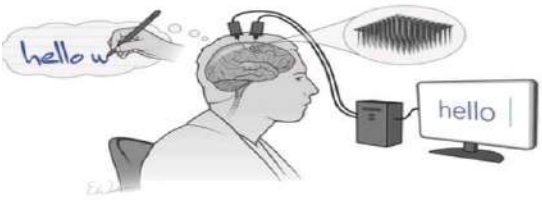
**III year ECE**

A brain–computer interface (BCI), sometimes called a neural control interface (NCI), mind–machine interface (MMI), direct neural interface (DNI), or brain–machine interface (BMI), is a direct communication pathway between an enhanced or wired brain and an external device. BCIs are often directed at researching, mapping, assisting, augmenting, or repairing human cognitive or sensory-motor functions.

Research on BCIs began in the 1970s at the University of California, Los Angeles (UCLA) under a grant from the National Science Foundation, followed by a contract from DARPA. The papers published after this research also mark the first appearance of the expression brain–computer interface in scientific literature.

Due to the cortical plasticity of the brain, signals from implanted prostheses can, after adaptation, be handled by the brain like natural sensor or effector channels. Following years of animal experimentation, the first neuroprosthetic devices implanted in humans appeared in the mid-1990s.

Recently, studies in human-computer interaction via the application of machine learning to statistical temporal features extracted from the frontal lobe (EEG brainwave) data has had high levels of success in classifying mental states (Relaxed, Neutral, Concentrating), mental emotional states (Negative, Neutral, Positive)[6] and thalamocortical dysrhythmia.



The history of brain–computer interfaces (BCIs) starts with Hans Berger's discovery of the electrical activity of the human brain and the development of electroencephalography (EEG). In 1924 Berger was the first to record human brain activity by means of EEG. Berger was able to identify oscillatory activity, such as Berger's wave or the alpha wave (8–13 Hz), by analyzing EEG traces.

Berger's first recording device was very rudimentary. He inserted silver wires under the scalps of his patients. These were later replaced by silver foils attached to the patient's head by rubber bandages. Berger connected these sensors to a Lippmann capillary electrometer, with disappointing results. However, more sophisticated measuring devices, such as the Siemens double-coil recording galvanometer, which displayed electric voltages as small as one ten thousandth of a volt, led to success.

Berger analyzed the interrelation of alternations in his EEG wave diagrams with brain diseases. EEGs permitted completely new possibilities for the research of human brain activities.

Although the term had not yet been coined, one of the earliest examples of a working brain-machine interface was the piece Music for Solo Performer (1965) by the American composer Alvin Lucier. The piece makes use of EEG and analog signal processing hardware (filters, amplifiers, and a mixing board) to stimulate acoustic percussion instruments. To perform the piece one must produce alpha waves and thereby "play" the various percussion instruments via loudspeakers which are placed near or directly on the instruments themselves.

UCLA Professor Jacques Vidal coined the term "BCI" and produced the first peer-reviewed publications on this topic.Vidal is widely recognized as the inventor of BCIs in the BCI community, as reflected in numerous peer-reviewed articles reviewing and discussing the field . His 1973 paper stated the "BCI challenge": Control of external objects using EEG signals. Especially he pointed out to Contingent Negative Variation (CNV) potential as a challenge for BCI control. The 1977 experiment Vidal described was the first application of BCI after his 1973 BCI challenge. It was a noninvasive EEG (actually Visual Evoked Potentials (VEP)) control of a cursor-like graphical object on a computer screen. The demonstration was movement in a maze.

After his early contributions, Vidal was not active in BCI research, nor BCI events such as conferences, for many years. In 2011, however, he gave a lecture in Graz, Austria, supported by the Future BNCI project, presenting the first BCI, which earned a standing ovation. Vidal was joined by his wife, Laryce Vidal, who previously worked with him at UCLA on his first BCI project.

In 1988, a report was given on noninvasive EEG control of a physical object, a robot. The experiment described was EEG control of multiple start-stop-restart of the robot movement, along an arbitrary trajectory defined by a line drawn on a floor. The line-following behavior was the default robot behavior, utilizing autonomous intelligence and autonomous source of energy. This 1988 report written by Stevo Bozinovski, Mihail Sestakov, and Liljana Bozinovska was the first one about a robot control using EEG.

In 1990, a report was given on a closed loop, bidirectional adaptive BCI controlling computer buzzer by an anticipatory brain potential, the Contingent Negative Variation (CNV) potential. The experiment described how an expectation state of the brain, manifested by CNV, controls in a feedback loop the S2 buzzer in the S1-S2-CNV paradigm. The obtained cognitive wave representing the expectation learning in the brain is named Electro expectogram (EXG). The CNV brain potential was part of the BCI challenge presented by Vidal in his 1973 paper.

Studies in 2010s suggested the potential ability of neural stimulation to restore functional connectively and associated behaviors through modulation of molecular mechanisms of synaptic efficacy. This opened the door for the concept that BCI technologies may be able to restore function in addition to enabling functionality.

Since 2013, DARPA has funded BCI technology through the BRAIN initiative, which has supported work out of the University of Pittsburgh Medical Center, Paradromics, Brown, and Synchron, among others.

# XENOBOT THE LIVING ROBOT

**KISHORE.K**

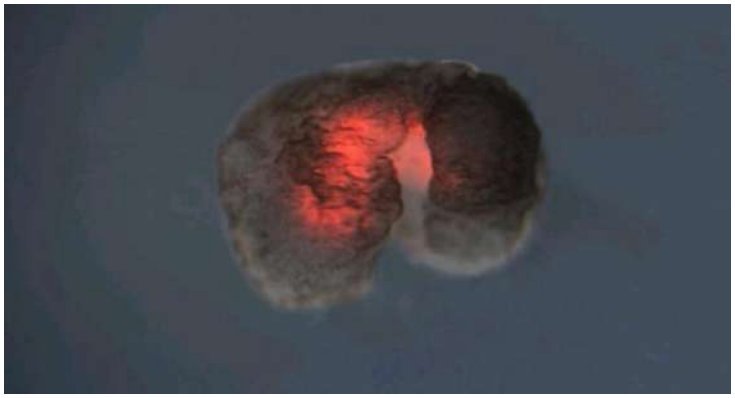
**III Year ECE**

Living robots built using frog cells Tiny 'xenobots' assembled from cells promise advances from drug delivery to toxic waste clean-up.Scientists repurposed living frog cells -- and assembled them into entirely new life-forms. These tiny 'xenobots' can move toward a target and heal themselves after being cut. These novel living machines are neither a traditional robot nor a known species of animal. They're a new class of artifact: a living, programmable organism.

(CNN)Scientists have created the world's first living, self-healing robots using stem cells from frogs. Named xenobots after the African clawed frog (Xenopus laevis) from which they take their stem cells, the machines are less than a millimeter (0.04 inches) wide -- small enough to travel inside human bodies. They can walk and swim, survive for weeks without food, and work together in groups.

These are "entirely new life-forms," said the University of Vermont, which conducted the research with Tufts University's Allen Discovery Center.

Stem cells are unspecialized cells that have the ability to develop into different cell types. The researchers scraped living stem cells from frog embryos, and left them to incubate. Then, the cells were cut and reshaped into specific "body forms" designed by a supercomputer -- forms "never seen in nature," according to a news release from the University of Vermont.



A xenobot with large hind limbs and smaller forelimbs, layered with red heart muscle. The cells then began to work on their own -- skin cells bonded to form structure, while pulsing heart muscle cells allowed the robot to move on its own. Xenobots even have self-healing capabilities; when the scientists sliced into one robot, it healed by itself and kept moving. "These are novel living machines," said Joshua Bongard, one of the lead researchers at the University of Vermont, in the news release. "They're neither a traditional robot nor a known species of animal. It's a new class of artifact: a living, programmable organism."

Xenobots don't look like traditional robots -- they have no shiny gears or robotic arms. Instead, they look more like a tiny blob of moving pink flesh. The researchers say this is deliberate -- this "biological machine" can achieve things typical robots of steel and plastic cannot.

Some xenobots had holes in their center -- which could potentially be used to transport drugs or medicines.

Traditional robots "degrade over time and can produce harmful ecological and health side effects," researchers said in the study, which was published Monday in the Proceedings of the National Academy of Sciences. As biological machines, xenobots are more environmentally friendly and safer for human health, the study said.

The xenobots could potentially be used toward a host of tasks, according to the study, which was partially funded by the Defense Advanced Research Projects Agency, a federal agency that oversees the development of technology for military use.

Xenobots could be used to clean up radioactive waste, collect microplastics in the oceans, carry medicine inside human bodies, or even travel into our arteries to scrape out plaque. The

xenobots can survive in aqueous environments without additional nutrients for days or weeks making them suitable for internal drug delivery.

Aside from these immediate practical tasks, the xenobots could also help researchers to learn more about cell biology -- opening the doors to future advancement in human health and longevity.

"If we could make 3D biological form on demand, we could repair birth defects, reprogram tumors into normal tissue, regenerate after traumatic injury or degenerative disease, and defeat aging," said the researchers' website. This research could have "a massive impact on regenerative medicine (building body parts and inducing regeneration.)"

It may all sound like something from a dystopian sci-fi movie, but the researchers say there is no need for alarm.

The organisms come pre-loaded with their own food source of lipid and protein deposits, allowing them to live for a little over a week -- but they can't reproduce or evolve. However, their lifespan can increase to several weeks in nutrient-rich environments.And although the supercomputer -- a powerful piece of artificial intelligence -- plays a big role in building these robots, it's "unlikely" that the AI could have evil intentions."At the moment though it is difficult to see how an AI could create harmful organisms any easier than a talented biologist with bad intentions could," said the researchers' website.

# VOYAGER THE ENDLESS JOURNEY

**JAYASRI.P**

**III year ECE**

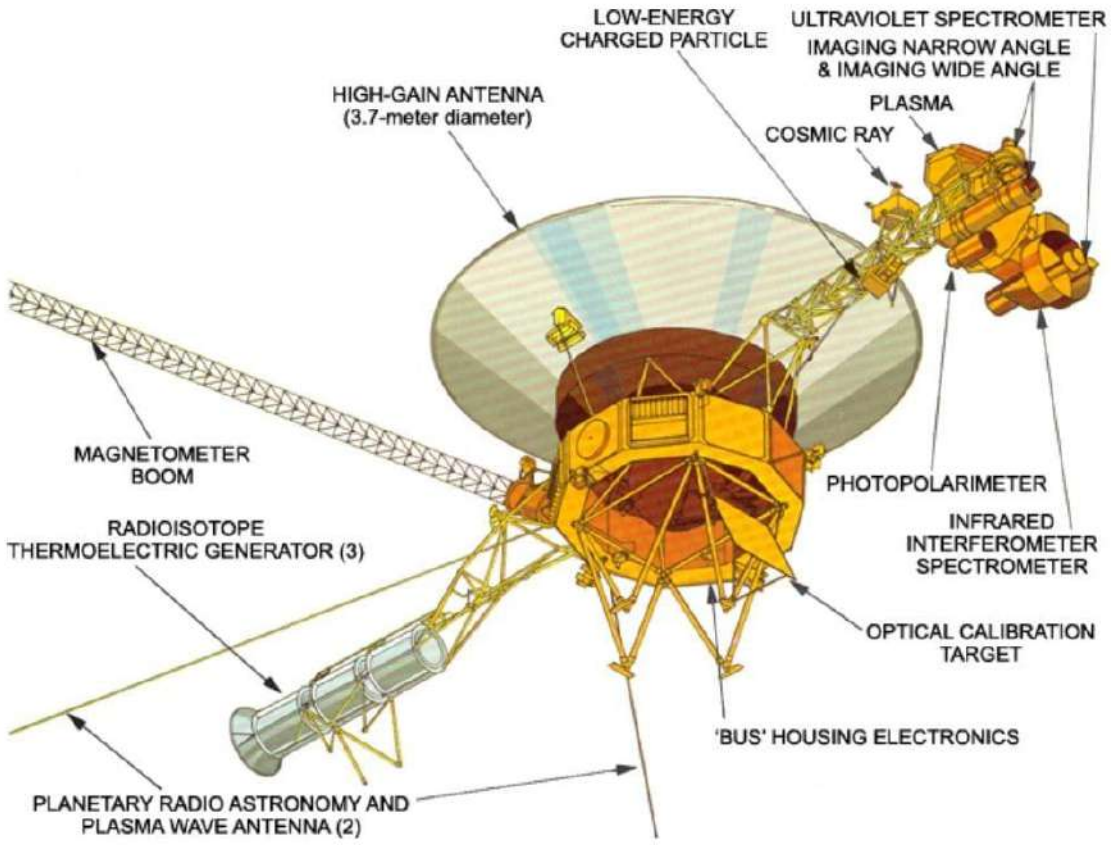
The twin Voyager 1 and 2 spacecraft are exploring where nothing from Earth has flown before. Continuing on their more-than-40-year journey since their 1977 launches, they each are much farther away from Earth and the sun than Pluto. In August 2012, Voyager 1 made the historic entry into interstellar space, the region between stars, filled with material ejected by the death of nearby stars millions of years ago. Voyager 2 entered interstellar space on November 5, 2018 and scientists hope to learn more about this region. Both spacecraft are still sending scientific information about their surroundings through the Deep Space Network, or DSN.

The primary mission was the exploration of Jupiter and Saturn. After making a string of discoveries there — such as active volcanoes on Jupiter's moon Io and intricacies of Saturn's rings — the mission was extended. Voyager 2 went on to explore Uranus and Neptune, and is still the only spacecraft to have visited those outer planets. The adventurers' current mission, the Voyager Interstellar Mission (VIM), will explore the outermost edge of the Sun's domain. And beyond.

# Voyager's 30-Year Plan

The Voyager Interstellar Mission has the potential for obtaining useful interplanetary, and possibly interstellar, fields, particles, and waves science data until around the year 2020 when the spacecraft's ability to generate adequate electrical power for continued science instrument operation will come to an end.

The identical Voyager spacecraft are three-axis stabilized systems that use celestial or gyro referenced attitude control to maintain pointing of the high-gain antennas toward Earth. The prime mission science payload consisted of 10 instruments (11 investigations including radio science).




The command computer subsystem (CCS) provides sequencing and control functions The CCS contains fixed routines such as command decoding and fault detection and corrective routines, antenna pointing information, and spacecraft sequencing information.

The Attitude and Articulation Control Subsystem (AACS) controls spacecraft orientation, maintains the pointing of the high gain antenna towards Earth, controls attitude maneuvers, and positions the scan platform.

Uplink communications is via S-band (16-bits/sec command rate) while an X-band transmitter provides downlink telemetry at 160 bits/sec normally and 1.4 kbps for playback of high-rate plasma wave data. All data are transmitted from and received at the spacecraft via the 3.7 meter high-gain antenna (HGA).

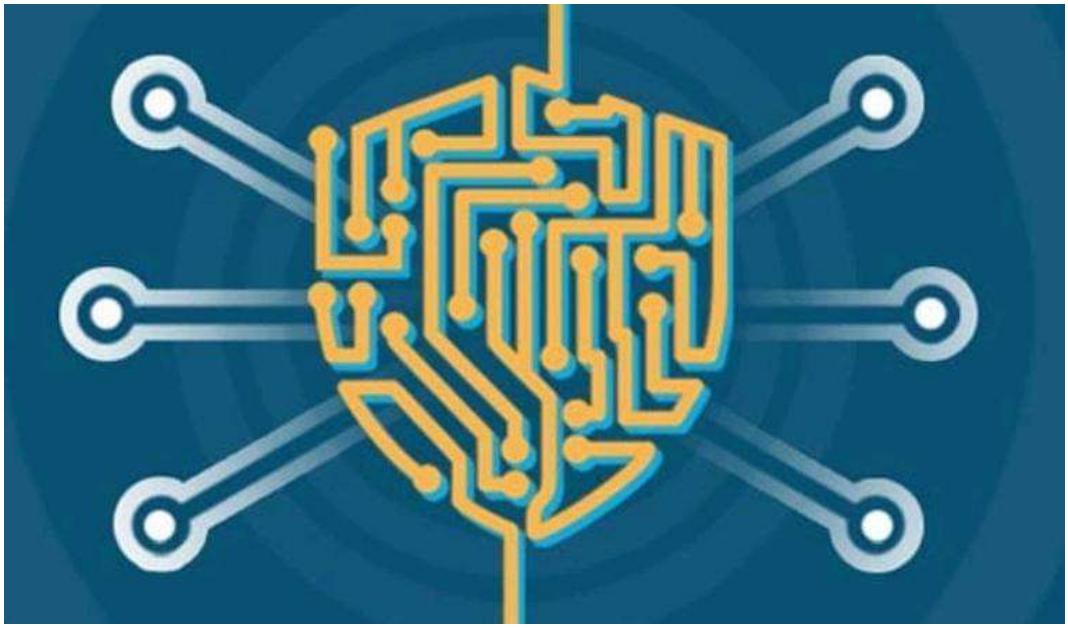
Electrical power is supplied by three Radioisotope Thermoelectric Generators (RTGs). The current power levels are about 249 watts for each spacecraft. As the electrical power decreases, power loads on the spacecraft must be turned off in order to avoid having demand exceed supply. As loads are turned off, some spacecraft capabilities are eliminated.
Voyager 1 is the farthest human-made object from Earth and the first spacecraft to reach interstellar space. Scientists think it will reach in the inner edge of the Oort Cloud in 300 years.

Voyager 1 and 2 has been travelling for more than 43 years and still on its work this voyager 1 and 2 live status is revealed through a NASA website MISSION STATUS where the distance covered by voyager and the speed it travels has shown .

# CYBERSECURITY

**ARAVINDHAN.RA**
**III year ECE**

Cybersecurity is the practice of protecting systems, networks, and programs from digital attacks. These cyberattacks are usually aimed at accessing, changing, or destroying sensitive information; extorting money from users; or interrupting normal business processes. Implementing effective cybersecurity measures is particularly challenging today because there are more devices than people, and attackers are becoming more innovative.



## What is cybersecurity all about?

A successful cybersecurity approach has multiple layers of protection spread across the computers, networks, programs, or data that one intends to keep safe. In an organization, the people, processes, and technology must all complement one another to create an effective defense from cyber attacks. A unified threat management system can automate integrations across select Cisco Security products and accelerate key security operations functions: detection, investigation, and remediation.

## People

Users must understand and comply with basic data security principles like choosing strong passwords, being wary of attachments in email, and backing up data. Learn more about basic cyber security principles.

## Processes

Organizations must have a framework for how they deal with both attempted and successful cyber attacks. One well-respected framework can guide you. It explains how you can identify attacks, protect systems, detect and respond to threats, and recover from successful attacks. Watch a video explanation of the NIST cybersecurity framework

## Technology

Technology is essential to giving organizations and individuals the computer security tools needed to protect themselves from cyber attacks. Three main entities must be protected: endpoint devices like computers, smart devices, and routers; networks; and the cloud. Common technology used to protect these entities include next-generation firewalls, DNS filtering, malware protection, antivirus software, and email security solutions.

## Why is cybersecurity important?

In today's connected world, everyone benefits from advanced cyberdefense programs. At an individual level, a cybersecurity attack can result in everything from identity theft, to extortion attempts, to the loss of important data like family photos. Everyone relies on critical infrastructure like power plants, hospitals, and financial service companies. Securing these and other organizations is essential to keeping our society functioning.

Everyone also benefits from the work of cyberthreat researchers, like the team of 250 threat researchers at Talos, who investigate new and emerging threats and cyber attack strategies. They reveal new vulnerabilities, educate the public on the importance of cybersecurity, and strengthen open source tools. Their work makes the Internet safer for everyone.

# Types of Cyber Security Threats

## Phishing

Phishing is the practice of sending fraudulent emails that resemble emails from reputable sources. The aim is to steal sensitive data like credit card numbers and login information. It's the most common type of cyber attack. You can help protect yourself through education or a technology solution that filters malicious emails.

## Ransomware

Ransomware is a type of malicious software. It is designed to extort money by blocking access to files or the computer system until the ransom is paid. Paying the ransom does not guarantee that the files will be recovered or the system restored.

## Malware

Malware is a type of software designed to gain unauthorized access or to cause damage to a computer.

## Social engineering

Social engineering is a tactic that adversaries use to trick you into revealing sensitive information. They can solicit a monetary payment or gain access to your confidential data. Social engineering can be combined with any of the threats listed above to make you more likely to click on links, download malware, or trust a malicious source.

# *Editorial Board*

# THANK YOU