April-2021

ELECTRIQUE

-The Technical Magazine

Department of Electrical & Electronics Engineering

ADITYA COLLEGE OF ENGINEERING

Approved by AICTE,New Delhi and Affiliated to JNTUK,Kakinada
Aditya Nagar,ADB Road,Surampalem-533437

EDITORIAL BOARD

Chief-Editor

Mr.K.Manoz Kumar Reddy,
HOD, EEE Dept.

Faculty Editors

B.V.S S S Gopal,Asst.Prof,EEE

T.Himaja, Asst.Prof,EEE

Student Coordinators

B. Jaya Sree - 17MH1A0201

D.Govindaraju - 18MH5A0203

D. Kameswara Rao - 19MH5A0215

K.Ajay Narayana - 19MH5A0229

K. Ganga Sunny- 19MH1A0205

Contents

Vision & Mission *1*

1. Scientist Who Changed the World 2
2. Faculty Articles 3
3. Student Articles 6
4. Project Idea 9
5. Current issue 11
6. Crossword Puzzles 13
7. Riddles 14
8. From Books to Canvas 15
9. Inventions 17
10. Important websites 19

VISION

To be a leading department of Electrical Engineering Education and Research

MISSION

To produce quality engineers by providing state of the art engineering facilities

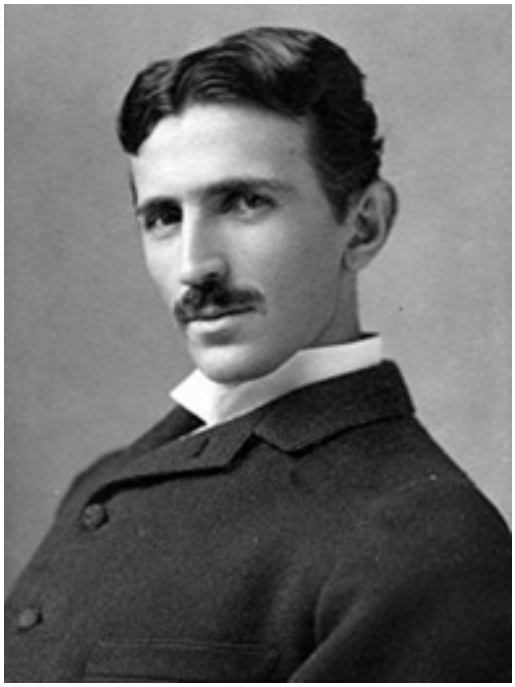
To impart skill based education and enhance knowledge on electric vehicles

To organize professional, cultural and social activities with collaborations

To promote training with institution and industry collaborations

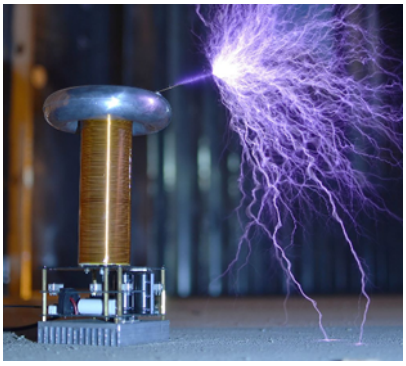
SCINTIST WHO CHANGED THE WORLD

Nikola Tesla



Nikola Tesla, (born July 9/10, 1856, Smiljan, Austrian Empire died January 7, 1943, New York, New York, U.S.), Tesla was from a family of Serbian origin. His father was an Orthodox priest; his mother was unschooled but highly intelligent. As he matured, he displayed remarkable imagination and creativity as well as a poetic touch. He is a Serbian American inventor and engineer who discovered and patented the rotating magnetic field, the basis of most alternating-current machinery. He also developed the three-phase system of electric power transmission. He immigrated to the United States in 1884 and sold the patent rights to his system of alternating-current dynamos, transformers, and motors to George Westinghouse. In 1891 he invented the Tesla coil, an induction coil widely used in radio technology.

Tesla was one of the most prolific and innovative engineers and inventors of the nineteenth and twentieth centuries. As previously mentioned, his illustrious inventive endeavors began in the early-1880s while he was working at the Central Telegraph Office in Budapest.However, there is little, if any, information about attempts to file any patents for his work at this time. Tesla's first-ever confirmed patent, for the electric arc lamp, was filed after his arrival in the United States, in March of 1884. The vast majority of his patents were filed after he left Edison's employ and founded his own company, Tesla Electric Light and Manufacturing. Up until 1928, Tesla appears to have protected many of his inventions with patents all across the world.



TESLA COIL

Tesla had intended the Tesla Coil to be part of a wireless power system and was a mainstay of many of Tesla’s other experiments.

Alternating Current

Alternating current is considered Tesla’s crowning achievement. While not the inventor of AC power, he made it easy to use widespread.

FACULTY ARTICLES

Internet of Things-Aided Smart Grid

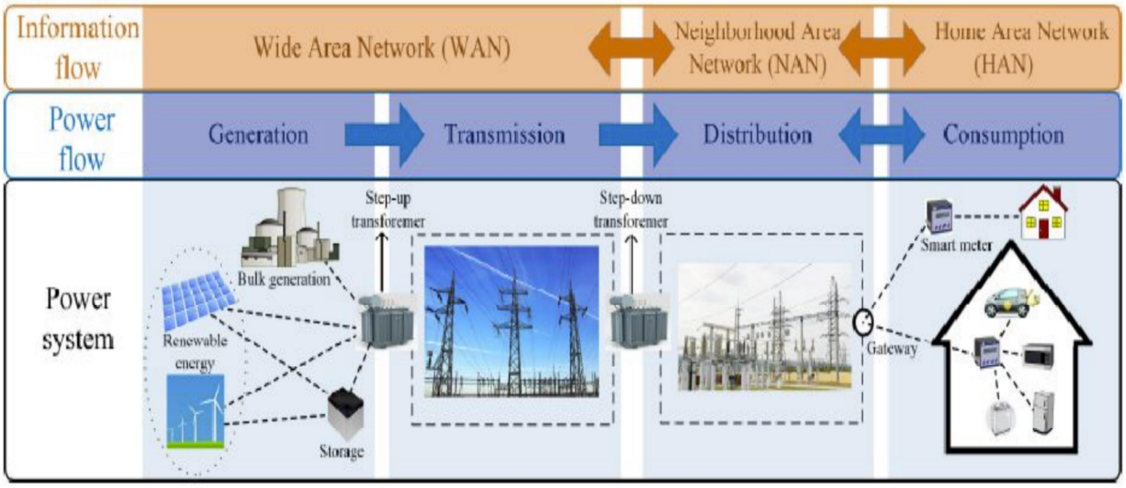
- Dr.M.Ravindra

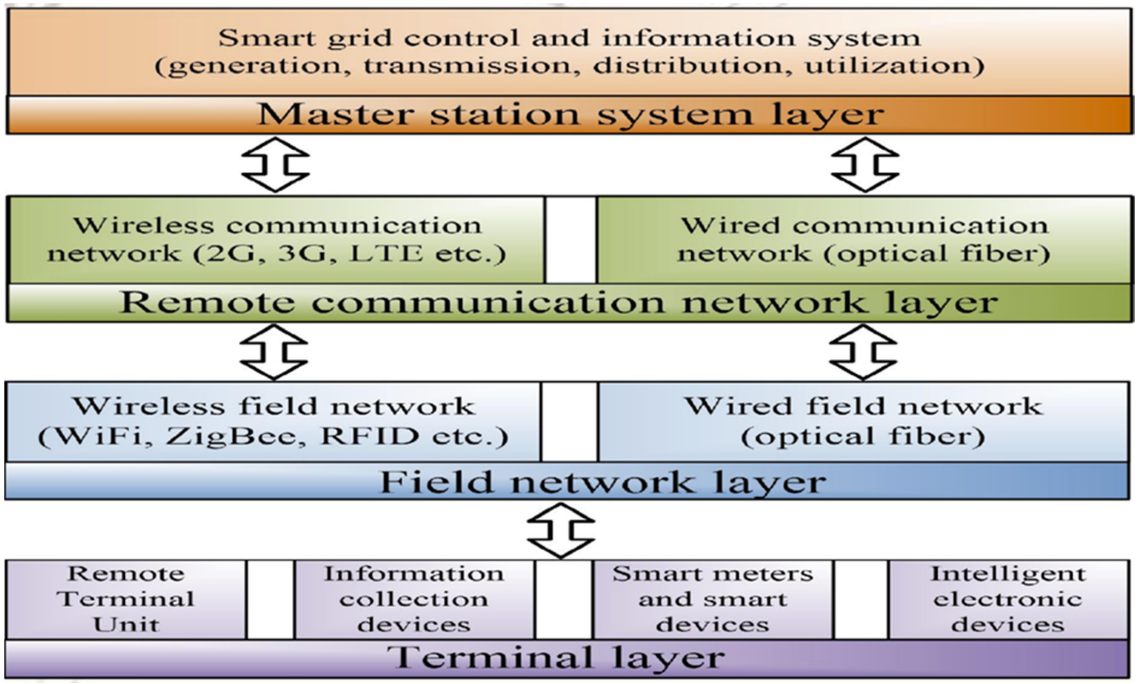
A traditional power grid consists of a large number of loosely interconnected synchronous Alternate Current (AC) grids. It performs three main functions: generation, transmission and distribution of electrical energy in which electric power flows only in one direction, i.e., from a service provider to the consumers. Firstly in power generation, a number of large power plants generate electrical energy, mostly from burning carbon and uranium based fuels. Secondly in power transmission, the electricity is transmitted from power plants to remote load centers through high voltage transmission lines. Thirdly in power distribution, the electrical distribution systems distribute electrical energy to the end consumers at reduced voltage. Each grid is centrally controlled and monitored to ensure that the power plants generate electrical energy in accordance with the needs of the consumers within the constraints of power systems. Nearly, all the generation, transmission and distribution of electrical energy is owned by the utility companies who provide electrical energy to consumers and bill them accordingly to recover their costs and earn profit. The traditional power grid worked very well from its inception in 1870 until 1970. Even though the consumers' demand for energy grew exponentially, it was still rather predictable. However, there has been a dramatic change in the nature of electrical energy consumption since 1970, as the load of electronic devices has become the fastest growing element of the total electricity demand and new sources of high electricity consumption have been developed, such as electric vehicles (EVs). The power grids endure a significant wastage of energy due to a number of factors, such as consumers' inefficient appliances and lack of smart technology, inefficient routing and dispensation of electrical energy, unreliable communication and monitoring, and most importantly, lack of a mechanism to store the generated electrical energy. Furthermore, power grids face some other challenges as well, including growing energy demand, reliability, security, emerging renewable energy sources and aging infrastructure problems to name a few. In order to solve these challenges, the Smart Grid (SG) paradigm has appeared as a promising solution with a variety of information and communication technologies. Such technologies can improve the effectiveness, efficiency, reliability, security, sustainability, stability and scalability of the traditional power grid. SG solves the problem of electrical energy wastage by generating electrical energy which closely matches the demand. SG helps to make important decisions according to the demand of energy, such as real time pricing, self healing, power consumption scheduling and optimized electrical energy usage. Such decisions can significantly improve the power quality as well as the efficiency of the grid by maintaining a balance between power generation and its usage. SG differs from traditional power grids in many aspects. For instance, SG offers a bi-directional communication flow between service providers and consumers, while a traditional power grid only offers only uni-directional communication from the service provider to the consumer. SG provides supervisory control and data acquisition (SCADA), advanced metering infrastructure (AMI), smart meters, fault tolerance, unauthorized usage detection, and load balancing , as well as self-healing, i.e., detection and recovery from faults.

SG deploys various types of devices for monitoring, analyzing and controlling the grid. Such monitoring devices are deployed at power plants, transmission lines, transmission towers and distribution centers and consumers premises. The numbers of such devices is large.

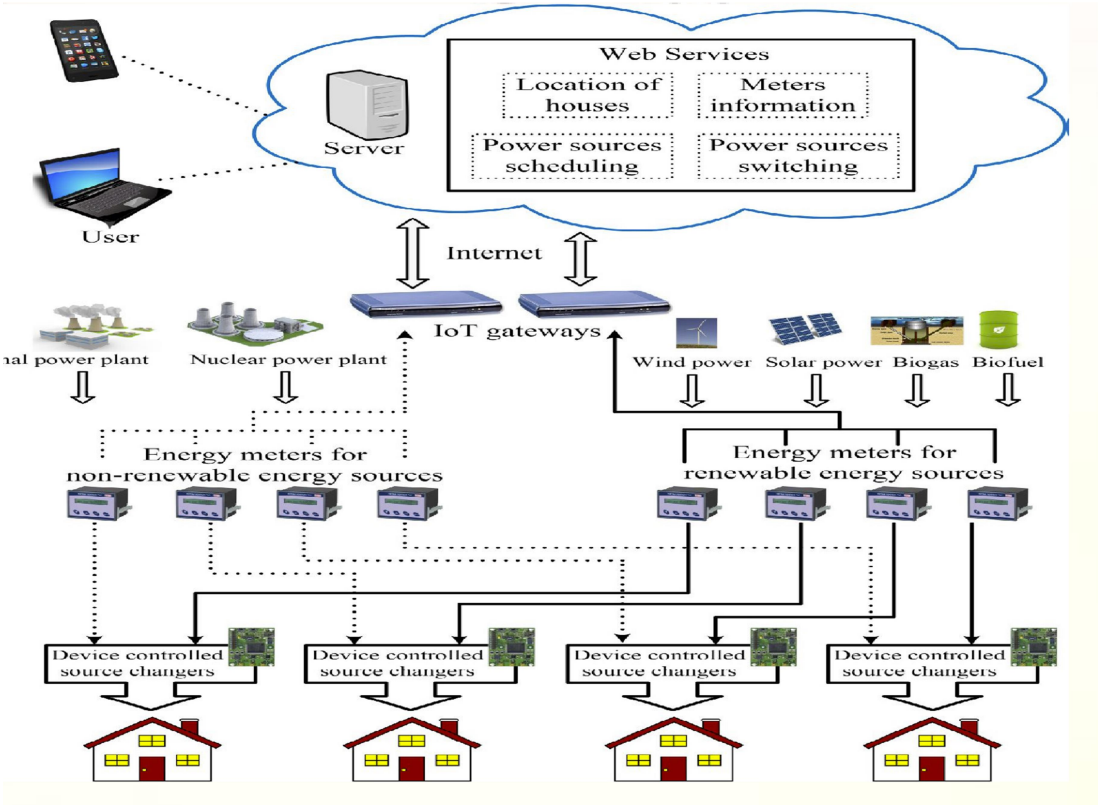
One of the main concerns for SG is the connectivity, automation and tracking of such large number of devices, which requires distributed monitoring, analysis and control through high speed, ubiquitous and two-way digital communications. It requires distributed automation of SG for such devices or "things". This is already being realized in the real world through the Internet of Things (IoT) technology.

IOT AS A PART OF SMART GRID:-





WEB ENABLED SMART GRID ARCHITECTURE:-



BIG DATA AND CLOUD FOR IOT-AIDED SG SYSTEMS:

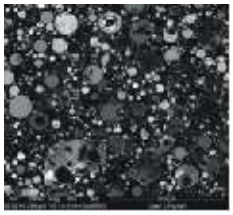
The integration of IoT technology with SG comes with a cost of managing huge volumes of data, with frequent processing and storage. Such data includes consumers load demand, energy consumption, network components status, power lines faults, advanced metering records, outage management records and forecast conditions. This means that the utility companies must have hardware and software capabilities to store, manage and process the collected data from IoT devices efficiently and effectively. Big data is defined as data with huge volume, variety and velocity (three V's). The high frequency of data collection by IoT devices in SG makes the data size very large. The variety is represented by the different sensors that produce different data. The data velocity represents the required speed for the data collection and processing. Hence, IoT-aided SG systems can apply the techniques of big data management and processing (such as hardware, software and algorithms).

CONCLUSION

Smart Grid (SG) is the future grid which solves the problems of uni-directional information flow, energy wastage, growing energy demand, reliability and security in the traditional power grid. The Internet of Things (IoT) technology provides connectivity anywhere and anytime. It helps SG by providing smart devices or IoT devices (such as sensors, actuators, and smart meters) for the monitoring, analysis and controlling the grid, as well as connectivity, automation and tracking of such devices. This realizes the IoT-aided SG system which supports and improves various network functions at the power generation, transmission, distribution, and utilization.

STUDENT ARTICLES

Fly Ash Utilization

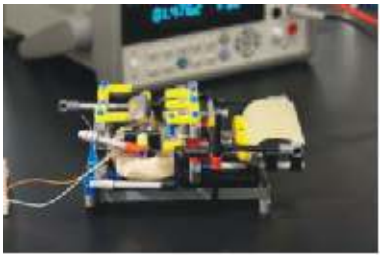


Fly ash, also known as flue-ash, is one of the residues generated in combustion, and comprises the fine particles that rise with the flue gases. Ash which does not rise is termed bottom ash. In an industrial context, fly ash usually refers to ash produced during combustion of coal. Fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys of coal-fired power plants, and together with bottom ash removed from the bottom of the furnace is in this case jointly known as coal ash. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide (SiO_2) (both amorphous and crystalline) and calcium oxide (CaO), both being endemic ingredients in many coal-bearing rock strata. Toxic constituents depend upon the specific coal bed makeup, but may include one or more of the following elements or substances in quantities from trace amounts to several percent: arsenic, beryllium, boron, cadmium, chromium, hexavalent chromium, cobalt, lead, manganese, mercury, molybdenum, selenium, strontium, thallium, and vanadium, along with dioxins and PAH compounds.

the fly ash may contain higher levels of contaminants than the bottom ash and mixing the fly and bottom ash together brings the proportional levels of contaminants within the range to qualify as non hazardous waste in a given state, whereas, unmixed, the fly ash would be within the range to qualify as hazardous waste. Heavy Water Board had initiated efforts to achieve full utilization of its fly ash being generated in the captive thermal power plant for its Heavy Water Plant at Manuguru. In this plant, there are 3 steam generators and 3 turbo generators each of 30 MW capacity. These units generate 600-900 tonnes of coal ash every day depending upon the ash content, which varies from 30-45%. As per the current practice, fly ash generated from coal-based power plants is disposed off in ash ponds in the form of wet slurries.

K.Harish
18MH5A0226.

Electricity with Bacteria-Coated Rubber



A new electric generator has a modest and unexpected energy source: A small strip of latex rubber coated with bacterial spores. The contraption makes use of the harmless soil bacterium Bacillus subtilis, which has a neat survival trick. When nutrients are scarce, it turns itself into a tough little spore that can withstand heat, desiccation, chemical assaults, radiation, and anything else the world can throw at it.

These spores respond to changes in humidity. When the air dries they shrivel up like grapes turning into raisins; when the air is moist they plump up again. Researchers from Harvard's Wyss Institute and several other universities realized they could harness that physical movement, and could make an actuator to generate electricity. The researchers slathered one side of a sheet of rubber with the bacterial spores. When the sheet dried it curled up, much like a leaf does after it falls from a tree. Increasing the humidity caused the sheet to straighten out again. Researcher OzgurSahin then built a humidity driven generator out of Legos, in which the spore-coated rubber acts as a cantilever that flips back and forth, driving a rotating magnet to produce electricity. Such a device, properly scaled up, could use the natural evaporation of water to generate useful amounts of clean electricity, the researchers say.

A.Karthik
18MH5A0222

Ultrasonic Motor

All of us know that motor is a machine which produces or imparts motion, or in detail it is an arrangement of coils and magnets that converts electric energy into mechanical energy and ultrasonic motors are the next generation motors.

In 1980,the world's first ultrasonic motor was invented which utilizes the piezoelectric effect in the ultrasonic frequency range to provide its motive force resulting in a motor with unusually good low speed, high torque and power to weight characteristics.

Electromagnetism has always been the driving force behind electric motor technology. But these motors suffer from many drawbacks. The field of ultrasonic seems to be changing that driving force.

Drawbacks of electromagnetic motors

Electromagnetic motors rely on the attraction and repulsion of magnetic fields for their operation. Without good noise suppression circuitry, their noisy electrical operation will affect the electronic components inside it. Surges and spikes from these motors can cause disruption or even damage in non-motor related items such as CRTs and various types of receiving and transmitting equipment's. Also, electromagnetic motors are notorious for consuming high amount of power and creating high ambient motor temperatures. Both are undesirable from the efficiency point of view. Excessive heat energy is wasted as losses. Even the efficiently rated electromagnetic motor has high input to output energy loss ratios.

Replacing these by ultrasonic motors would virtually eliminate these undesirable effects. The electromagnetic motors produce strong magnetic fields which cause interference. Ultrasonic motors use piezoelectric effect and hence no magnetic interference.

Principle of operation:

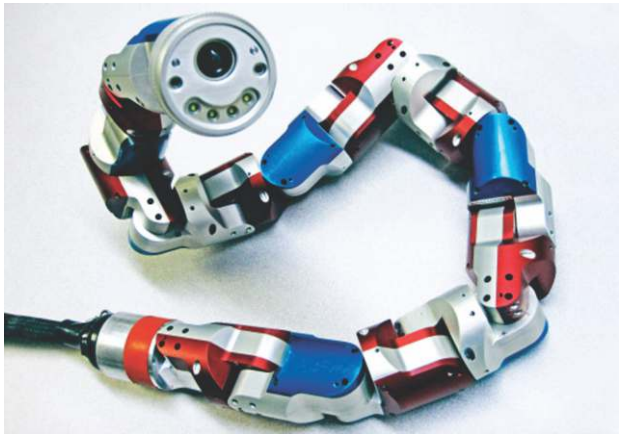
Piezoelectric effect

Many polymers, ceramics and molecules are permanently polarized; that is some parts of the molecules are positively charged, while other parts are negatively charged. When an electric field is applied to these materials, these polarized molecules will align themselves with the electric field, resulting in induced dipoles within the molecular or crystal structure of the material. Furthermore a permanently polarized material such as Quartz (SiO_2) or Barium Titanate ($BaTiO_3$) will produce an electric field when the material changes dimensions as a result of an imposed mechanical force. These materials are piezoelectric and this phenomenon is known as piezoelectric effect. Conversely, an applied electric field can cause a piezoelectric material to change dimensions. This is known as Electrostriction or Reverse piezoelectric effect. Current ultrasonic motor design works from this principle, only in reverse.

When a voltage having a resonance frequency of more than 20 K Hz is applied to the piezoelectric element of an elastic body (a stator), the piezoelectric element expands and contracts. If voltage is applied, the material curls. The direction of the curl depends on the polarity of the applied voltage and the amount of curl is determined by how many volts are applied.

D.Kameswara Rao
19MH5A0215

Snake Robot:



In the past two decades it is estimated that disasters are responsible for about 3 million deaths worldwide, 800million people adversely affected, and property damage exceeding US$50 billion. The recent earthquake in Turkey in November of 1999 left 700 dead and 5000 injured. Many of these deaths were from structural collapse as buildings fell down onto people. Urban Search and Rescue involves the location, rescue (extrication), and initial medical stabilization of victims trapped in confined spaces. Voids formed when a buildings collapse is one instance of a confined space. Urban Search and Rescue may be needed for a variety of situations, including earthquakes, hurricanes, tornadoes floods, fires, terrorist activities, and hazardous materials (hazmat) accidents. Currently, a typical search and rescue team is composed of about ten people, including canine handlers and dogs, a paramedic, a structural engineer, and various specialists in handling special equipment to find and extract a victim. Current state of the art search equipment includes search cameras and listening devices. Search cameras are usually video cameras mounted on some device like a pole that can be inserted into gaps and holes to look for signs of people. Often a hole is bored into the obstructing walls if a void is suspected to exist on the other side. Thermal imaging is also used. This is especially useful in finding warm bodies that have been coated with dust and debris effectively camouflaging the victim. The listening devices are highly sensitive microphones that can listen for a person who may be moving or attempting to respond to rescuers calls. This whole process can take many hours to search one building. If a person is found extrication can take even longer. This paper presents the developments of a modular robot system towards USAR applications as well as the issues that would need to be addressed in order to make such a system practical.

Serpentine rescue robots: leading approaches:

Sensor-Based Online Path Planning:

This section presents multisensory-based online path planning of a serpentine robot in the unstructured, changing environment of earthquake rubble during the search of living bodies. The robot presented in this section is composed of six identical segments joined together through a two-way, two degrees-of- freedom (DOF) joint enabling yaw and pitch rotation while our prototype mechanism (to be discussed later in this article) is made of ten joints with 1 DOF each.

Configuration of each segment:

The robot configuration of this section results in 12 controllable DOF. An ultrasound sensor, used for detecting the obstacles and a thermal camera are located in the first segment (head). The camera is in a dust free, anti-shock casting and operates intermittently when needed

Modified distance transforms:

The modified distance transform (MDT) is the original distance transform method modified for snake robot such that the goal cell is turned in to a valley of zero values within which the serpentine robot can nest. Other modifications are also made to render the method on line

"Distance transform is first computed for the line of sight directed towards the intermediate goal, without taking into account sensorial data about obstacles and free space. This is the goal-orientedplanning.

" The obstacle cells are superimposed on the cellular work space. This modification to the original distance transform integrates IR data that represent the obstacles are assigned high values.

D.Govindaraju
18MH5A0203

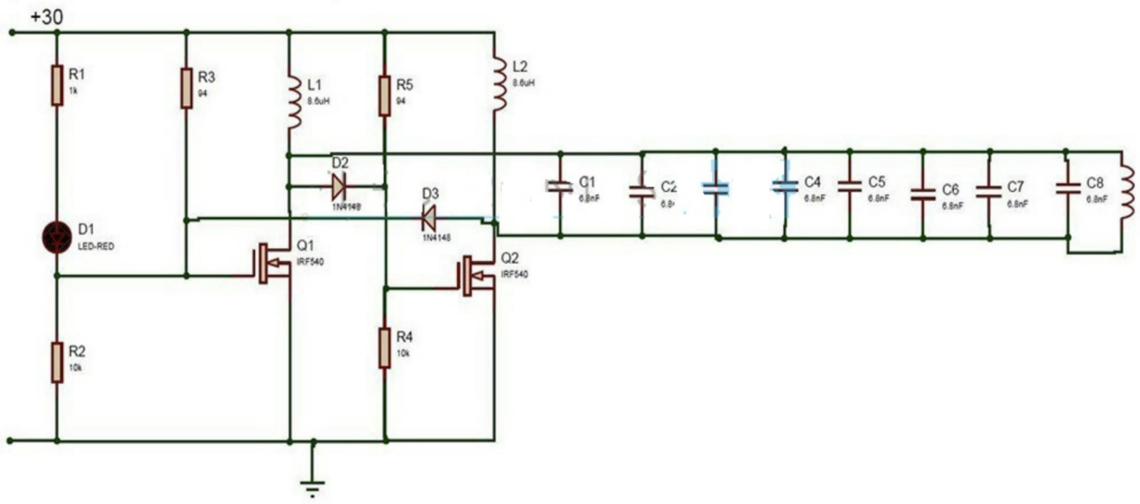
PROJECT IDEA

Wireless Mobile Battery Charger Circuit

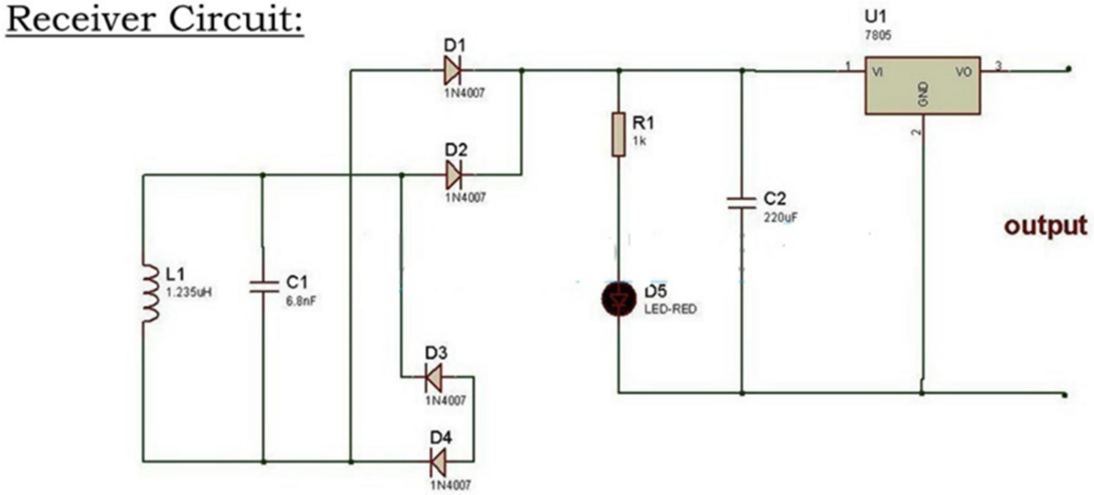
Circuit Diagram

The circuit diagram for the Wireless Mobile Battery Charger Circuit is given below

Transmitter Circuit:



Receiver Circuit:



Principle of the Project

In our Wireless battery charger, we use two circuits. The first circuit is transmitter circuit used to produce voltage wirelessly. The transmitter circuit consists of DC source, oscillator circuit and a transmitter coil. oscillator circuit consists of two n channel MOSFETS IRF 540 , 4148 diodes. When the DC power is given to the oscillator, current starts flowing through the two coils L1, L2 and drain terminal of the transistor. At the same time some voltage is appeared at the gate terminals of the transistors. One of the transistors is in on state while the other is in off state. Thus voltage at drain of transistor which is in off state raises and it fall through the tank circuit made of 6.8nf capacitors and transmitter coil of 0.674. Thus operating frequency is determined by using formula $F=1/[2\pi\sqrt{(LC)}]$.

In the second circuit that is receiver circuit consists of receiver coil, rectifier circuit and regulator. When the receiver coil is placed at a distance near the inductor Ac power is induced in the coil. This is rectified by the rectifier circuit and is regulated to DC 5v using 7805 regulator. The rectifier circuit consists of 1n4007 diode and capacitor of 6.8nf. The output of regulator is connected to the battery.

Working of the Project

- Initially, connect the circuit as shown in the circuit diagram.
- Switch on the supply.
- Connect the battery charger at the output of the circuit.
- Place the receiver coil near the transmitter coil .
- You can observe the charging of battery.

.

Applications

- Wireless chargers can be used to charge mobiles, camera batteries, Bluetooth headsets etc.
- This can also be used in applications like car battery charger with little modification. Go to Simple Car Battery Charger Circuit post for more information.
- This can also be used in medical devices.

CURRENT ISSUE

CYBER ATTACK

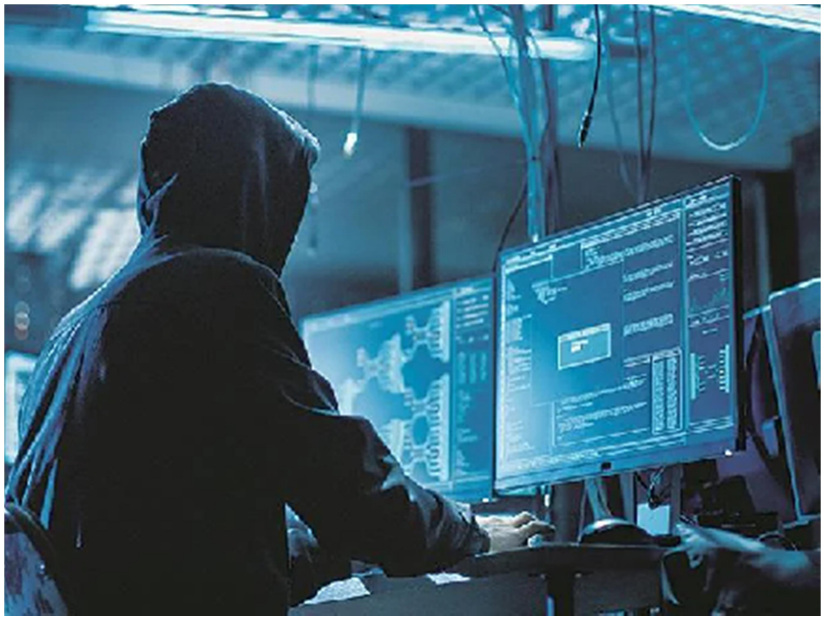
With pandemic disrupting businesses and with remote working becoming reality, cyber criminals have been busy exploiting vulnerabilities. In February 2021—nearly one year from the start of the pandemic—there were 377.5 million brute-force attacks—a far cry from the 93.1 million witnessed at the beginning of 2020. India alone witnessed 9.04 million attacks in February 2021. The total number of attacks recorded in India during Jan & Feb 2021 was around 15 million. Cyber attacks amid the Covid-19 pandemic rose by almost 300% last year in the country to reach 1,158,208 compared to 394,499 in 2019, the Union home ministry told Parliament on Tuesday, citing the data from Computer Emergency Response Team (CERT-In). The ministry did not elaborate on the attacks or the profile of attackers. But cyber experts said the spike could be linked to an increase in online activity last year particularly during the lockdown imposed to check the Covid-19 spread. The experts blamed a lack of cybersecurity awareness for phishing and malware attacks.

"CERT-In receives inputs from its situational awareness systems and threat intelligence sources about malware infections in networks of entities across sectors. Whenever any incident comes to notice of CERT-In, it issues alerts and advisories to the entities concerned and sectoral CERTs for remedial measures," Union minister of state for home affairs G Kishan Reddy told Parliament. He was responding to a query on cyber attacks on India's power supply and on a company supplying Covid-19 vaccines.

- This can also be used in medical devices.

Earlier this month, American cyber intelligence company Recorded Future said it uncovered a suspected China-linked cyber operation that was focused on India's electricity grid and other critical infrastructure. While the company did not link a wide power outage in Mumbai to the operation, which it titled Red Echo, it did not rule out a link. Recorded Future said Red Echo deployed malware known as Shadow Pad, which has been previously linked to Chinese cyber soldiers.

Reddy said the government has issued guidelines to chief information security officers regarding their key roles and responsibilities for securing applications/infrastructure and compliance. "All the government websites and applications are audited with respect to cybersecurity prior to their hosting. The auditing of the websites and applications are conducted on a regular basis after hosting also. [The] government has empanelled security auditing organisations to support and audit [the] implementation of information security best practices."



"Be the reason someone smiles."

CROSSWORD PUZZLES

Across

2. process of generating an electric current from the motion of a conductor in a magnetic field

4. What is produced when there us a current in the primary coil of a transformer?

5. Which of the following motor will have a relatively higher power factor

6. The armature of DC motor is laminated to reduce

8. Torque weight ratio will be least in ..... instruments

9. material that can be magnetize

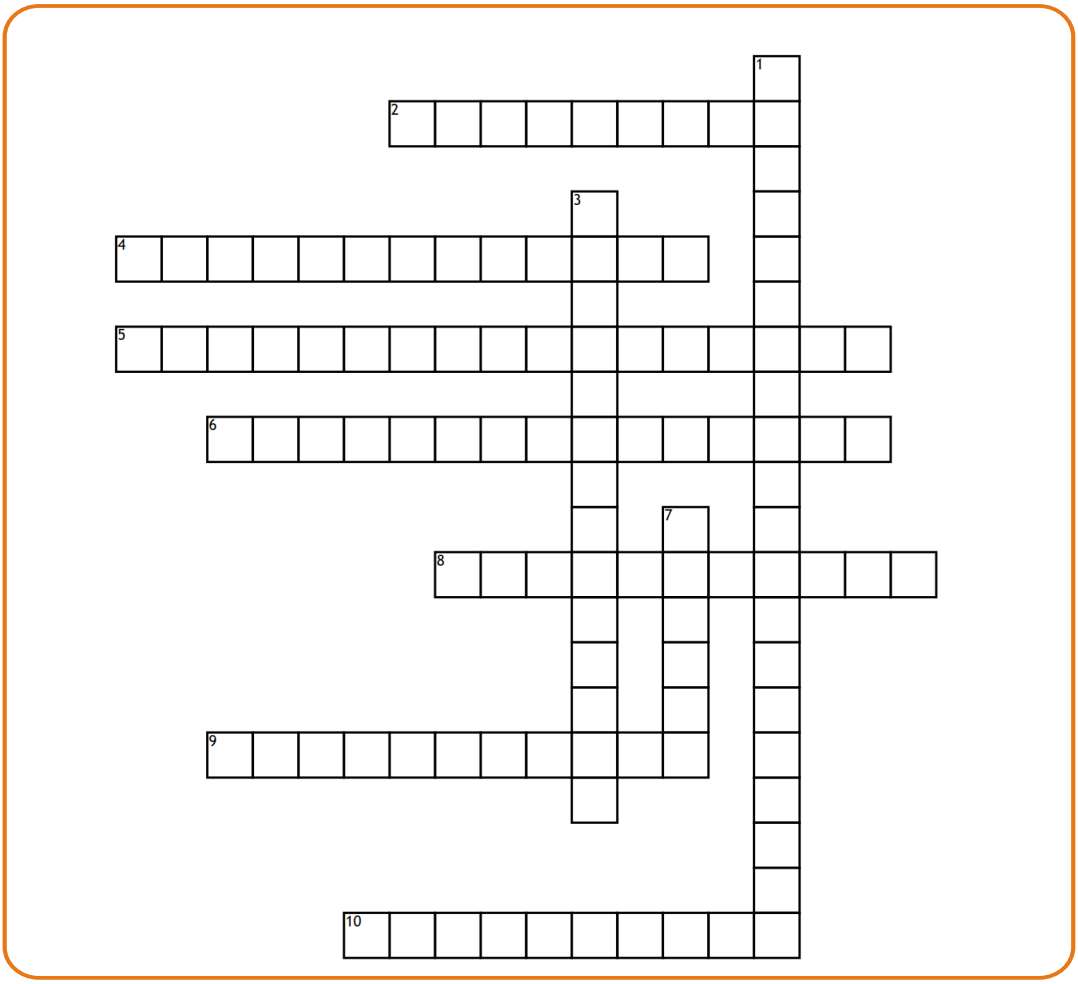
10. In a split-phase motor, the running winding should have high

Down

1. Megger is used to measure

3. In a DC machine fractional pitch winding is used to

7. You insert an electric plug into this to connect to the source of energy



Riddles

1. What goes round the house and in the house but never touches the house?
2. What comes once in a minute, twice in a moment, but never in a thousand years?
3. I am taken from a mine, and shut up in a wooden case, from which I am never released, and yet I am used by almost everybody.
4. Brothers and sisters have I none but that man's father is my father's son.
5. There are four brothers in this world that were all born together. The first runs and never wearies. The second eats and is never full. The third drinks and is always thirsty. The fourth sings a song that is never good.
6. What belongs to you but others use it more than you do?
7. I am the beginning of sorrow, and the end of sickness. You cannot express happiness without me, yet I am in the midst of crosses. I am always in risk, yet never in danger. You may find me in the sun, but I am never out of darkness.
8. A cloud was my mother, the wind is my father, my son is the cool stream, and my daughter is the fruit of the land. A rainbow is my bed, the earth my final resting place, and I'm the torment of man.
9. What is it the more you take away the larger it becomes?
10. I have a little house in which I live all alone. It has no doors or windows, and if I want to go out I must break through the wall.

ANSWERS

1) The sun
2) The letter M
3) Pencil lead
4) My son
5) Water, fire, earth, wind
6) Your name
7) The letter S
8) Rain
9) A hole
10) A chicken in an egg

FROM BOOKS TO CANVAS

G. Gayatri
-II EEE

V.Sai Chaitanya
-II EEE

V. Anil Kumar
-III EEE

K.ROJA
-IV EEE

Y.RAMALAKSHMI
-IV EEE

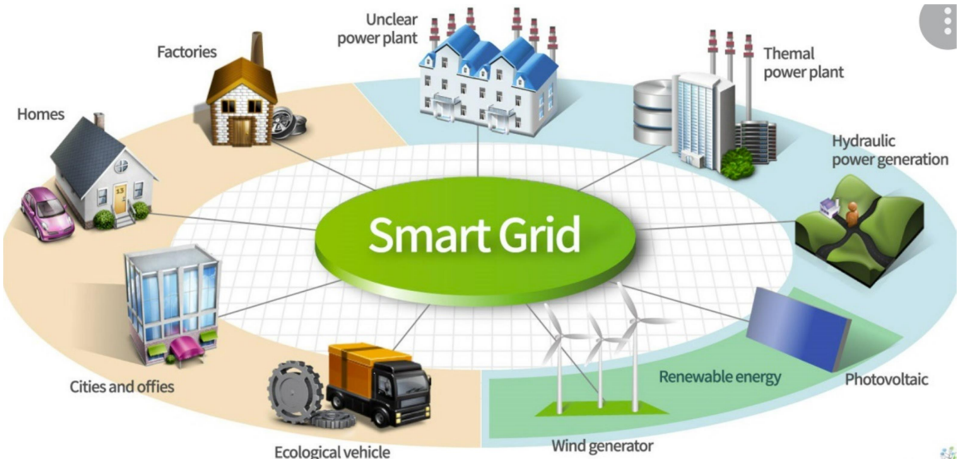
The Most Influential Trends to Watch in 2020 in the Field of Electrical & Electronics Engineering

The electrical engineering industry is under a significant paradigm shift. Ambitious research and development departments all around the globe are working towards better ways to obtain, store, and use electrical energy. Below are some of the most noteworthy industry trends you should watch out for in 2020

Smart Grids

Most Energy Departments around the world are placing smart devices throughout their networks, right up to customers' homes, offices, and factories. The smart grid collects valuable data to allow both consumers and suppliers a higher degree of control over multiple power sources. It also enables them to predict surges in usage and instantly detect outages.

By allowing end-to-end communication between distribution sites, power plants, and the end user's electrical point-of-presence, smart grids significantly raise efficiency and reduce costs. Soon, it's inevitable that electrical engineers will frequently come across smart grids and or be asked to help develop one.



Soon, electrical Vehicles would be the standard de facto

Tesla recently hit the $100 billion milestone, making itself the first publicly listed US carmaker in history to do so. This is a good sign that electric vehicles have come to stay.

Experts predict that by 2030, there would be over 125 million electric vehicles on the road. Considering the millions of EVs that are already roaming the streets, this is not so much of a long-short. Many EV manufacturers are investing hard into the tech, and consumers can expect better batteries, improved charging tech, more accurate autonomous driving, solar-powered EVs, and even electric planes!

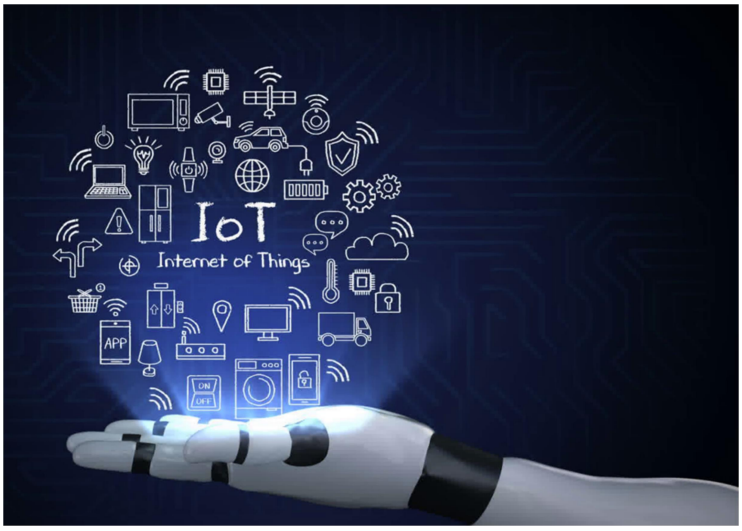
Increased use of Drones

When you think of drones, often you probably think of the entertainment industry, shooting music videos and movies.

Well, the application of drones goes far beyond the entertainment industry. A recent survey on seven business sectors has shown that the engineering and construction industries use drones the most. Did you know that leveraging drones can increase safety on a construction site by 55%?

Electrical engineers are using drones to examine certain hazardous electrical zones without putting themselves at risk. This provides much-needed safety in the electrical engineering industry. Furthermore, drones are now helping to record, collect, and analyze data at the job site, thus increasing productivity and efficiency.

The Internet of Things (IoT)



IoT impacts many different areas of the electrical engineering landscape. From smart grids to smart lighting and Visible Light Communication (VLC), among many others, IoT is now intertangled with the electrical engineering industry. As a result, it's now imperative that every electrical engineer becomes "IoT literate."

Apart from the smart grid benefits like monitoring, distribution and automation implemented in electrical utilities, IoT applications in the field of electrical energy also include smart inverters, advanced metering infrastructure (AMI), remote control operation of energy-consuming devices and SCADA (supervisory control and data acquisition.)

IMPORTANT WEBSITES

- http://www.electrical4u.com
- www.allaboutcircuits.com
- www.powerstream.com
- www.ciruitlab.com
- www.ieee.org
- www.falstad.com
- www.pcbheaven.com
- www.electrical-engineering-portal.com
- www.electronics.wisc-online.com
- www.allaboutcircuits.com
- www.gutenburg.com
- www.guruengineers.com
- www.electro-tech-online.com
- Http://www.infocobuild.com/education/audio-video-courses/electronics/electronics-and-electrical-engineering.html

SUGGESTED REFERENCES

- ELECTRICAL ENGINEERING BY JB GUPTHA
- ELECTRICAL ENGINEERING BY GALGOTIA
- ELECTRICAL INDIA
- POWER TODAY MAGAZINE
- ELECTRICITY TODAY (TRANSMISSION AND DISTRIBUTION) MAGAZINE

Send your articles to

electrique_eee@acoe.edu.in

Aditya College of Engineering

Approved by AICTE, New Delhi Affiliated to JNTUK,Kakinada

Aditya Nagar,ADB Road,Surampalem-533437

www.acoe.ac.in