Department of Electronics And Communication Engineering

E-SPARSH

Technical Magazine

JUL - DEC 2023

EDITORIAL BOARD

INSTITUTION

Vision of the Institute:

To be a premier center of learning in Engineering and Management education that evolves the youth into dynamic professionals with a social commitment

Mission of the Institute:

M1: To provide quality teaching- learning practices in engineering and management education by imparting core instruction and state-of-the-art infrastructure.

M2: To engage the faculty and students in acquiring competency in emerging technologies and research activities through Industry Institute Interaction.

M3: To foster social commitment in learners by incorporating leadership skills and ethical values through value-based education

DEPARTMENT

Vision of the Department:

To produce technically competent and research oriented Electronics and Communication Engineers to meet the Industrial and Social requirements.

Mission of the Department:

M1: To impart quality technical education in the field of Electronics and Communication Engineering through state-of-the art facilities and effective teaching learning process.

M2: To enrich the faculty and students with research and consultancy skills through Industry-Interaction and Training in Emerging areas of Electronics and Communication Engineering.

M3: To develop lifelong learning, leadership qualities and ethical values in learners to meet the societal and industrial needs.

Program Educational Objectives (PEOs)

PEO-I : Graduates will have the capabilities to analyze, design and develop innovative solutions for the problems in the field of Electronics and Communication Engineering using core competencies.

PEO-II :Graduates will have the ability to engage themselves in research and lifelong learning to achieve professional excellence.

PEO-III : Graduates will have successful career with leadership qualities, ethics and good communication skills in Electronics and Communication Engineering and related fields.

ECE PBRVITS | **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

Program Outcomes (POs)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO-1 : Graduates will be able to design and analyze Image Processing and communication systems concepts using appropriate tools.

PSO-2 : Graduates will be able to design and develop solutions for real world problems by applying the concepts of VLSI and Embedded systems.

DEPARTMENT PROFILE

The Department of Electronics and Communication Engineering (ECE) was established in the years 1998–99 with an intake of 60 and currently running with an intake of 360. It is 25 years old now and one of the most well-established departments in our Institution. It is also offering one post graduate programme with the specialization of VLSI Design with an intake of 12 students.

The Department is known for its esteemed faculty members who are renowned for their path-breaking contributions in the field of electronics and communications. It is well equipped with laboratories, audio-visual facilities and software tools such as MultiSim, ModelSim, Lab View, HFSS, MATLAB, and Xilinx.

We offer our students an excellent educational experience that combines intellectual rigor and cross-disciplinary breadth. The course contents are periodically updated to introduce new scientific and technological developments. Electronic design, communication technologies, hands-on programming, a research focus, and entrepreneurship skills are all part of our signature educational curriculum. The ECE domain is often regarded as a challenging culmination of hardware and software. Our curriculum focuses primarily on the knowledge and skills that emerging engineers need.

PROFESSOR DESK

I am delighted to announce the release of the third edition of E-SPARSH, our technical e-magazine from the ECE department, dedicated to showcasing our students' remarkable talents. Our department flourishes due to the dedication and expertise of our experienced faculty, committed to teaching and ground breaking research.

This e-magazine stands as a platform, unveiling the hidden potentials of our students. Our commitment remains strong in annually spotlighting the creativity and skills of both our staff and students through this publication. My heartfelt congratulations to the editorial team for their unwavering efforts in bringing this edition to life. On this momentous occasion, I extend my best wishes to all the students of the department in their endeavours

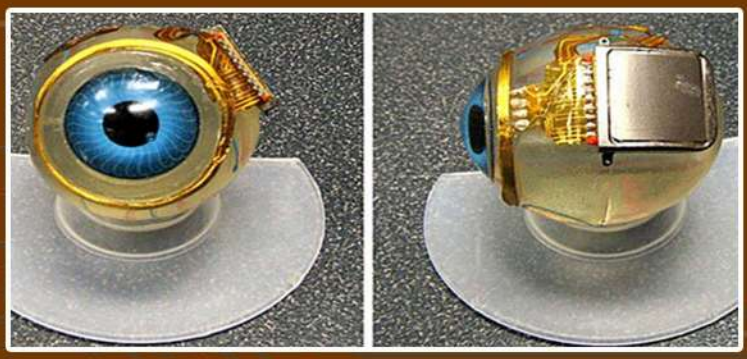
Dr. R. Sravanthi
Assoc. Professor & HOD, ECE.

1. BIONIC EYE

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. 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. 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.

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.

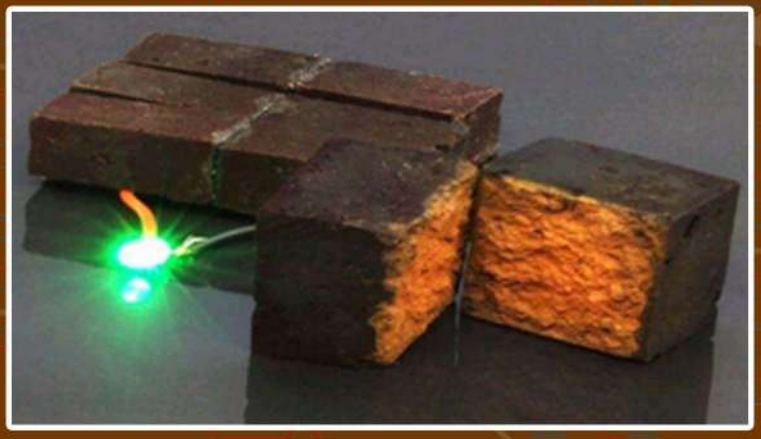
It is also focused on providing vision to people with untreatable blindness and movement to the arms of people paralyzed by quadriplegia, transforming their health care. Further research could raise the level of acuity that the bionic eye provides, and different materials, such as diamond, are being tested for their effectiveness in the implant. Long-term effects of the implantation of a bionic eye remain unknown.

MOCHARLA BHARGAVI
(20731A0497)

2. ENERGY STORING BRICKS

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. 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.

PATAN MOHASEENA
(20731A04A5)

3. SMART FOOD LABELS

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 those 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.

YAMALA BHASKAR
(20731A04C0)

4. BATTERY THAT CAN CHARGE IN 10 MINS

Now a day's 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 Store Dot 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 Enervated are also working on similar technologies.

KUMARI NAGALAKSHMI
(21735A0406)

5. SMART MED KIT

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 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 Quick Clot 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 Quick Clot 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 Garal nick, 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."

BADAM LAVANYA
(20731A0406)

6. BRAIN COMPUTER INTERFACE TECHNOLOGY

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) 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, or 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 loops the S2 buzzer in the S1-S2-CNV paradigm. The obtained cognitive wave representing the expectation learning in the brain is named Electro expect gram (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.

DIVI VENKATA MALLESWARI
(20731A0415)

7. XENOBOT THE LIVING ROBOT

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, its "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.

SHAIK SHAHIL
(21731A04B6)

8. VOYAGER THE ENDLESS JOURNEY

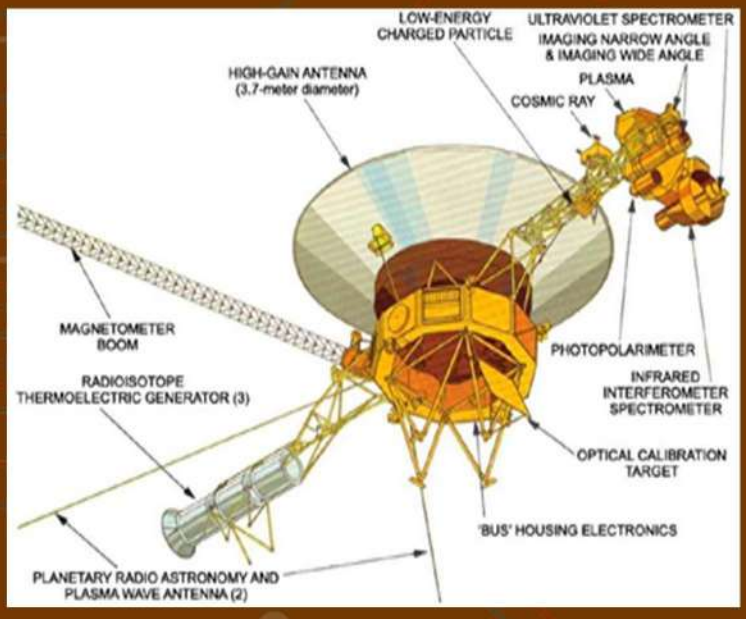
The twin Voyager 1 and 2 spacecraft are exploring where nothing from Earth has flown before. Continuing on their more-than-40-year journey since their 1977 launches, they each are much farther away from Earth and the sun than Pluto. In August 2012, Voyager 1 made the historic entry into interstellar 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.

PODAMEKALA MAHENDRA
(21731A04A0)

9. SATELLITE TV

Satellite TV is a type of television programming that is wirelessly delivered to TV sets across the world via a network of radio signals, communications satellites, broadcast centers and outdoor antennas. Broadcast signals are transmitted from satellites orbiting the Earth and received by local and regional satellite TV systems.

How Satellite TV service works

Satellite TV technology makes use of specialized antennas known as satellite dishes. These satellite dishes transmit signals to a satellite receiver such as a set-top box or satellite tuner module within a TV set. The programming source transmits signals to a satellite provider broadcast center and these waves are then picked up by a compact satellite dish and broadcast onto television sets.

Overview of Satellite TV Video Content Delivery:

Satellite TV service can also be referred to as direct-broadcast satellite (DBS or DBSTV) service. A DBS provider will select programming—often a wide range of channels and services—and will then broadcast this content to satellite TV subscribers as part of a larger TV package. DBS programming can either be sent to a digital satellite receiver or an analog satellite receiver. Analog satellite television is slowly being replaced by digital satellite programming. Digital satellite television has become increasingly available in better quality known as HD TV (high-definition television). Digitally-broadcast content is characterized by greater picture and sound quality.

Satellite stations and broadcast television stations both transmit TV programming through radio signals. Years ago, the first satellite television TV technologies were broadcast in the C-band radio frequency range. Today, digital satellite TV content is transmitted in the Ku frequency range. To further understand the technology behind direct-broadcast satellite systems, it is important to review the top features and elements involved in direct-broadcast satellite TV video content delivery: programming sources, satellite provider broadcast centers, satellites, satellite dishes and the satellite receivers. Programming sources refer to networks or channels that offer TV shows and movies for the enjoyment of subscribers. A broadcast center plays an integral role in video content delivery. At broadcast centers, TV providers receive and send broadcast signals to satellites orbiting the Earth.

Reliability and Reception

If a satellite dish or antenna is knocked out of place by inclement weather, homeowners may need to climb a roof to adjust these settings.

Bundle Services

Bundling services like television, Internet, phone and home security is often a very convenient option for customers. One advantage of bundled service is a single bill. While cable TV providers frequently offer bundles, satellite TV companies may need to partner up with other carriers in order to provide Internet, phone and other services to their customers.

Online Streaming Service

If you are interested in streaming live TV and watching video content online, you may want to carefully review package details to ensure you sign on with a provider—whether Internet, cable or satellite—that offers a wide array of live TV streaming content, both in-home and on-the-go. Do you want to stream your favorite TV shows and movies online or would you prefer to watch live TV on your mobile devices?

Direct broadcast via satellite

Direct broadcast satellite, (DBS) also known as "Direct-To-Home" can either refer to the communications satellites themselves that deliver DBS service or the actual television service. Most satellite television customers in developed television markets get their programming through a direct broadcast satellite provider. Signals are transmitted using Ku band and are completely digital which means it has high picture and stereo sound quality.

Programming for satellite television channels comes from multiple sources and may include live studio feeds. The broadcast center assembles and packages programming into channels for transmission and, where necessary, encrypts the channels. The signal is then sent to the uplink where it is transmitted to the satellite. With some broadcast centers, the studios, administration and uplink are all part of the same campus. The satellite then translates and broadcasts the channels.

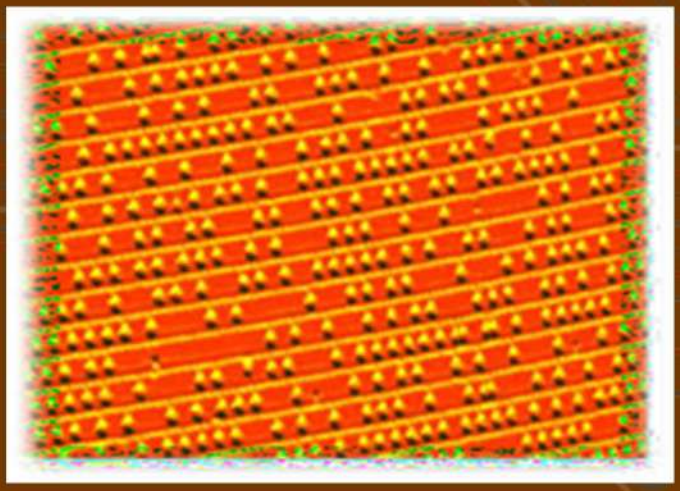
KONDA MANJU
(21731A04F6)

10. SILICON MEMORY

The limits of pushing storage density to the atomic scale are explored with a memory that stores a bit by the presence or absence of one silicon atom. These atoms are positioned at lattice sites along self-assembled tracks with a pitch of five atom rows. The memory can be initialized and reformatted by controlled deposition of silicon. The writing process involves the transfer of Si atoms to the tip of a scanning tunneling microscope.

The constraints on speed and reliability are compared with data storage in magnetic hard disks and DNA. The physics icon Richard Feynman estimated that —all of the information that man has carefully accumulated in all the books in the world, can be written in a cube of material one two-hundredth of an inch wide‖. Thereby, he uses a cube of 5×5×5 = 125 atoms to store one bit, which is comparable to the 32 atoms that store one bit in DNA. Such a simple, back-of-the- envelope calculation gave a first glimpse into how much room there is for improving the density of stored data when going down to the atomic level.

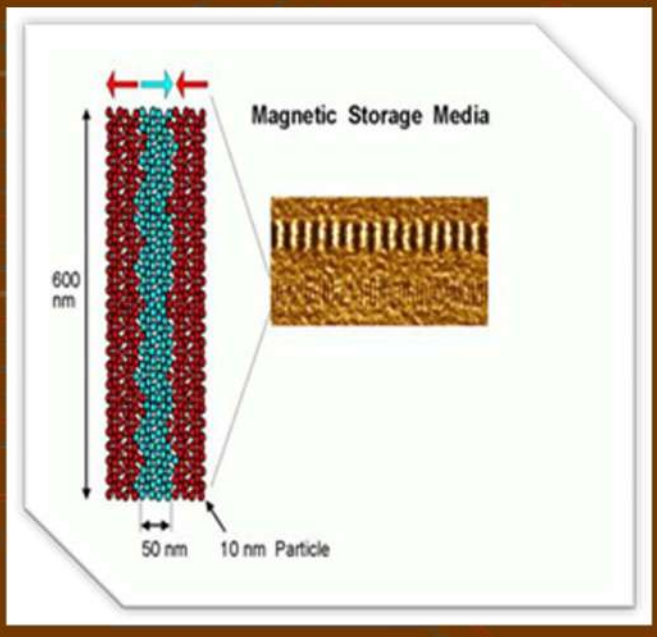
In the meantime, there has been great progress towards miniaturizing electronic devices all the way down to single molecules or nanotubes as active elements. Memory structures have been devised that consist of crossed arrays of nanowires linked by switchable organic molecules or crossed arrays of carbon nanotubes with electro statically switchable intersections. The purpose is to push the storage density to the atomic limit and to test whether a single atom can be used to store a bit at room temperature. How closely can the bits be packed without interacting? What are the drawbacks of pushing the density to its limit while neglecting speed, reliability and ease of use?



A bit is encoded by the presence or absence of a Si atom inside a unit cell of 5×4 = 20 atoms. The remaining 19 atoms are required to prevent adjacent bits from interacting with each other, which is verified by measuring the autocorrelation. A specialty of the structure in figure 1 is the array of self-assembled tracks with a pitch of five atom rows that supports the extra atoms. Such regular tracks are reminiscent of a conventional CDROM. However, the scale is shrunk from μm to nm. Although the memory created now is in two dimensions rather than the three-dimensional cube envisioned by Feynman, it provides a storage density a million times greater than a CD-ROM, today's conventional means of storing data.

The highest commercial storage density is achieved with magnetic hard disks, whose aerial density has increased by seven orders of magnitude since their invention in Feynman's days. Currently, the storage density is approaching 100 Gigabits per square inch in commercial hard disks. Typical storage media consist of a combination of several metals, which segregate into magnetic particles embedded into a non-magnetic matrix that keeps them magnetically independent. A strip of particles with parallel magnetic orientation makes up a bit, as color coded red and turquoise in the figure below. (The dimensions keep getting smaller.) When such a bit is imaged by a magnetic force microscope the collection of these particles shows up as white or dark line, depending on the magnetic orientation.

The density limit in magnetic data storage is largely determined by the in homogeneity of the magnetic particles that make up the storage medium. Overcoming variations in particle size, shape, spacing, and magnetic switching currently requires the use of about 100 particles per bit. The error limits are extremely stringent (less than one error in 108 read/write cycles, which can be reduced further to one error in 1012 cycles by error-correcting codes). The individual particles in today's media approach the super paramagnetic limit already (about 10 nm), where thermal fluctuations flip the magnetization.



Writing is more difficult. While atoms can be positioned controllably at liquid helium temperature, that is much harder to achieve that at room temperature. In order to prevent them from moving around spontaneously it is necessary to choose atoms that are strongly bound to the surface. Pushing them around with the STM tip requires a close approach, which entails the risk of an atom jumping over to the tip. This problem can be turned into a solution by using the STM tip to remove silicon atoms for writing zeros. The memory is pre-formatted with a 1 everywhere by controlled deposition of silicon onto all vacant sites Advantages and Disadvantages.

An intriguing aspect of atomic scale memory is that memory density is comparable to the way nature stores data in DNA molecules. The Wisconsin atomic-scale silicon memory uses 20 atoms to store one bit of information, including the space around the single atom bits. DNA uses 32 atoms to store information in one half of the chemical base pair that is the fundamental unit that makes up genetic information. Compared to conventional storage media, both DNA and the silicon surface excel by their storage density. Obviously there are some drawbacks. The memory was constructed and manipulated in a vacuum, and that a scanning tunneling microscope is needed to write memory which makes the writing process very time consuming.

Moreover, there is a tradeoff between memory density and speed. As density increases, the ability to read the memory comes down because we get less and less of a signal. As we make things smaller, it's going to get slower. The push towards the atomic density limit requires a sacrifice in speed. Practical data storage might evolve in a similar direction, with the gain in speed slows down as the density increases. Somewhere on the way to the atomic scale ought to be an optimum combination of density and speed. If the reading and writing speed is improved and the memory is made cost effective, this will revolutionize the field of secondary storage devices.

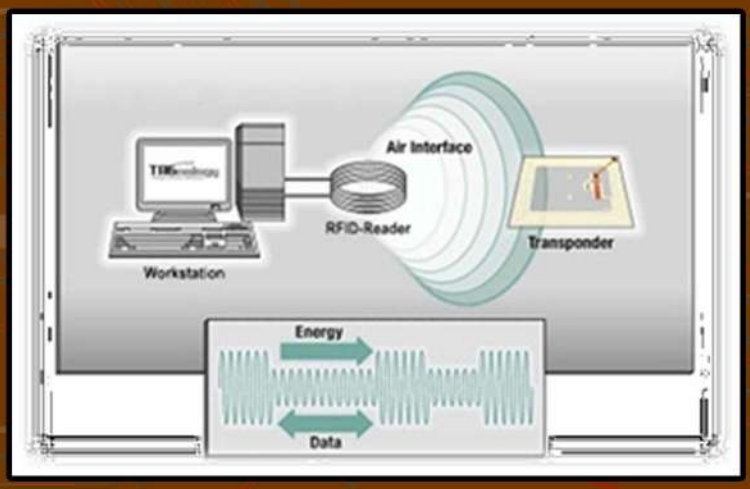
CHEJARLA RAJESH
(21731A04K4)

11. ELECTRONIC TOLL COLLECTION

Electronic Toll Collection is a generally mature technology that allows for electronic payment of highway tolls. It takes advantage of vehicle-to-roadside communication technologies to perform an electronic monetary transaction between a vehicle passing through a toll station and the toll agency. This project is implemented using the innovative technology of Radio Frequency Identification (RFID).

Radio-frequency identification (RFID) is a technology that uses communication via electromagnetic waves to exchange data between a terminal and an electronic tag attached to an object, for the purpose of identification and tracking.

An RFID system consists of a reader and transponders. Transponders (derived from the words "transmitter" and "responder") are attached to the items to be identified. They are often called "tags". Radio Frequency Identification (RFID) involves contact less reading and writing of data into an RFID tag's non-volatile memory through an RF signal. The reader emits an RF signal and data is exchanged when the tag comes in proximity to the reader signal. The RFID tag derives its power from the RF reader signal and does not require a battery or external power source.

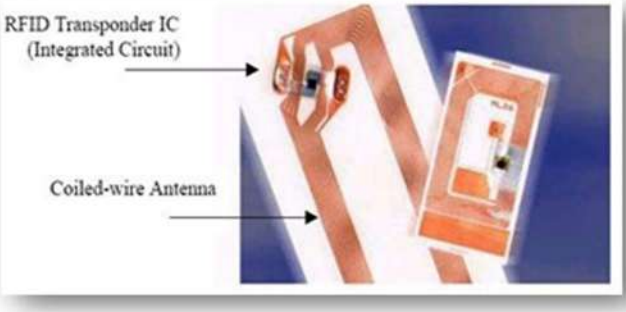


Each vehicle will be provided with an RFID tag. This transponder (tag) stores the unique ID of the vehicle and related information. When interrogated by a reader, it responds with that data over a radio frequency link. The readers are fixed in the toll gates. So when the vehicle comes near the reader, the data from the tags can be easily read by the readers. This data is passed to the computer and thus the cash can be deducted from the user's account
RFID is a wireless link to uniquely identify tags. These systems communicate via radio signals that carry data either unidirectional or bidirectional. The tag is energized by a time-varying electromagnetic radio frequency (RF) wave that is transmitted by the reader. This RF signal is called carrier signal. When tag is energized the information stored in the tag is transmitted back to the reader. This is often called backscattering. By detecting the backscattering signal, the information stored in the tag can be fully identified. RFID systems are comprised of two main components RF reader and RF Tag.

The RFID tag, or transponder, is located on the object to be identified and is the data carrier in the RFID system. Typical transponders (transmitters/responders) consist of a microchip that stores data and a coupling element, such as a coiled antenna, used to communicate via radio frequency communication. Transponders may be either active or passive.

Active transponders have an on-tag power supply (such as a battery) and actively send an RF signal for communication while passive transponders obtain all of their power from the interrogation signal of the transceiver and either reflect or load modulate the transceiver's signal for communication. Most transponders, both passive and active, communicate only when they are interrogated by a transceiver.

Active RFID and Passive RFID are fundamentally different technologies. While both use radio frequency energy to communicate between a tag and a reader, the method of powering the tags is different. Active RFID uses an internal power source (battery) within the tag to continuously power the tag and its RF communication circuitry, whereas Passive RFID relies on RF energy transferred from the reader to the tag to power the tag. While this distinction may seem minor on the surface, its impact on the functionality of the system is significant.



Passive RFID either 1) reflects energy from reader or 2) absorbs and temporarily stores a very small amount of energy from the reader's signal to generate its own quick response. In either case passive RFID operation requires very strong signals from the reader and the signal strength required from the tag is constrained to very low levels by the limited energy. On the other hand active RFID allows very low level signals to be received by the tag, and the tag can generate high level signals back to the reader, driven from its internal power source. Active RFID tag is continuously powered, whether in the reader field or not.

The selections of active or passive tag affect factors like range of communication, data storage capacity, sensor ability etc. If the tag is active the reader can spot more tags within seconds than the passive tag, but as the cost is compared the passive tags are cheaper than the active tags. The life of the passive tags are more than the active tag because, active tag requires tag power supply within the chip.

RF READER

The interrogator consists of a reader and data processing subsystem. The RFID reader, or transceiver, which may be able to both read data from and write data to a transponder. The data processing subsystem which utilizes the data obtained from the transceiver in some useful manner.

Typical transceivers (transmitter/receivers), or RFID readers, consist of a radio frequency module, a control unit, and a coupling element to interrogate electronic tags via radio frequency communication. In addition, many transceivers are fitted with an interface that enables them to communicate their received data to a data processing subsystem, e.g., a database running on a personal computer. The use of radio frequencies for communication with transponders allows RFID readers to read passive RFID tags at small to medium distances and active RFID tags at small to large distances even when the tags are located in a hostile environment and are obscured from view. The figure shows handheld and stationary reader modules.

The basic components of an RFID system combine in essentially the same manner for all applications and variations of RFID systems. All objects to be identified are physically tagged with transponders. The type of tag used and the data stored on the tag varies from application to application.

CHINTALA VISHNUVARDHAN
(21731A04K9)

12. HOLOGRAPHIC DATA STORAGE

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.

Effect of Annealing

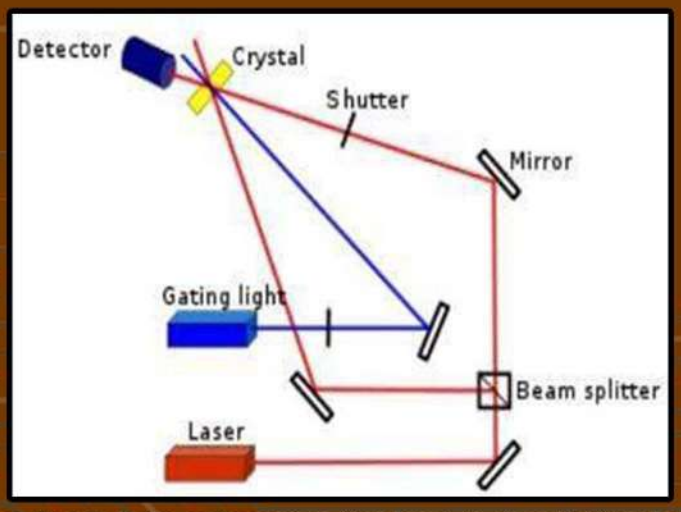
For doubly doped lithiumniobate (LiNbO3) crystal there exists an optimum oxidation/reduction state for desired performance. This optimum depends on the doping levels of shallow and deep traps as well as the annealing conditions for the crystal samples. This optimum state generally occurs when 95–98% 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.

PANDILLA INDHU
(21731A04H3)

13. DIGITAL LOLLIPOP - TASTE VIA INTERNET

Usually if you go to an Ice-cream parlor 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 trigger 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

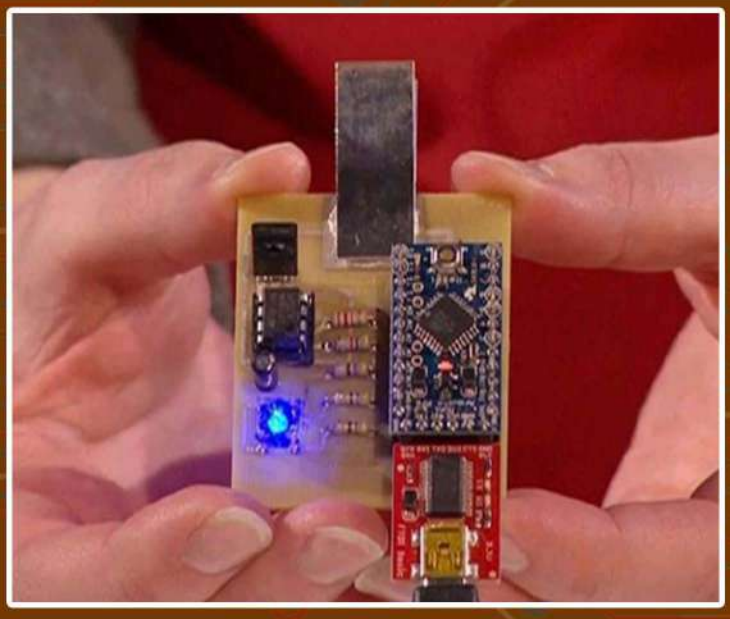
- Nowadays, diabetics are like common cold. That person cannot take sugar in their prescribed diet. But with Digital Lollipop, they can taste sweetness without getting scold by their doctor and their blood sugar level will also remain same.
- As mentioned earlier, it can be used in online food delivery 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.



J.MANOJA
(2273A04265)

14. PILL CAMERA

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 limitation 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 –oxidesemiconductor technology to require significantly less power than charge-coupled devices. Other construction benefit 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.

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.

Applications

- 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 acceptances 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 successes 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.

P.SAI DINESH
(2373A04L04)

15. EMBEDDED WEB TECHNOLOGY

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 system. 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 devicespecific 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.

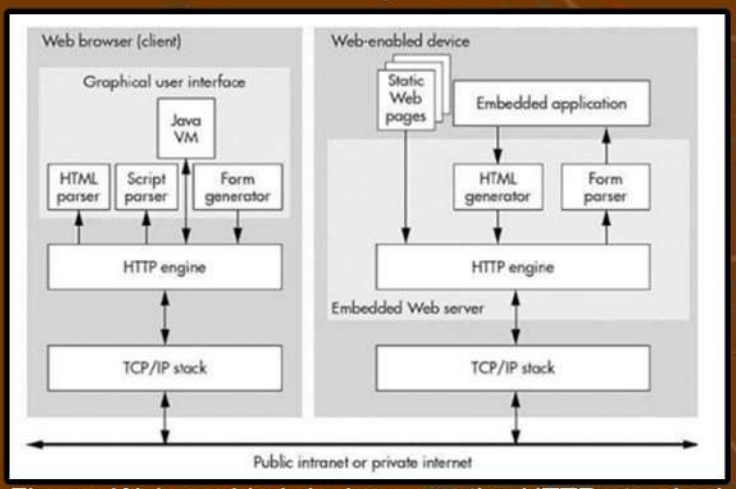
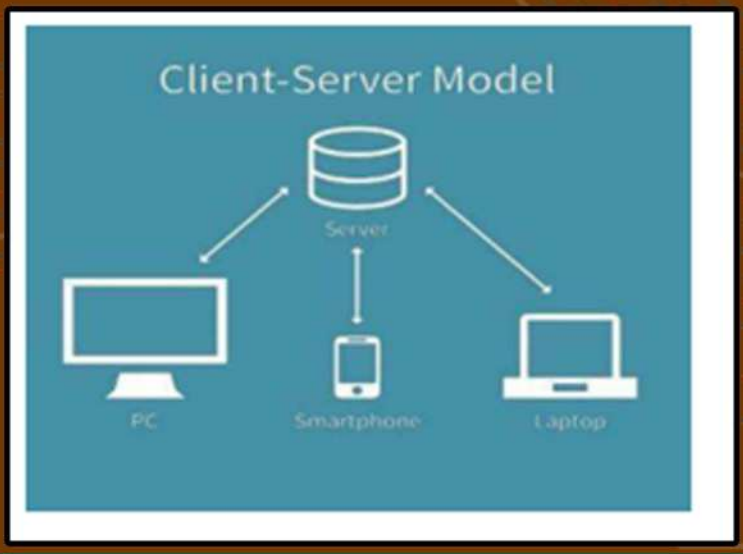


Figure: Web-enabled devices use the HTTP standard protocol to transmit

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 has 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.



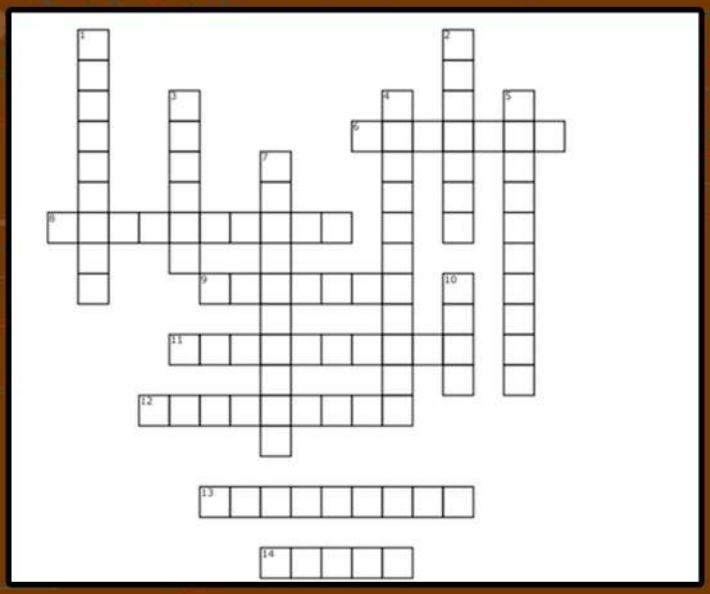
This approach eliminates the need to build custom management applications and provides access to the device using the Internet tools that everyone is familiar with. Embedded software space is vast and wide open. Newer embedded systems can require different software based applications.

These software based applications are:

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

RACHAKONDA RAMYA
(20731A04A7)

ELECTRONIC CROSS WORDS



Across

6. Used to power electronics circuits and objects with DC current
8. Measured in Henry's
9. Represented by an 1
11. Represented by a R
12. Resistance in a RL, RC, or RLC circuit
13. The inverse of a circuits Period
14. Represented by a P

DOWN

1. The inverse of a circuit's Period
2. Represented by an EoraV
3. Used to turn on and off circuits; has many different variations
4. Measured in Farads
5. A three-terminal electronic component
7. A diode meant to operate in the reverse region
10. An area in a circuit with infinite resistance that shouldn't be there

PULI NANDINI
(20731A0444)

TECHNICAL QUIZ

The SCS has__ terminals
a) 2
b) 3
c) 4
d) 5

2. Typical gate power rating of LASCR.
a) 0.1w
b) 0.2w
c) 0.3w
d) 0.4w

3. You have a light-dimmer circuit using an SCR. In testing the circuit, you find that IG = 0 mA and the light is still on. You conclude that the trouble might be one of the following:
a) The SCR is open or the source is in trouble.
b) The switch is faulty.
c) The gate circuits shorted.
d) This is normal. Nothing is wrong.

4. Identify the symbol
a) SCS
b) LASCR
c) PUT
d) DIAC

5. An SCR acts to control the speed of an electric motor by_ the __ of the pulse delivered to the motor.
a) Varying, width
b) Increasing, amplitude
c) Decreasing, gate width
d) None of these

6. In which of these is reverse recovery time nearly zero?
a) Zener diode
b) Tunnel diode
c) Schottky diode
d) PIN diode

7. A transistor has a current gain of 0.99 in the CB mode. Its current gain in the CC mode is
a) 100
b) 99
c) 1.01
d) 0.99

8. The vectors of the electromagnetic wave propagation can be expressed in
a) Dot product
b) Cross product
c) Unit vector
d) Perpendicular vector

9. The velocity factor of a transmission line depends on
a) Temperature
b) Skin effect
c) Relative permittivity of dielectric
d) None of the above

10. If transfer function of a system is H(z) = 6 + z-1 + z-2 then system is
a) Minimum phase
b) Maximum phase
c) Mixed phase
d) None

RACHAKONDA RAMYA
(20731A04A7)