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K S R Institute for Engineering and Technology

Department of Electrical and Electronics Engineering

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August 2016

BEES Magazine

Together We Make Difference

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Contents

Editorial Board

E-Paper

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Introduction

Smart paper is another name for the e-paper or electronic paper which is the electronic ink display technology which is designed to get the similar appearance of an ordinary ink on paper. It is also called Radio paper or electronic ink display. The smart paper reflect light alike a conventional flat panel display. The main aim of it is that this paper should be light weighted, lower cost, simple and with flexible display. For building an e-paper or smart paper several technologies such as plastic substrate, electronics and flexible electronics are being used. Smart paper has to be potential to be more comfortable to read than conventional display because of the stable image that does not need to be refreshed constantly.

A smart paper display is also readable in direct sunlight without appearing faded image. The black and white ink on this paper look similar to that most widely read material on the planet newspaper. Applications of this include time table at bus stations, labels for showing the price in retail shops, e-readers, e-paper magazines, general signage and Motorola Fone F3.

Construction of E-Paper

Basically, an epaper can be comprised into two different parts namely; a front panel and back panel. the front panel consists of electronic ink and some other parts like the Gyricon whereas the back panel consists of the electronic circuits .
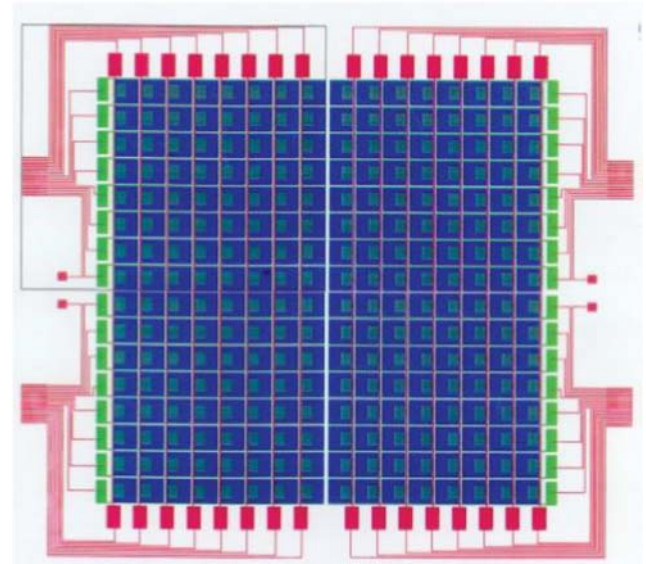
Back Panel Layout

For forming the electronic ink display the electronic ink is printed onto a plastic film which is laminated over a layer of circuitry.
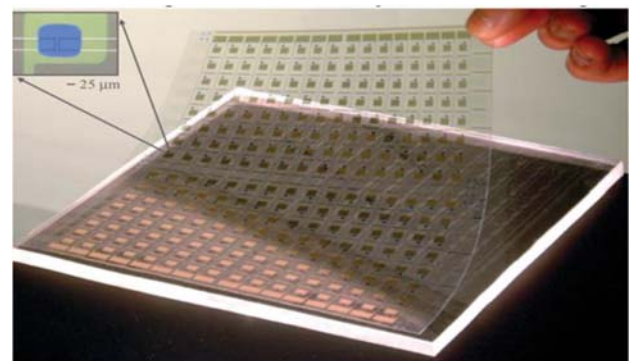
Plastic Film Sheet of Electronic Ink.

Working of the Epaper

As read in the history after many years Gyricon eink has been created by Nicholes after a wide range of study of tiny rotating particles. Based on a thin sheet of flexible plastic containing a thin layer of tiny plastic beads which can free rotation

within the plastic sheet. Each and every hemisphere has a different charge and colour, when electric field applied as backbone beads rotate. This occurs in the front plane. Later as the electrophoretic technology was developed which consists of microcapsules has given a new form. some more new forms are described .

Gyricon

The first Gyricon was developed by Nicholas Sheridon. It consists of polyethylene spheres of diameter between 75-106 micrometers. Each sphere is also called Janus particle composed of negatively charged black on one side and positively charged white plastic on the other side. In this each and every hemisphere has its own different colour and charge. When an electric field is an applied as backbone then the beads in it rotate creating a di-coloured pattern. When the electric polarity is applied to each pair of electrodes determines the white or black side is face-up, thus giving up black or white appearance. This method has two limitations; one - lack of color, two - low brightness and resolution.

Electrophoretic Display

As there are some limitations with Gyricon, they have to be solved thus it had a solution called Electrophoretic display. By using an applied electric field it forms visible images by rearranging charged pigment particles. This consists of titanium oxide particles as microcapsules with one micrometer in diameter dispersed in a hydrocarbon oil which contains a dark coloured dye along with the surfactants and charging agents. If some voltage is supplied across the two plates, the particles will move to the plate which is bearing the opposite charge from that of the particles. When a negative electric field is applied the particles move to bottom and thus there is hidden view. When a positive electric field is applied the particles move to top and thus there is a image or text generated by the white particles.
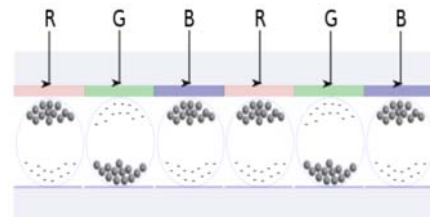
Pigmented Particles Of Electrophoretic Display

Electrophoretic displays was generally developed by Philips research which was manufactured using electronics on plastic by Laser release (EPLar) process which has enabled the existing AM-LCD manufacturing plants for the creation of flexible displays.

Electronic Ink

Basically, an electronic ink is combination of tiny plastic well particles and flexible particles well which consists of both black and white particles suspended by with a clear fluid. The black and white have opposite charge which is appeared on giving an electrical supply embeds underneath or to top or both sides of the layer to create an E display.
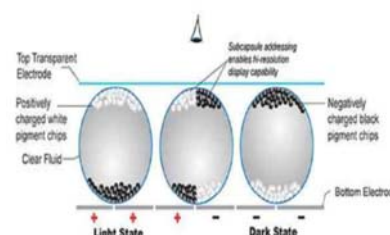
Cross Section Electronic Ink Particles.

The main disadvantage of this is the particles moving from upside down.

Electrowetting

Based on the controlling of the shape of a confined water or oil interface by an applied voltage electrowetting is obtained. The oil forms a film with no voltage between electrode and water, when voltage is applied the coating changes. As a result no stable state for stacked state. It results in the party transparent pixel, or, in case of reflective white surface that is being used under switchable element of white pixels. The switching between white and colour reflection is fast enough to display the content

Electro Fluidic Display

It is different from the above types of display. An aqueous pigment dispersion inside a tiny reservoir is placed by the electro fluidic display. 5-10% viewable pixel area is present in the reservoir. For pulling the pigment out of the reservoir voltage is applied. Liquid surface tension creates the pigment dispersion which helps to rapidly recoil into the reservoir when voltage is removed.

Comparison of Smart paper with LCD display

E-- ink display	Liquid Crystal Displays
It has a Wide viewing angle	It has the Best image from only one position.
Black on paper white.	Gary on Gary
It can be read in sunlight.	It cannot be seen in sunlight
It holds images without Drain	It requires power to hold the images.
It has plastic or glass sheets.	Glass sheets only.
It is light weighted.	It is heavy relatively.
Its thickness is nearly equal to 1mm.	Its thickness 7mm.

Applications

Wrist watches: in 2005 Seiko company has used for their Spectrum, in 2010 the same Seiko released another advanced E- watch. Not only that there are also some types of Matrix watches in which E-ink Display is used.

A MATRIX WRIST WATCH

In E-books: In 2007 Amazon Kindle was released .In 2009 Amazon released Kindle2 , in the same year larger kindle dx was released and now until November 2015 amazon Kindle store contains four million kinds of eBooks.
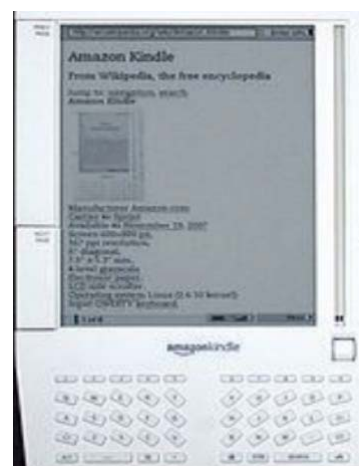
THE FIRST GENERATION KINDLE

In cell phones such as Motorola fonef3 and Samsung Alias.

MOTOROLA F3 FONE

In status displays such as USB flash drive to display status information such as storage. In case of digital school book, in 2007 Jan, the Dutch specialist has used for edupaper.nl It is also used for Digital Photo Frame in order to overcome the disadvantages of high quality, power supply and wide viewing angle.

Conclusion

The technology keeps on changing. From the 1990's until today the smart paper technology is almost continuously used. Though it has the updates in between 1990 -2010 which we are still using in our daily life we are still trying for its advancement. It is used for decreasing the usage of LCD display also. Thus it would be the most evergreen thing being updated. Alike a human life is used make many things the electronic ink display or smart paper technology can be used make many wonders. The e-paper can also communicate satellite and other computer easily .And for the further more updates the researchers are thinking of making a paperless world by using the smart papers. Finally, there would be a more usage of E-paper technology rather than an LCD and an ordinary paper.

Global Positioning System (GPS)

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III year EEE   *III year EEE*

Introduction

GPS technology became a reality through the efforts of the American military, which established a satellite-based navigation system consisting of a network of 24 satellites orbiting the earth. GPS is also known as the NAVSTAR (Navigation System for Timing and Ranging).

GPS works all across the world and in all weather conditions, thus helping users track locations, objects, and even individuals! GPS technology can be used by any person if they have a GPS receiver.

Applications

This technique was initially developed for military applications. During 1980, the government decided to make it available for the civilian use as well. GPS has become an efficient tool in the field of scientific use, commerce, surveillance and tracking. GPS is used except in locations where it is difficult to detect the signal for example, underwater, subterranean location, inside the building and caves.

Civilian Applications

· Navigation – Used by navigators for orientation and precise velocity measurements.

· Geotagging – Map overlays can be created by applying location coordinates to photographs and other kind of documents.

· Surveying – Surveyors create maps and verify the boundaries of the property.

· Map-making – Used by civilians and military cartographers.

· Tectonics – Detect the direct false motion measurement in earthquakes.

· Geofencing – Vehicle, person or pet can be detected by using GPS vehicle tracking system, person tracking systems, and pet tracking systems.

Military Applications

· Navigation – Soldiers can find objectives in the dark and unknown regions with the help of GPS.

· Search and Rescue – Knowing the position of a downed pilot, its location can be traced out easily.

· Reconnaissance – Patrol movement can be handled.

· Target tracking – Military weapon systems use GPS to track air targets and potential ground before they are flagged as hostile.

· GPS carry a set of nuclear detonation detectors (such as optical sensor, dosimeter, electromagnetic pulse sensor, X-ray sensor) which is a part of United States Nuclear Detonation Detection System.

· Missile and projectile guidance – Targets military weapons such as cruise missiles, precision – guided munitions.

Structure of GPS

The GPS system comprises of three parts: Space segment, User segment and Control segment. The diagram of the structure of GPS is given below.
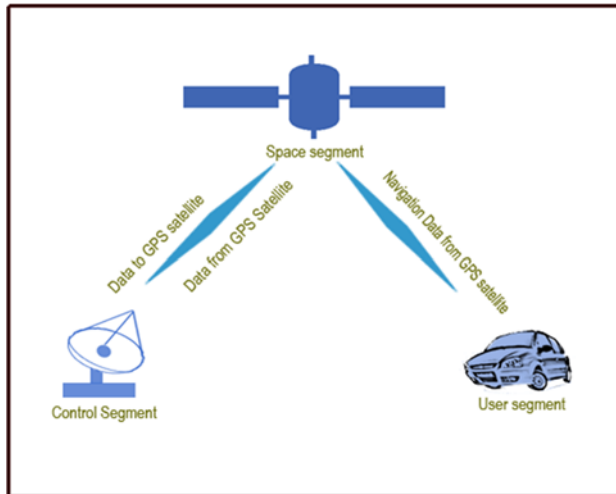
Structure of GPS System

Space segment – The satellites are the heart of the Global positioning system which helps to locate the position by broadcasting the signal used by the receiver. The signals are blocked when they travel through buildings, mountains, and people. To calculate the position, the signals of four satellites should be locked. You need to keep moving around to get clear reception.

User segment – This segment includes military and civilian users. It comprises of a sensitive receiver which can detect signals (power of the signal to be less than a quadrillionth power of a light bulb) and a computer to convert the data into useful information. GPS receiver helps to locate your own position but disallows you being tracked by someone else.

Control segment – This helps the entire system to work efficiently. It is essential that the transmission signals have to be updated and the satellites should be kept in their appropriate orbits.

Working and Types of GPS Receivers
Working

  The GPS satellites rotate twice a day around the earth in a specific orbit. These satellites transmit signal information to earth. This signal information is received by the GPS receiver in order to measure the user's correct position. The GPS receiver compares the time a satellite transmits the signal with the time the signal is received. The time difference calculated enables us to know the distance of the satellite. By measuring the distance of few more satellites, the user's position can be verified and displayed on the unit's electronic map.

  To measure 2D position and track movement, the GPS receiver must lock the signal of three satellites. The receiver can measure 3D position (latitude, longitude and altitude) if the GPS receiver locks the signal of four or more satellites. On determining the position of the user, the unit of GPS can measure speed, trip distance, bearing, distance to destination, tack, time of sunrise and sunset, etc.

Types of GPS receivers

  The three types of GPS receivers that offer different level of accuracy, and have different necessity to obtain the accuracies are:

· **Coarse Acquisition (C/A) code receivers** – These receivers offer 1-5 meter GPS position accuracy with differential correction. With an occupation time of 1 second, these receivers offer 1-5 meter GPS position accuracy. The GPS position accuracies can be within 1-3 meters consistently if the occupation time is long.

· **Carrier Phase receivers** – These receivers offer 10-30 meter GPS position accuracy with differential correction. The waves that carry C/A signal are counted to calculate the distance between the satellite and the receiver. High occupation time is required to obtain position accuracy.

· **Dual Frequency receivers** – These receivers offer sub-centimetre GPS position accuracy with differential correction. These receivers accept signals from the satellites on two different frequencies to find out accurate position.

History of GPS

History

GPS was initially meant for military applications and was built by the American Department of Defence (DOD) in 1978. It was originally called NAVSTAR and was introduced with the launch of the first satellite.

Today, around thirty fully operational satellites orbit the earth covering a distance of 20200 km. These GPS satellites transmit signals which help locate the precise location of a GPS receiver. The latest in efficient satellite technology ensures that the GPS signal can be used without any fee by any individual in possession of a GPS receiver.

The predecessor of GPS used to be fixed radio stations spread across the globe in known locations. First, a master station sends out signals after which the slave stations across the globe start to respond. The slave stations send out these signals after a precise amount of time. The receivers then start to evaluate the time delay between the reception of the master and slave signals, thus determining a position relative to the slave stations.

Fixed radio station broadcasting was a problem for the military. This is the main reason why Transit, the first navigation satellite, was introduced in the 1960s. The location was determined with the help of a receiver, which calculated the Doppler Effect on the frequency broadcasted by the satellite to the frequency actually received. After this, the receiver closest to the satellite would get information and subsequent readings would precisely single out a location relative to the position of the satellite.

Modern satellites work differently to determine exact positions. A satellite signal would include the satellite's position and the time of signal transmission. With this crucial information, the ground unit would be able to successfully locate a target swiftly and efficiently. Every satellite signal places the ground unit on a sphere from the satellite. The location of the GPS receiver is then identified as the intersection of the spheres (for additional satellite signals).

Interesting facts and figures

GPS Tracking Of Mordern Satellite

GPS has become more important in our daily life. New cameras that are launched have a built in GPS in order to give the information (latitude and longitude of where you were) when you take a photo and the information is stamped on the photo.

While driving it is difficult to concentrate on the GPS screen, and hence the developers launched a "Voice Guided GPS" in order to make it convenient and safer for the driver. The GPS now can provide information on where to turn, distance remaining to reach your destination, etc. Other units of GPS are voice controlled. You can give voice commands to find an alternative route. This makes the technology quite an interesting one.

GPS is very useful to hikers. The GPS will show the street you are on, can mark the location of hotel and places to be visited which could save your time rather than spend your precious time in finding the route.

GPS is a essential if you plan to go hunting, fishing, exploring, hiking, etc. and especially if you are not quite familiar with the region. The unit of GPS for hikers are lightweight, compact and waterproof as well.

Current Research and Problems

Latest/Current Research and Key developments

In the mobile phone domain, GPS receivers are very much in demand today. In a few years from now, all GSM phones are expected to be fitted with superior GPS technology to help the user in navigation. This superior GPS technology will also help track other GPS-mobile enabled users. For example, anxious parents can keep a tab on the movements of their children. It also helps to keep track of individuals working in high-risk areas.

Another important feature is the GPS-enabled theft-protection systems that are very much in demand these days. This helps motorcycle and automobile manufacturers to locate stolen vehicles with pinpoint accuracy.

A big boost is provided to computer users in the form of Bluetooth GPS receivers. These receivers score over traditional connections because a cable is not required.
GPS is also being introduced into supply chains, to ensure that all goods are transported without hassles and are free from theft.

Problems being faced today

The most common problem that arises with the GPS system is accuracy. Accuracy depends on the signal that is sent by the time unit. The accuracy gets disturbed if the time is off in the GPS unit. The time and calculations are affected when it encounters rough atmospheric conditions. Inaccuracy occurs when a signal is bounced back from mountains, skyscrapers etc.

Another problem is related to its position that gets updated every twelve minutes. Once the signal has reached the updated time, the satellite is unable to know the correct location and can make calculation on based on the wrong information. This kind of errors is unavoidable.

Energy Harvesting for Low-Power Applications

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Introduction

Energy harvesting is the capture and conversion of small amounts of readily available energy in the environment into usable electrical energy. The electrical energy is conditioned for either direct use or accumulated and stored for later use. This provides an alternative source of power for applications in locations where there is no grid power and it is inefficient to install wind turbines or solar panels.

Other than outdoor solar, no small energy sources provide a great deal of energy. However, the energy captured is adequate for most wireless applications, remote sensing, body implants, RFID, and other applications at the lower segments of the power spectrum. And even if the harvested energy is low and incapable of powering a device, it can still be used to extend the life of a battery.
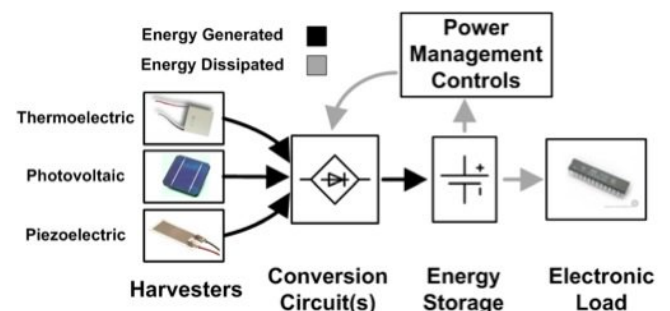
Why Harvest Energy

Most low-power electronics, such as remote sensors and embedded devices, are powered by batteries. However, even long-lasting batteries have a limited lifespan and must be replaced every few years. The replacements become costly when there are hundreds of sensors in remote locations. Energy harvesting technologies, on the other hand, provide unlimited operating life of low-power equipment and eliminate the need to replace batteries where it is costly, impractical, or dangerous.

Most energy harvesting applications are designed to be self-sustaining, cost-effective, and to require little or no servicing for many years. In addition, the power is used closest to the source, hence eliminating transmission losses and long cables. If the energy is enough to power the device directly, the application or device powered by the energy can operate batteryless.

The Building Blocks of an Energy Harvesting System

The process of energy harvesting takes different forms based on the source, amount, and type of energy being converted to electrical energy. In its simplest form, the energy harvesting system requires a source of energy such as heat, light, or vibration, and the following three key components.

Basic components of an energy harvesting system.

- **Transducer/harvester:** This is the energy harvester that collects and converts the energy from the source into electrical energy. Typical transducers include photovoltaic for light, thermoelectric for heat, inductive for magnetic, RF for radio frequency, and piezoelectric for vibrations/kinetic energy.

- **Energy storage**: Such as a battery or super capacitor.

- **Power management**: This conditions the electrical energy into a suitable form for the

application. Typical conditioners include regulators and complex control circuits that can manage the power, based on power needs and the available power.

Common Sources of Energy

- **Light energy:** From sunlight or artificial light.
- **Kinetic energy:** From vibration, mechanical stress or strain.
- **Thermal energy:** Waste energy from heaters, friction, engines, furnaces, etc.
- **RF energy:** From RF signals.

Energy Harvesting Technologies

Harvesting electrical power from non-traditional power sources using thermoelectric generators, piezoelectric transducers, and solar cells still remains a challenge. Each of these requires a form of power conversion circuit to efficiently collect, manage, and convert the energy from these sources into usable electrical energy for microcontrollers, sensors, wireless devices, and other low-power circuits.

Harvesting Kinetic Energy

Piezoelectric transducers produce electricity when subjected to kinetic energy from vibrations, movements, and sounds such as those from heat waves or motor bearing noise from aircraft wings and other sources. The transducer converts the kinetic energy from vibrations into an AC output voltage which is then rectified, regulated, and stored in a thin film battery or a super capacitor.
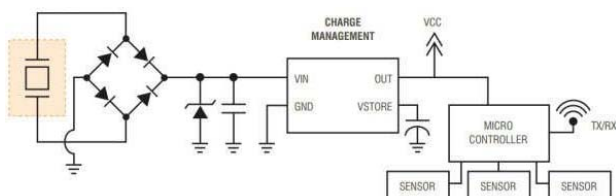

Piezoelectric Energy Harvesting Circuit.

Potential sources of kinetic energy include motion generated by humans, acoustic noise, and low-frequency vibrations. Some practical examples are:

- A batteryless remote control unit: Power is harvested from the force that one uses in pressing the button. The harvested energy is enough to power the low-power circuit and transmit the infrared or wireless radio signal.
- Pressure sensors for car tires: Piezoelectric energy harvesting sensors are put inside the car tire where they monitor pressure and transmit the information to the dashboard for the driver to see.
- Piezoelectric floor tiles: Kinetic energy from people walking on the floor is converted to electrical power that can be used for essential services such as display systems, emergency lighting, powering ticket gates, and more.

Harvesting RF Energy

In this arrangement, an RF power receiving antenna collects the RF energy signal and feeds it to an RF transducer such as the Powercast's P2110 RF Powerharvester.
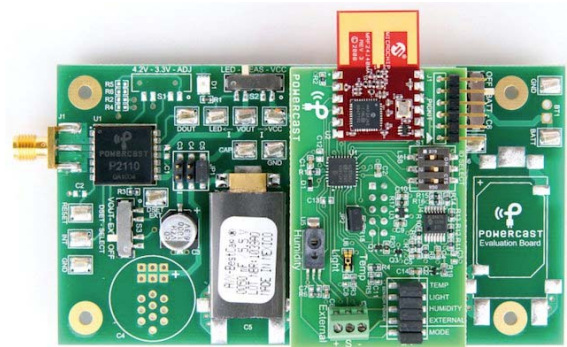

A P2110 Powerharvester receiver evaluation board.

The Powerharvester converts the low-frequency RF signal to a DC voltage of 5.25V, capable of delivering up to 50mA current. It is possible to make a completely battery-free

wireless sensor node by combining sensors, the P2110, a radio module, and a low-power MCU. Typical applications for these types of sensors include building automation, smart grid, defense, industrial monitoring, and more.
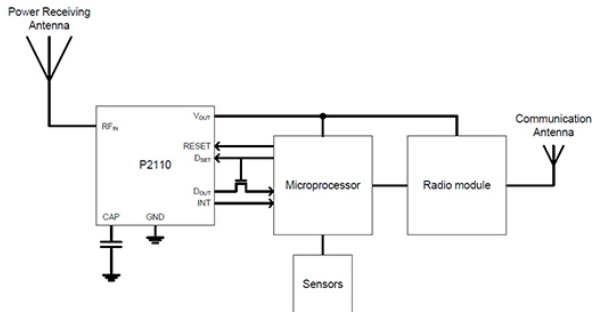
Powercast P2110 RF energy harvesting for a batteryless wireless sensor.

Harvesting Solar Energy

Small solar cells are used in industrial and consumer applications such as satellites, portable power supplies, street lights, toys, calculators, and more. These utilize a small photovoltaic cell which converts light to electrical energy. For indoor applications, light is usually not very strong and typical intensity is about 10 μW/cm^2.

The power from an indoor energy harvesting system thus depends on the size of the solar module as well as the intensity or spectral composition of the light. Due to the intermittent nature of light, power from solar cells is usually used to charge a battery or supercapacitor to ensure a stable supply to the application.

Harvesting Thermal Energy

Thermoelectric energy harvesters rely on the Seebeck effect in which voltage is produced by the temperature difference at the junction of two dissimilar conductors or semiconductors. The energy harvesting system consists of a thermoelectric generator (TEG) made up of an array of thermocouples that are connected in series to a common source of heat. Typical sources include water heaters, an engine, the back of a solar panel, the space between a power component such as a transistor and its heat sink, etc. The amount of energy depends on the temperature difference, as well as the physical size of the TEG.

The TEGs are useful in recycling energy that would otherwise have been lost as heat. Typical applications include powering wireless sensor nodes in industrial heating systems and other high-temperature environments.

Harvesting Energy from Multiple Sources

Manufacturers such as Maxim, Texas Instruments, and Ambient Micro have developed some integrated circuits with the ability to simultaneously capture different types of energy from multiple sources. Combining multiple sources has the benefit of maximizing the peak energy as well as providing energy even when some sources are unavailable.

An example of a circuit that harvests energy from multiple sources is as shown below:
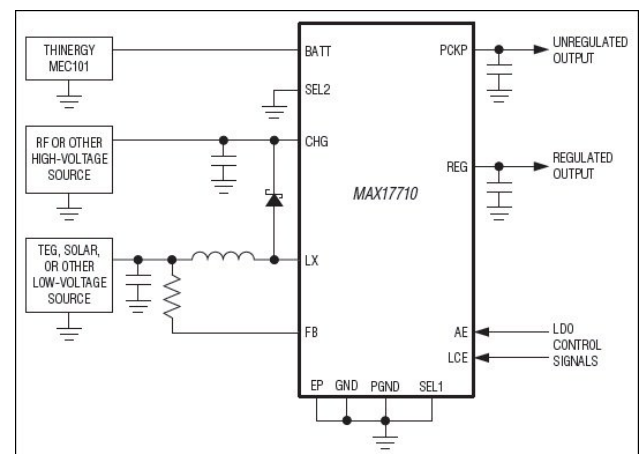
Maxim Integrated MAX17710 multiple source circuit

Benefits of Energy Harvesting

There is plenty of energy in the environment which can be converted into electrical energy to power a variety of circuits.

Energy harvesting is beneficial because it provides a means of powering electronics where there are no conventional power sources, eliminating the need for frequent battery replacements and running wires to end applications. By this same token, it opens up new applications in remote locations, underwater, and other difficult-to-access locations where batteries and conventional power are not realistic.

Energy harvesting is also largely maintenance free and is environmentally friendly.

Applications for Energy Harvesting Technologies

Alternative power sources provide a means of extending the battery life of remote sensors in industrial, commercial, and medical applications. This enables installation of standalone sensors in hard-to-reach or remote areas to provide a variety of information and warnings. These sensors can monitor and warn of air pollution, worn out bearings, bridge stresses, forest fires, and more.

Other applications include:

- Remote corrosion monitoring systems
- Implantable devices and remote patient monitoring
- Structural monitoring
- RFID
- Internet of Things (IoT)
- Equipment monitoring

Desirable Properties of Energy Harvesting Applications

Since the energy from harvested sources is intermittent and small, the systems must be carefully designed to efficiently capture, condition, and store the power. The systems should further incorporate circuits to control the charging process and regulate the power for the sensors, MCUs, and other low-power loads.

Harvesting Circuit

Energy management system components should have:

- High energy efficiency in capturing, accumulating, and storing small energy packets. Efficiency must be high enough to ensure that the energy consumed by the energy harvesting circuit is much smaller than the energy captured from the source.
- High energy retention with minimal leakage or losses in energy storage.
- Energy conditioning to ensure the output meets power requirements for the application or desired task.
- Tolerance of a wide range of voltages, currents, and other irregular input conditions.

Application Circuit

Circuits receiving harvested energy for application should:

- Consume the lowest amount of electrical power possible when active.
- Consume the lowest standby current.
- Be capable of turning on and off with minimal delay.
- Operate at the low-voltage range.

Conclusion

Harvesting energy from nonconventional sources in the environment has received increased interest over the past few years as designers look for alternative energy sources for low-power applications.

Even though energy harvested is small and in the order of milliwatts, it can provide enough power for wireless sensors, embedded systems, and other low-power applications.

Pill Camera

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Introduction

Imagine a vitamin pill-sized camera which could travel through your body capturing pictures, helping doctor to diagnose a problem which previously would have found only through surgery. Such technology is no longer the stuff of science fiction films.

The miniature e camera, along with a light, transmitter, and batteries, called Capsule Cam, is housed in a capsule, the size of a large vitamin pill, and is used in a procedure known as capsule endoscopy, which is a noninvasive and painless way of looking into the esophagus and small intestine.

Once swallowed, the capsule is propelled through the small intestine by peristalsis, and acquires and transmits digital images at the rate of two per second to a sensor array attached to the patients abdomen, through a recording device worn on a belt stores the images, to be examined and reviewed.

Material and Methods

The device, called the Diagnostic Imaging System, comes in a capsule form and contains a camera, lights, transmitter and batteries. The capsule has a clear end that allows the camera to view the lining of the small intestine.

Capsule endoscopy consists of a disposable video camera encapsulated into a pill like form that is swallowed with water. The wireless camera takes thousands of high-quality digital images within the body as it passes through the entire length of the small intestine. The latest pill camera is sized at 26*11 mm and is capable of transmitting 50,000 color images during its traversal through the digestive system of patient.

Video chip consists of the IC CMOS image sensor which is used to take pictures of intestine. The lamp is used for proper illumination in the intestine for taking photos. Micro actuator acts as memory to store the software code that is the instructions. The antenna is used to transmit the images to the receiver. For the detection of reliable and correct information, capsule should be able to design to transmit several biomedical signals, such as pH, temp and pressure. This is achieved with the help of Soc.

Working

- It is slightly larger than normal capsule. The patient swallows the capsule and the natural muscular waves of the digestive tract propel it forward through stomach, into small intestine, through the large intestine, and then out in the stool.

- It takes snaps as it glides through digestive tract twice a second. The capsule transmits the images to a data recorder, which is worn on a belt around the patient's waist while going about his or her day as usual.

- The physician then transfers the stored data to a computer for processing and analysis the complete traversal takes around eight hours and after it has completed taking pictures it comes out of body as excreta.

- Study results showed that the camera pill was safe, without any side effects, and was able to detect abnormalities in the small intestine, including parts that cannot be reached by the endoscope.
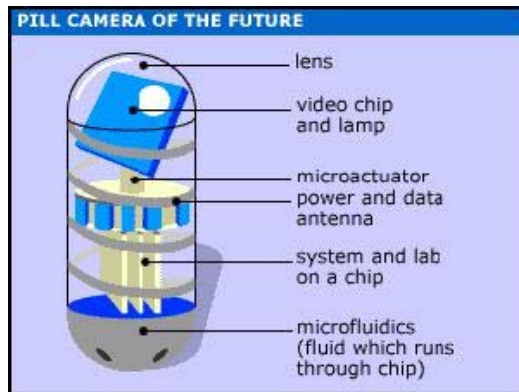
Pill Camera

Internal view of the capsule
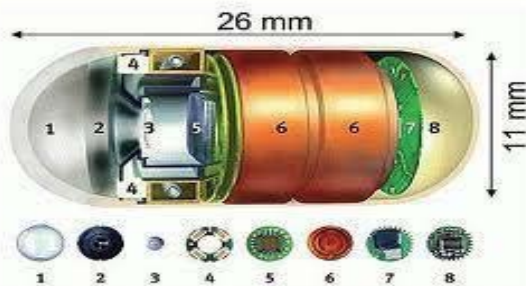
1. Optical Dome:

This shape results in easy orientation of the capsule axis along the central axis of small intestine and so helps propel the capsule forward easily. This consists of light receiving window.

2. Lens Holder:

The Lens Holder is that part of the capsule which accommodates the lens. The lens is tightly fixed to the holder so that it doesn't get dislocated anytime

3. Lens:

The Lens is an integral component of the capsule. It is arranged behind the Light Receiving Window

4. Illuminating LED's:

Around the Lens & CMOS Image Sensor, four LED's (Light Emitting Diodes) are present. These plural lighting devices are arranged in donut shape.

5. CMOS Image Sensor:

CMOS (Complementary Metal Oxide Semiconductor) Image Sensor is the most important part of the capsule. It is highly sensitive and produces very high quality images. It has 140º field of view and can detect objects as small as possible

6. Battery:

Battery used in the capsule is buttons shaped and are two in number as shown. The batteries are arranged together just behind the CMOS Image Sensor.

Silver Oxide primary batteries are used (Zinc/Alkaline Electrolyte/Silver Oxide). Such a battery has an even discharge voltage, disposable and doesn't cause harm to the body.

7. ASIC Transmitter:

The ASIC (Application Specific Integrated Circuit) Transmitter is arranged behind the Batteries as shown. Two Transmitting Electrodes are connected to the outlines of the ASIC Transmitter. These electrodes are electrically isolated from each other.

8. Antennae:

As shown, the Antennae is arranged at the end of the capsule. It is enclosed in a dome shaped chamber.

Pill Camera platform Components:
Sensory array belt

Like ECG leads, several wires are attached to the abdomen to obtain images by radio frequency. These wires are connected to data

recorder on a belt. The position of the capsule is calculated by the sensor arrays. Receiver belt is worn by the patient around his or her waist over clothing.

This belt holds recording device and battery pack. Sensors are incorporated within the belt. Sensor array includes sensor pads, data cable, battery charging and receiver bag.

Data recorder:

This is the small portable recording device attached to the sensor belt placed in recorder pouch.

It weighs around 470gm. The signals transmitted by the camera is received and recorded by the data recorder which is placed on patient's body. This recorder receives and stores 5000 to 6000 JEPG images.

Real Time Viewer:

This is a hand held device and enables real-time viewing. This contains rapid reader software and colour LCD monitor.

This is used to test the proper functioning before procedures and confirms location of capsule.

Rapid work station:

Rapid workstation performs the function of reporting and processing of images and data. Image data from the data recorder is downloaded to a computer equipped with software called rapid application software. It helps to convert images in to a movie and allows the doctor to view the colour 3D images. Once the patient has completed the endoscopy examination, the antenna array and image recording device are returned to the health care provider. The recording device is then attached to a specially modified computer workstation and the entire examination is downloaded in to the computer, where it becomes available to the physician as a digital video.

The workstation software allows the viewer to watch the video at varying rates of speed, to view it in both forward and reverse directions, and to capture and label individual frames as well as brief video clips. Images showing normal anatomy of pathologic findings can be closely examined in full colour. A recent addition to the software package is a feature that allows some degree of localization of the capsule within the abdomen and correlation to the video images.

Procedures followed during capsule endoscopy

- The procedure begins with the patient fasting from the midnight on the day before the examination.

- Patient is fitted with antenna array and image recorder The recording device and its battery pack are worn on a special belt which allows the patient to move freely

- A fully charged capsule is removed from its holder. Capsule is swallowed only after the indicator light show that the data is being transmitted and received.

- Capsule is then swallowed with small amount of water. Once the capsule is ingested, the patient should avoid ingesting anything other than cellular liquids for approximately 2 hours.

- The examination can be considered complete after 7-8 hours of capsule consumption.

- Patient can now return the antenna and recording device to the physician.

- Downloading of data in the recording device takes to workstation takes approximately 2.5-3 hours.

- Interpretation of data takes approximately 1 hour. Individual frames and video clips of normal and pathologic findings can be saved and exported as files for incorporation into procedure reports or patient records

Advantages

- High quality images with accurate and precise results

- Simple procedure with high sensitivity and specificity

- This method is more efficient than x-ray, CTscan, endoscopy

Disadvantages

Pill camera is a revolution, no doubt about it but there are few medical risks

1. Patients with gastrointestinal structures or narrowing's are not preferred for this conduct because they pose the risk of obstruction

2. Pill gets struck if there is a partial obstruction in the small intestine and a patient who is

undergoing diagnostic process may end up in the emergency room for intestinal obstruction.

3. The pill camera transmits image from inside to outside the body. Sometimes it becomes impossible to control the camera behavior, including the on/off power functions and effective illuminations inside the intestine.

This drawback can be overcome by using a bidirectional wireless telemetry camera. The current paper presents the design of a bidirectional wireless telemetry camera, 11mm in diameter, which can transmit video images from inside the human body and receive the control signals from an external control unit

Conclusion

The endoscopy system is the first of its kind to be able to provide non-invasive imaging of the entire small intestine. It has revolutionized the field of diagnostic imaging to a great extent and has proved to be of great help to physicians all over the world. In this study capsule endoscopy was superior to push enteroscopy in the diagnosis of recurrent bleeding in patients who had a negative gastroscopy and colonoscopy. It was safe and well tolerated.

Wireless capsule endoscopy represents a significant technical breakthrough for the investigation of the small bowel, especially in light of the shortcomings of other available techniques to image this region. The capsule endoscopy seems best suited to patients with gastrointestinal bleeding of unclear etiology who have had non diagnostic traditional testing and in whom the distal small bowel (beyond reach of a push enteroscope) needs to be visualized.

Sixth Sense Technology

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Introduction

It's the beginning of a new era of technology where engineering will reach new milestones. Just like in the science fiction movies where display of computer screen appears on walls, commands are given by gestures, the smart digital environment which talks to us to do our work and so on, these all will be possible very soon. You imagine it and **sixth sense technology** will make it possible. Isn't it futuristic? Now it's time for sci-fi movie directors to think ahead because the technology shown in there fiction movies soon will become household stuff. Before few years back it was considered to be supernatural or tantalizing imagination. But now it has been made possible. Thanks to Pranav Mistry, a genius who introduced mankind to this futuristic technology.

What is sixth sense?

Sixth Sense is a wearable gestural interface that enhances the physical world around us with digital information and lets us use natural hand gestures to interact with that information. It is based on the concepts of augmented reality and has well implemented the perceptions of it. Sixth sense technology has integrated the real world objects with digital world. The fabulous 6th sense technology is a blend of many exquisite technologies. The thing which makes it magnificent is the marvellous integration of all those technologies and presents it into a single portable and economical product. It associates technologies like hand gesture recognition, image capturing, processing, and manipulation, etc. It superimposes the digital world on the real world.

Sixth sense technology is a perception of augmented reality concept. Like senses enable us to perceive information about the environment in different ways it also aims at perceiving information. Sixth sense is in fact, about comprehending information more than our available senses. And today there is not just this physical world from where we get information but also the digital world which has become a part of our life. This digital world is now as important to us as this physical world. And with the internet the digital world can be expanded many times the physical world. God hasn't given us sense to interact with the digital world so we have created them like smart phones, tablets, computers, laptops, net books, PDAs, music players, and others gadgets. These gadgets enable us to communicate with the digital world around us.

But we're humans and our physical body isn't meant for digital world so we can't interact directly to the digital world. For instance we press

keys to dial a number; we type text to search it and so on. This means for an individual to communicate with the digital world he/she must learn it. We don't communicate directly and efficiently to the digital world as we do with the real world. The sixth sense technology is all about interacting to the digital world in most efficient and direct way. Hence, it wouldn't be wrong to conclude sixth sense technology as gateway between digital and real world. Before Wear Ur World (WuW) came there were other methods like speech recognition software, touch recognition etc., which empowered us with direct interfacing.

This WuW or sixth sense device invented by Pranav Mistry is a prototype of next level of digital to real world interfacing. It comprises of a camera, a projector, a mobile cum computing device and colored sensors which are put on the fingers of a human being. The device efficiently senses the motion of the colored markers. Using them it provides us the freedom of directly interacting with the digital world. This technology enables people to interact in the digital world as if they are interacting in the real world.

Why choose sixth sense technology?

Humans take decisions after acquiring inputs from the senses. But the information we collect aren't enough to result in the right decisions. But the information which could help making a good decision is largely available on internet. Although the information can be gathered by connecting devices like computers and mobiles but they are restricted to the screen and there is no direct interaction between the tangible physical world and intangible digital world. This sixth sense technology provides us with the freedom of

interacting with the digital world with hand gestures. This technology has a wide application in the field of artificial intelligence. This methodology can aid in synthesis of bots that will be able to interact with humans.

Working

The sixth sense technology uses different technologies like gesture recognition, image processing, etc. At present the commercial product isn't launched but the prototype is prepared. The sixth sense prototype is made using very common and easily available equipments like pocket projector, a mirror, mobile components, color markers and a camera.

Prototype Equipped With Pocket Projector, Mobile Components, Mirror, Colour Markers, and Camera

The projector projects visual images on a surface. This surface can be wall, table, book or even your hand. Thus, the entire world is available on your screen now. When user moves their hands to form different movements with colored markers on the finger tips, the camera captures these movements. Both the projector and the camera are connected to the mobile computing device in the user's pocket. Recognition is made using computer vision technique. These markers act as visual

tracking fiducials. The software program processes this video stream data and interprets the movements into gestures. The gestures are different from one another and are assigned some commands. These gestures can act as input to application which is projected by the projector. Since, the projector is aligned downwards for compactness; therefore images would be formed at the user's feet if mirror wasn't used. The mirror reflects the image formed by the projector to front. The entire hardware is fabricated in the form of a pendent. The entire product cost around $ 350 and that also because of projector. It works very similar like a touch screen phone with entire world as the screen.

Evolution of Sixth Sense Technology

Steve Mann is considered as the father of Sixth Sense technology who made a wearable computer in 1990. He implemented the Sixth Sense technology as the neck worn projector with a camera system. He was a media lab student at that time. Then his work was carried forward by Pranav Mistry, an Indian research assistant in MIT Media Lab. He came up with exciting new applications from this technology. Sixth sense technology was developed at media labs in MIT and coined as Wear Ur World (WUW). The inventors have filed patent under the name Wear Ur World (WUW) in February 2010.

Application

Fingers as brush: The user can draw anything on paint with the help of his fingers. This drawing can be 3D also. Hence, no need to use mouse.

Capturing Photo Using Fingers

Capture photos with fingers: using the fingers the user can capture photos hence, no need to carry an additional gizmo. The box created by the fingers act as frame for capturing photo.

Dialer Projected on Palm to Make Calls

Palm is the new dialer: this technology enables the user to call without using the dialer. The dialer will be projected on palm and the user can dial the number using other hand.

Read Books easily: Check out the ratings of the Book you are going to buy, it checks the ratings from the internet. And another amazing thing is that it reads the book for you.

Video Newspapers: like the video newspapers of Harry Potter this technology identifies the news headline and then projects the relevant video.

Checking the Flight Status

Check your Flight Status: Just place the ticket in front of the projector and it checks its status from the internet.

Clock Projected On the User's Hand

Clock: the user just needs to make gesture of clock and the watch will be projected on the user's hand.

Possibility to Access Internet On Any Surface

Access anywhere internet: the users can browse internet on any surface even on their palm.

Conclusion

This technology has seamless applications. This can be used as a replacement of the 5th senses for handicapped peoples. This can provide easy control over machineries in industry. This will have different application for different developers just depending upon how he imagines and what he wants. So, considering its widespread applications the inventor Pranav Mistry has decided to make its software open source. This will enable individuals to make their own application depending upon needs and imagination. As this technology will emerge may be new devices and hence forth new markets will evolve. Some existing devices and technologies will be discontinued but one thing is guaranteed it will write a new chapter in history of science and technology.

Artificial Intelligence in Power Station

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Introduction:

An electric power system is a network of electrical components used to supply, transmit and use electric power. Power systems engineering is a subdivision of electrical engineering that deals with the generation, transmission, distribution and utilisation of electric power and the electrical devices connected to such systems like generators, motors and transformers.

Commonly, artificial intelligence is known to be the intelligence exhibited by machines and software, for example, robots and computer programs. The term is generally used for developing systems equipped with the intellectual features and characteristics of humans, like the ability to think, reason, generalize, distinguish, learn from past experience or rectify their mistakes. It generally refers to machines or programs with ability to think on an independent level from their operator to make decisions.

Need for AI in Power Systems:

Power system analysis by conventional techniques becomes more difficult because of: Complex, versatile and large amount of information used in calculation, diagnosis and maintenance of systems. Increase in data handling and processing time due to the vast data generated during such processes been accepted,

Types of Major Power Plants

1) Thermal power plants
2) Hydal power plants
3) Nuclear power plants

Thermal Power Plant:

A **thermal power station** is a power plant in which heat energy is converted to electric power. In most of the world the prime movers is steam driven. Water is heated, turns into steam and spins a steam turbine which drives an electrical generator. After it passes through the turbine, the steam is condensed in a condenser and recycled to where it was heated; this is known as a Rankine cycle. The greatest variation in the design of thermal power stations is due to the different heat sources, fossil fuel dominates here, although nuclear heat energy and solar heat energy are also used.

In a thermal power station fuel such as coal, oil or gas is burned in a furnace to produce heat - chemical to heat energy. This heat is used to change water into steam in the boiler. this drives the generator to produce electricity .i.e,kinetic to electrical energy.
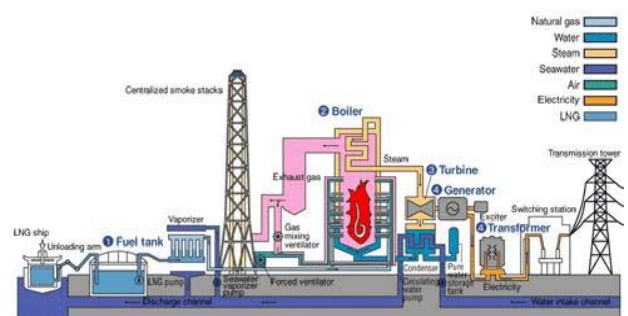

Nuclear Power Plant:

Nuclear plants, like plants that burn coal, oil and natural gas, produce electricity by boiling water into steam. This steam then turns turbines to produce electricity. The difference is that nuclear plants do not burn anything. Instead, they use

uranium fuel, consisting of solid ceramic pellets, to produce electricity through a process called fission.

Nuclear power plants obtain the heat needed to produce steam through a physical process. This process, called fission, entails the splitting of atoms of uranium in a nuclear reactor. The uranium fuel consists of small, hard ceramic pellets that are packaged into long, vertical tubes. Bundles of this fuel are inserted into the reactor.

Commercial nuclear power plants in the are either boiling water reactors or pressurized water reactors. Approximately two-thirds of the reactors in the area pressurized water reactors, and one-third of them are boiling water reactors.
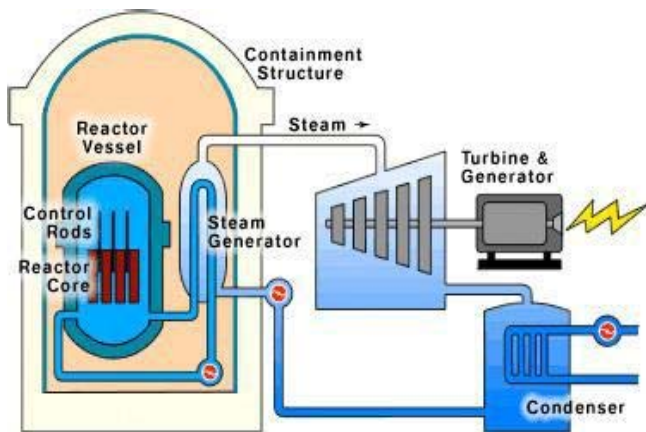
Hydro Power Plant:

In **Hydro Power Plant** we use gravitational force of fluid water to run the turbine which is coupled with electric generator to produce electricity. This power plant plays an important role in protecting our fossil fuel which is limited, because the electricity generated is due to the use of water which is a renewable source of energy .The force of the water being released from the reservoir through the dam spins the blades of a giant turbine. The turbine is connected to the generator that makes electricity as it spins. After passing through the turbine, the water flows back into the river on the other side of the dam.
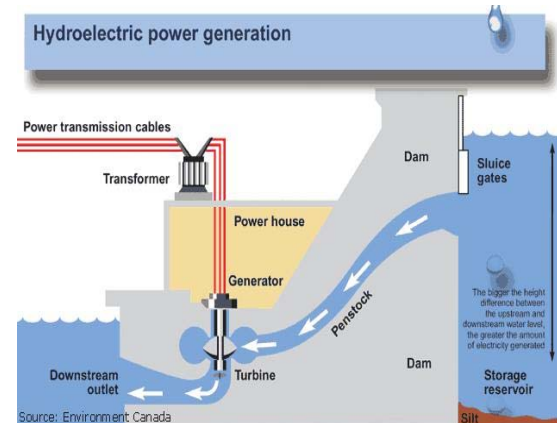
Artificial Intelligence Techniques

Artificial Neural Networks:

Artificial Neural Networks are systems designed based on organic thought processes which convert a set of inputs into a set of outputs by a network of neurons. Each neuron produces one output as a function of inputs. These system are used in real world applications wherein the need for classification of patterns and pattern recognition arises.

They are classified by their architecture: number of layers and topology, connectivity pattern, feed forward or recurrent.

Input Layer: The nodes are input units which do not process the data and information but distribute this data and information to other units.

Hidden Layers: The nodes are hidden units that are not directly evident and visible. They provide the networks the ability to map or classify the nonlinear problems.

Output Layer: The nodes are output units, which encode possible values to be allocated to the case under consideration.
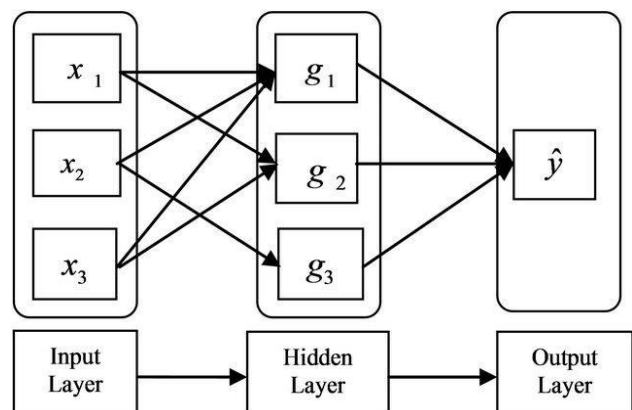
Application in Power Systems:

As they are designed to perform biological based evaluation of problems due to their inherent design, They are suitable for obtaining solutions to problems arising in power generation, distribution and transmission. Based on the constraints of a practical transmission system , taking into account factors such as environmental factors and other unbalancing features, ANN's can arrive at a solution.

Disadvantages:

(i) Large dimensionality.

(ii) Results are always generated even if the input data are unreasonable.

(iii) They are not scalable i.e. once an ANN is trained to do certain task, it is difficult to extend for other tasks without retraining the neural network.
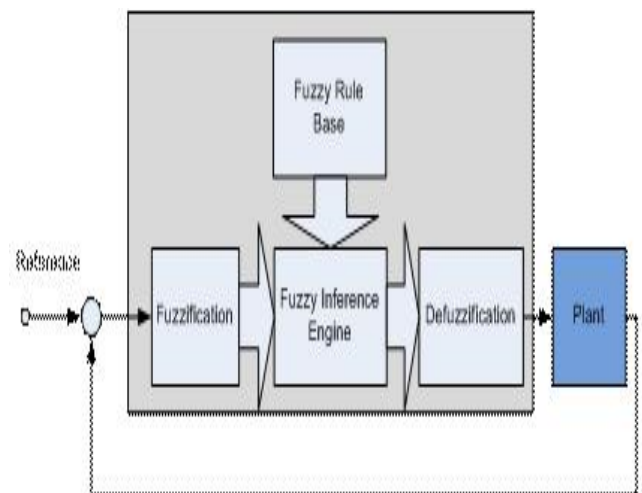
Fuzzy logic:

Fuzzy logic or Fuzzy systems are logical systems for standardisation and formalisation of approximate reasoning. It is similar to human decision making with an ability to produce exact and accurate solutions from certain or even approximate information and data. The reasoning in fuzzy logic is similar to human reasoning. Fuzzy logic is the way like which human brain works, and we can use this technology in machines so that they can perform somewhat like humans. Fuzzification provides superior expressive power, higher generality and an improved capability to model complex problems at low or moderate solution cost.

Fuzzy logic allows a particular level of ambiguity throughout an analysis. Because this ambiguity can specify available information and minimise problem complexity, fuzzy logic is useful in many applications. For power systems, fuzzy logic is suitable for applications in many areas where the available information involves uncertainty. For example, a problem might involve logical reasoning, but can be applied to numerical, other than symbolic inputs and outputs. Fuzzy logic provide the conversions from numerical to symbolic inputs, and back again for the outputs.

Fuzzy Logic Controller:

`````Simply put, it is a fuzzy code designed to control something, generally mechanical input. They can be in software or hardware mode and can be used in anything from small circuits to large mainframes. Adaptive fuzzy controllers learn to control complex process much similar to as we do.



Advantages:

(i) Stability analysis and enhancement

(ii) Power system control

(iii) Fault diagnosis

(iv) Security assessment

(v) Load forecasting

(vi) Reactive power planning and its control

(vii) State estimation

Application in Power Systems:

Fuzzy logic can be used for designing the physical components of power systems. They can be used in anything from small circuits to large mainframes. They can be used to increase the efficiency of the components used in power systems. As most of the data used in power system

analysis are approximate values and assumptions, fuzzy logic can be of great use to derive a stable, exact and ambiguity-free output.

*Expert Systems:*

An expert system obtains the knowledge of a human expert in a narrow specified domain into a machine implementable form. Expert systems are computer programs which have proficiency and competence in a particular field. This knowledge is generally stored separately from the program's procedural part and may be stored in one of the many forms, like rules, decision trees, models, and frames. They are also called as knowledge based systems or rule based systems. Expert systems use the interface mechanism and knowledge to solve problems which cannot be or difficult to be solved by human skill and intellect.



Advantages:

(i)It is permanent and consistent.

(ii) It can be easily documented.

(iii)It can be easily transferred or reproduced.

Disadvantage:

Expert Systems are unable to learn or adapt to new problems or situations.

Applications:

Many areas of applications in power systems match the abilities of expert systems like decision making, archiving knowledge, and solving problems by reasoning, heuristics and judgment. Expert systems are especially useful for these problems when a large amount of data and information must be processed in a short period of time.

**How expert systems can be used in power systems**:

Since expert systems are basically computer programs, the process of writing codes for these programs is simpler than actually calculating and estimating the value of parameters used in generation, transmission and distribution. Any modifications even after design can be easily done because they are computer programs. Virtually, estimation of these values can be done and further research for increasing the efficiency of the process can be also performed density $B$ or magnetic field strength symbolized as $\mu_0 H$. Use the center dot to separate compound units, e.g., "A·m$^2$."

**Current Application of AI in Power Systems**

Several problems in power systems cannot be solved by conventional techniques are based on several requirements which may not feasible all the time. In these situations, artificial intelligence techniques are the obvious and the only option. Areas of application of AI in power systems are:

- Replacing human workers for dangerous and highly specialized operations, such as live maintenance of high voltage transmission lines, has been a long standing effect in the power community.

- Operation in hazardous environments, such as radioactive locations in nuclear plants, access to tight spaces, such as cable viaducts and cooling pipes, and precise positioning of measurement equipment.

- Expert systems use the interface mechanism and knowledge to solve problems which cannot be or difficult to be solved by human skill and intellect.

- Results are permanent and consistent can be easily documented. Results can be easily transferred and reproduced.

- The understanding of the working of neurons and the pattern of their interconnection can be used to construct computers for solving real world problems of classification of patterns and pattern recognition.

- Fuzzification provides superior expressive power, higher generality and an improved capability to model complex problems at low or moderate solution cost.

- Stability analysis and enhancement.

- Power system control.

- Fault diagnosis.

- Load forecasting.

- Reactive power planning and its control.

- Operation of power system like unit commitment, hydro-thermal coordination, economic dispatch, congestion management, maintenance scheduling, state estimation, load and power flow.

- Planning of power system like generation expansion planning, power system reliability, transmission expansion planning, reactive power planning.

- Control of power system like voltage control, stability control, power flow control, load frequency control.

- Control of power plants like fuel cells power plant control, thermal power plant control.

- Automation of power system like restoration, management, fault diagnosis, network security.

- Can be used in anything from small circuits to large mainframes.

- Can be used to increase the efficiency of the components used in power systems.

As most of the data used in power system analysis are approximate values and assumptions, fuzzy logic can be of great use to derive a stable, exact and ambiguity free output.

**Conclusion**

The main feature of power system design and planning is reliability, which was conventionally evaluated using deterministic methods. Moreover, conventional techniques do not fulfil the probabilistic essence of power systems. This leads to increase in operating and maintenance costs. Plenty of research is performed to utilize the current interest AI for power system applications. A lot of research is yet to be performed to perceive full advantages of this upcoming technology for improving the efficiency of electricity market investment, distributed control and monitoring, efficient system analysis particularly power systems which use renewable energy resources for operation.

# Blue Eyes Sensor Technology

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## Introduction

Imagine yourself in a world where humans interact with computers. You are sitting in front of your personal computer that can listen, talk, or even scream aloud. It has the ability to gather information about you and interact with you through special techniques like facial recognition, speech recognition, etc. It can even understand your emotions at the touch of the mouse. It verifies your identity, feels your presents, and starts interacting with you. You ask the computer to dial to your friend at his office. It realizes the urgency of the situation through the mouse, dials your friend at his office, and establishes a connection.

The BLUE EYES sensor technology aims at creating computational machines that have perceptual and sensory ability like those of human beings. Employing most modern video cameras and microphones to identify the user' sanctions through the use of imparted sensory abilities. The machine can understand what a user wants, where he is looking at, and even realize his physical or emotional states. The U.S. computer giant, IBM has been conducting research on the Blue Eyes technology at its Alma den Research Center (ARC) in San Jose, Cal if, since 1997. The ARC is IBMs main laboratory for basic research. The primary objective of the research is to give a computer the ability of the human being to assess a situation by using the senses of sight, hearing and touch. Animal survival depends on highly developed sensory abilities. Likewise, human cognition depends on highly developed abilities to perceive, integrate, and interpret visual, auditory, and touch information. Without a doubt, computers would be much more powerful if they had even a small fraction of the perceptual ability of animals or humans. Adding such perceptual abilities to computers would enable computers and humans to work together more as partners. Toward this end, the Blue Eyes project aims at creating computational devices with the sort of perceptual abilities that people take for granted. Thus Blue eyes are the technology to make computers sense and understand human behavior and feelings and react in the proper ways.

TECHNOLOGIES USED

1. Emotion Mouse This is the mouse embedded with sensors that can sense the physiological attributes such as temperature, Body pressure, pulse rate, and touching style, etc. The computer can determine the user's emotional states by a single touch.

IBM is still Performing research on this mouse and will be available in the market within the next two or three years. The expected accuracy is 75%. One goal of human computer interaction (HCI) is to make an adaptive, smart computer system.

2.   Magic Pointing We programmed the two MAGIC pointing techniques on a Windows NT system. The techniques work independently from the applications. The MAGIC pointing program takes data from both the manual input device (of any type, such as a mouse) and the eye tracking system running either on the same machine or on another machine connected via serial port. Raw data from an eye tracker cannot be directly used for gaze based interaction, due to noise from image processing, eye movement jitters, and samples taken during saccade (ballistic eye movement) periods. We experimented with various filtering techniques and found the most effective filter in our case is similar to that .The goal of filter design in general is to make the best compromise     between     preserving     signal bandwidth and eliminating unwanted noise.

In the case of eye tracking, as Jacob argued, eye information relevant to interaction lies in the fixations. The key is to select fixation points with minimal delay. Samples collected during a saccade are unwanted and should be avoided. In designing our algorithm for picking points of fixation, we considered our tracking system speed (30 Hz), and that the MAGIC pointing techniques utilize gaze information only once for each new target, probably immediately after a saccade. Our filtering algorithm was designed to pick a fixation with minimum delay by means of selecting two adjacent points over two Samples.

3.   Artificial Intelligence Speech Recognition It is important to consider the environment in which the speech recognition system has to work. The grammar used by the speaker and accepted by the system, noise level, noise type, position of the microphone, and speed and manner of the user's speech are some factors that may affect the quality of speech recognition. When you dial the telephone number of a big company, you are likely to hear the sonorous voice of a cultured lady who responds to your call with great courtesy saying "Welcome to company X. Please give me the extension number you want". You pronounce the extension number, your name, and the name of person you want to contact. If the called person accepts the call, the connection is given quickly. This is artificial intelligence where an automatic call-handling system is used without employing any telephone operator.

4. SUITOR The Simple User Interest Tracker (SUITOR) is a revolutionary approach in this

direction. By observing the Webpage at bedizen is browsing, the SUITOR can help by fetching more information at his desktop. By simply noticing where the user's eyes focus on the computer screen, the SUITOR can be more precise in determining his topic of interest. The Alma den cognitive scientist who invented SUITOR, "the system presents the latest stock price or business news stories that could affect IBM. If I read the headline off the ticker, it pops up the story in a browser window. If I start to read the story, it adds related stories to the ticker. That the whole idea of an attentive system— one that attends to what you are doing, typing, reading, so that it can attend to your information needs. 5. Eye Movement Sensor Since the goal of this work is to explore MAGIC pointing as a user interface technique, we started out by purchasing a commercial eye tracker (ASL Model 5000) after a market survey. In comparison to the system reported in early studies. This system is much more compact and reliable. However, we felt that it was still not robust enough for a variety of people with different eye characteristics, such as pupil brightness and correction glasses. We hence chose to develop and use our own eye tracking system [10]. Available commercial systems, such as those made by ISCAN Incorporated, LC Technologies, and Applied Science Laboratories (ASL), rely on a single light source that is positioned either off the camera axis in the case of the ISCANETL-400 systems, or on-axis in the case of the LCT and the ASL E504 systems. Illumination from an off-axis source (or ambient

illumination) generates a dark pupil image. When the light source is placed on-axis with the camera optical axis, the camera is able to detect the light reflected from the interior of the eye, and the image of the pupil appears bright.



Bright (left) and dark (right) pupil images resulting from on- and off-axis illumination. The glints, or corneal reflections, from the on- and off-axis light sources can be easily identified as the bright points in the iris. The Alma den system uses two near infrared (IR) time multiplexed light sources, composed of two sets of IR LED's, which were synchronized with the camera frame rate. One light source is placed very close to the camera's optical axis and is synchronized with the even frames. Odd frames are synchronized with the second light source, positioned off axis. The two light sources are calibrated to provide approximately equivalent whole-scene illumination. Pupil detection is realized by means of subtracting the dark pupil image from the bright pupil image. After thresholding the difference, the largest connected component is identified as the pupil. This technique significantly increases the robustness and

reliability of the eye tracking system. After implementing our system with satisfactory results, we Discovered that similar pupil detection schemes had been independently developed by Tomonoetal and Ebisawa and Satoh

It is unfortunate that such a method has not been used in the commercial systems. We recommend that future eye tracking product designers consider such an approach. Once the pupil has been detected, the corneal reflection (the glint reflected from the surface of the cornea due to one of the light sources) is determined from the dark pupil image. The reflection is then used to estimate the user's point of gaze in terms of the screen coordinates where the user is looking at. The estimation of the user's gaze requires an initial calibration procedure, similar to that required by commercial eye trackers. Our system operates at 30 frames per second on a Pentium II 333 MHz machine running Windows NT. It can work with any PCI frame grabber compatible with Video for Windows.

**Architecture**

Blue Eyes - the system developed intended to be the complex solution for monitoring and recording the operator's conscious brain involvement as well as his physiological condition. This required designing a Personal Area Network linking all the operators and the supervising system. As the operator using his sight and hearing senses the state of the controlled system, the supervising system will look after his physiological condition.



**Advantages**

- Prevention from dangerous incidents
- Human-operators physiological condition.

The key features of the system are:

- visual attention monitoring (eye motility analysis)
- physiological condition monitoring (pulse rate, blood oxygenation)
- operator's position detection (standing, lying)
  □ wireless data acquisition using Bluetooth technology
- real-time user-defined alarm triggering
- physiological data, operator's voice and
- overall view of the control
- room recording
- recorded data playback

Blue Eyes system can be applied in every working environment requiring permanent operator's attention:

- at power plant control rooms
- at captain bridges
- at flight control centers

Data security - This system implies data security which is require in the modern network system.

- Only registered mobile devices can connect to the system
- Bluetooth connection authentication & encryption
- Access rights restrictions
- Personal and physiological data encryption

**APPLICATIONS**

1. One of the main benefits of speech recognition system is that it lets user do other works simultaneously. The user can concentrate on observation and manual operations, and still control the machinery by voice input commands.

2. Engineers at IBM's office: smart tags Research Center in San Jose, CA, report that a number of large retailers have implemented surveillance systems that record and interpret customer movements, using software from Alma den's Blue Eyes research project. Blue Eyes is developing ways for computers to anticipate users' wants by gathering video data on eye movement and facial expression. Your gaze might rest on a Web site heading, for example, and that would prompt your computer to find similar links and to call them up in a new window. But the first practical use for the research turns out to be snooping on shoppers.

3. It can be used in the field of security & controlling, where the contribution of human operator required in whole time.



4. Another application would be in the automobile industry. By simply touching a computer input device such as a mouse, the computer system is designed to be able to determine a person's emotional state.



5. Another major application of speech processing is in military operations. Voice control of weapons is an example. With reliable speech recognition equipment, pilots can give commands

and information to the computers by simply speaking into their microphones—they don't have to use their hands for this purpose.

6. Another good example is a radiologist scanning hundreds of X-rays, ultra sonograms, CT scans and simultaneously dictating conclusions to a speech recognition system connected to word processors. The radiologist can focus his attention on the images rather than writing the text.

7. Voice recognition could also be used on computers for making airline and hotel reservations. A user requires simply stating his needs, to make reservation, cancel a reservation, or making enquiries about schedule.

**Conclusion**

The nineties witnessed quantum leaps interface designing for improved man machine interactions. The Blue Eyes Sensor technology ensures a convenient way of simplifying the life by providing more delicate and user friendly facilities in computing devices. Now that we have proven the method, the next step is to improve the hardware. Instead of using cumbersome modules to gather information about the user, it will be better to use smaller and less intrusive units. The day is not far when this technology will push its way into your house hold, making you more lazy.

It may even reach your hand held mobile device. Any way this is only a technological forecast. In future it is possible to create a computer which can interact with us as we interact each other with the use of blue eye technology. It seems to be a fiction, but it will be the life lead by "**Blue Eyes**" in the very near future. Ordinary household device such as televisions, refrigerators, and ovens -- may be able to do their jobs when we look at them and speak to them.

# LED Lighting

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## Introduction

The light-emitting diode (LED) is one of today's most energy-efficient and rapidly-developing lighting technologies. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting.



## Energy Savings

LED is a highly energy efficient lighting technology, and has the potential to fundamentally change the future of lighting in the United States. Residential LEDs -- especially ENERGY STAR rated products -- use at least 75% less energy, and last 25 times longer, than incandescent lighting.

Widespread use of LED lighting has the greatest potential impact on energy savings in the United States. By 2027, widespread use of LEDs could save about 348 TWh (compared to no LED use) of electricity: This is the equivalent annual electrical output of 44 large electric power plants (1000 megawatts each), and a total savings of more than $30 billion at today's electricity prices.

## How LEDs are Different

LED lighting is very different from other lighting sources such as incandescent bulbs and CFLs. Key differences include the following:

- Light Source: LEDs are the size of a fleck of pepper, and a mix of red, green, and blue LEDs is typically used to make white light.
- Direction: LEDs emit light in a specific direction, reducing the need for reflectors and diffusers that can trap light. This feature makes LEDs more efficient for many uses such as recessed downlights and task lighting. With other types of lighting, the light must be reflected to the desired direction and more than half of the light may never leave the fixture.
- Heat: LEDs emit very little heat. In comparison, incandescent bulbs release 90% of their energy as heat and CFLs release about 80% of their energy as heat.

## LED Products

LED lighting is currently available in a wide variety of home and industrial products, and the list is growing every year. The rapid development of LED technology leads to more products and improved manufacturing efficiency, which also results in lower prices. Below are some of the most common types of LED products.

## Industrial and Commercial Lighting



The high efficiency and directional nature of LEDs makes them ideal for many industrial uses. LEDs are increasingly common in street lights, parking garage lighting, walkway and other outdoor area lighting, refrigerated case lighting, modular lighting, and task lighting.

## Kitchen Under-Cabinet Lighting



Because LEDs are small and directional, they are ideal for lighting countertops for cooking and reading recipes. The color can appear more cool or blue than is typically desirable in a kitchen, and there can be some excessive shadowing in some fixtures, so it is important to compare products to find the best fixture for your space.

## Recessed Downlights



Recessed downlights are commonly used in residential kitchens, hallways, and bathrooms, and in a number of office and commercial settings. DOE estimates there are at least 500 million recessed downlights installed in U.S. homes, and more than 20 million are sold each year. Both CFL and LED technology can decrease downlight wattage by 75% or more.

## LED Replacement Bulbs

With performance improvements and dropping prices, LED lamps can replace 40, 60, and even 75 Watt incandescent bulbs. It's important to read the Lighting Facts Label to make sure the product is the right brightness and color for the intended location. When chosen carefully, LED replacement products can be an excellent option.

## LED Holiday Lights



LEDs consume far less electricity than incandescent bulbs, and decorative LED light strings such as Christmas tree lights are no different. Not only do LED holiday lights consume

less electricity, they also have the following advantages:

- Safer: LEDs are much cooler than incandescent lights, reducing the risk of combustion or burnt fingers.
- Sturdier: LEDs are made with epoxy lenses, not glass, and are much more resistant to breakage.
- Longer lasting: The same LED string could still be in use 40 holiday seasons from now.
- Easier to install: Up to 25 strings of LEDs can be connected end-to-end without overloading a wall socket.

Estimated cost of electricity to light a six-foot tree for 12 hours a day for 40 days

| TYPE OF LIGHT | COST |
|---|---|
| Incandescent C-9 lights | $10.00 |
| LED C-9 lights | $0.27 |
| Incandescent Mini-lights | $2.74 |

| TYPE OF LIGHT | COST |
|---|---|
| LED Mini-lights | $0.82 |

**Estimated cost\* of buying and operating lights for 10 holiday seasons**

| Type of Light | Cost |
|---|---|
| Incandescent C-9 lights | $122.19 |
| LED C-9 lights | $17.99 |
| Incandescent Mini-lights | $55.62 |
| LED Mini-lights | $33.29 |

\*Assumes 50 C-9 bulbs and 200 mini-lights per tree, with electricity at $0.119 per kilowatt-hour (kWh) (AEO 2012 Residential Average). Prices of lights based on quoted prices for low volume purchases from major home improvement retailers. All costs have been discounted at an annual rate of 5.6%. Life span assumed to be three seasons (1,500 hours) for non-LED lights.

## Program Outcomes (POs)

| | |
|---|---|
| PO1 | **Engineering Knowledge:** Apply the knowledge of mathematics, science, and engineering fundamentals to solve the complex electrical engineering problems. |
| PO2 | **Problem Analysis:** Identify, formulate, review research literature, and analyze complex Electrical and Electronics Engineering problems enabling attainment of conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| PO3 | **Design/Development of Solutions:** Design solutions, components or process for complex Electrical Engineering problems to meet the specified needs considering public health, safety and environmental considerations. |
| PO4 | **Conduct Investigations of complex problems:** Exercise research knowledge and technical methodology for design, analysis and interpretation of data to converge to a suitable solution. |
| PO5 | **Modern Tool Usage**: Use modern engineering tools, softwares and equipments to predict, analyze and model engineering problems. |
| PO6 | **The Engineer & Society:** Apply reasoning skills to assess societal, health, safety, legal and cultural issues relevant to the professional engineering practice and take consequent responsibilities in the society |
| PO7 | **Environment and Sustainability:** Realize the impact of the professional engineering solutions and demonstrate the knowledge for sustainable development in environmental context |
| PO8 | **Ethics:** Apply and realize the professional ethics and responsibilities in Electrical engineering practice. |
| PO9 | **Individual and Team Work:** Exhibit Individuality, Leadership and Team spirit in multidisciplinary settings. |
| PO10 | **Communication:** Communicate, comprehend, write reports, design documentation and presentation effectively on complex engineering activities |
| PO11 | **Project Management & Finance:** Demonstrate the Electrical engineering and management principles adhering to financial strategies to manage projects as a member or leader in a team |
| PO12 | **Life Long Learning:** Inculcate independent and life-long learning in the broadest context of technological change. |

## Program Specific Outcomes (PSOs)

**PSO 1: Electrical drives and control:** Graduates will Analyze, design and provide Engineering solutions in the field of Power Electronics and Drives

**PSO 2: Embedded system:** Graduates will Simulate, experiment and solve complex problems in Embedded System.

# KSR INSTITUTE FOR ENGINEERING AND TECHNOLOGY

## VISION

To become a globally recognized Institution in Engineering Education, Research and Entrepreneurship.

## MISSION

- ❖ Accomplish quality education through improved teaching learning process.
- ❖ Enrich technical skills with state of the art laboratories and facilities.
- ❖ Enhance research and entrepreneurship activities to meet the industrial and societal needs.

# Department of EEE

## VISION

To produce world class Electrical and Electronics Technocrats and Entrepreneurs with social responsibilities.

## MISSION

- ❖ Impart quality education in the field of Electrical and Electronics Engineering through state of the art learning ambience.
- ❖ Enrich interdisciplinary skills and promote research through continuous learning.

- ❖ Enhance professional ethics, entrepreneurship skills and social responsibilities to serve the nation.

# BEES Magazine

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