P O W E R

Story

A TECHNICAL MAGAZINE

DEPERTMENT OF ELECTRICAL ENGINEERING

Year 2020-2021

Rcc Institute Of Information Technology

INDEX

From the desk of Principal

It is my pleasure to congratulate the Department of Electrical Engineering, RCCIIT for bringing out the current edition of departmental technical magazine POWER STORY maintaining its tradition. I think magazines like POWER STORY, which primarily showcases the technical awareness, knowledge gained beyond the curriculum and innovative ideas of the students are very essential to give creative satisfaction and freedom of expression to a college student. Such a magazine stands testimony to the multi-faceted talent of the students and points to their growing maturity – it also sends a positive pulse to the student and faculty community. I wish this tradition continues over the years.

Thanks to all

Prof. (Dr.) Anirban Mukherjee

Principal

RCC Institute of Information technology

From the desk of Head of the Department

"Education is not preparation of life, education is life itself"

–John Dewey

The Dept. of Electrical Engineering, RCC Institute of Information Technology with tradition happily brings together sound academic achievements with extensive and vibrant co-curricular programs that include publishing Technical Magazine, Wall Magazine, organization of sports, leadership activity programs etc. Our mission is to inculcate the love of knowledge in our students and for this we aim to develop the skills and demeanor of lifelong 'learning,' essential for making responsible global citizen. This effort will make students immensely capable of facing the future with resilience and optimism. On the deeper level, we try to instill the values of respect and trust in relationships that are the foundation of real success. I am very happy indeed to congratulate the students, faculty and staff members of the Dept. of Electrical Engineering who have endeavored to continue this tradition of publishing departmental magazines, newsletters etc. which are essential to utilize intrinsic talent, express their knowledge and skill earned through self-learning mode tinged with imaginations by various modern articles, innovative ideas, sci-fi, and exposure about the core industries, mathematical juggleries and interesting technical facts.

The technical magazine is the one of the unique representation in public domain by the department in the field of technical platform and will mark in near future in satisfying the vision and mission of the department through continuous improvement as per the guidelines of Washington Accord.

I convey my best wishes to all the students, faculty & staff members, specially the members of Technical Magazine Committee of the department for publishing the current edition of the Technical Magazine, POWER STORY. I hope with confidence that the department will continue and maintain this nice effort and with the joint contributions of all, the department of Electrical Engineering, RCCIIT will be emerged as an excellent learning centre.

Thanks to all

Dr. Debasish Mondal,
Associate Professor & Head
Dept. of Electrical Engineering

From the desk of Head of Editorial Committee

It is a matter of great pride and privilege for me being a part of technical Magazine "**POWER STORY 2021**" , published by EE Dept. of RCC Institute of Information technology . As we trudge along uncertainly under the looming shadow of the pandemic, it is my absolute pleasure to thanks each one of you for your continued support and patronage. This will be an academic excellence for our institution in this pandemic disaster.

Stepping into college is usually our first encounter with life without the warmth and reassurance and confused teenager, to take on the real world. We grow each semester, with lessons learnt from inside the classroom and outside on rainy days and clear nights. This Magazine captures the growth of the institution and the individuals, who are a part of it, throughout the semester. The magazine continues to expand its reach to achieve its vision of being a truly representative student publication.

Any educated Society is incomplete without adequate time investment in informative articles. This technical Magazine "**POWER STORY"** motivated us to launch innovative ideas of which will nicely be imprinted in the article. "Relevance of Print media" for exploring a person's creativity, a proper medium is a prerequisite. What else could be a campus, with better medium than the language of the masses. We are not professional, but we have tried our best to give you something, which with your support will evolve into an asset for erudite of RCCIIT crowd. At the last but not the least ,we need the support of all students, Alumni and faculty members. This will be immense pleasure for us if the Magazine is generating some creative contents and spreading the light of knowledge among whole community.

Thanks to all

Subhasis Bandopadhyay

Assistant Professor

Dept. of Electrical Engineering

Satellite: Celestial to Terrestrial

Subrata Ghosh
EE2018/008(3rd year)

During the modern times, technology is one of the most thing which we all are dependent on. The peak of technology is still unknown and within the perimeter, satellite is one of the most popular and most important equipment that the earthlings need almost daily.

In simple terms, a satellite is a layer of metal that collects, reroutes, and broadcasts a signals from high in the sky. The difference between a satellite and a balloon is that in a balloon it floats in the air and in satellite it's placed on a platform or a metallic platform. When a satellite goes to a given region, or a specific destination, it passes through all the routes that are in the shape of ring of atmosphere. Through its control tower, operators tell it where the ideal point of orbit should be reached. Satellite is the journey of transmitting a radio signal from a fixed or movable position in the sky. Usually, satellite technology is used for higher transmission quality. For instance, the aircraft satellite transmission system is used in the developed countries. Satellite TV uses the same principle for transmitting the signals of the televisions through the sky. In an ideal situation, the satellite would be in a stable position that will not move or rotate. Such satellite TV system allows the owners of the home to watch the televised signals from any part of the globe through their TV sets. The technology is now available in different options. Based on that, it rises up through the atmosphere and enters the sun, where it reflects the sunlight to be relayed to the earth. Each time the satellite passes through atmosphere, it creates artificial satellites that are in the shape of crescent. Satellite TV Almost every home and office today have a satellite TV set and they are almost non-intrusive than any traditional cable or satellite TV If you are considering to move to satellite TV, then this is the place to start. Pros Reduced Access Fees Satellite doesn't provide bundled with cable, if you live in a big city it is easy to find a good deal. Easy to Adjust Screen Size In Satellite, there are several satellites and it is possible to adjust the display size of your TV from an easy to get a bigger TV screen to a smaller TV screen in a very easy way. Satellite Allows One to DVR Programs GSM satellite Internet GSMA (Global System for Mobile Communication) alliance, a multinational body created in 1985 has partnered with world's leading mobile operators to launch high-speed mobile broadband service across the world. The technology has been named – Global System for Mobile Communications, GSM. This is a wide area coverage of wireless internet, 3G/4G technology and can be integrated into existing networks. It's fully capable of

5 Mbps download speed. Satellite TV Satellite TV is similar to normal TV except the service provider has to launch the satellite in order to provide the service.

Followed by the introduction of satellite TV and the various benefits it gives to us, there are some unknown facts and little-known facts of the same. To learn about these and other unknown facts of the satellite TV technology, let's begin with a general understanding about satellite technology. 1. Design and Technology Behind Satellite Unlike other types of wireless systems, satellite system uses different types of satellite antennas to communicate with the ground station. There are 3 main categories of these antennas which are line-of-sight, inclined and polar, named as LOS, ICL, and PRS.

Satellite uses in the advancement of new technologies are sky to space link from one location to another using satellite system. Satellite technology is vital for medical research, study of weather patterns, geo-thermal mapping, and assessing impact of human activity. Also satellite operates in remote areas where reliable and fast transportation is very difficult. Building/Sizing Satellites Small satellites, which are typically used for medium to high resolution imaging and data gathering. Very large satellites which are for interplanetary travel, manned missions, meteorology, and research. These are made up of various sized geostationary or sun-synchronous orbit, which follows a known path in the Earth's atmosphere.

Military Uses Military and military defense purposes. Satellites are used to relay communication signals in order to provide a stable network. Satellite devices are used for communication, weather forecasting, transportation, financial markets and more. Satellites are used to transmit, receive and relay a range of different signals from ground to space and back again.

HISTORY OF INTERNET OF THINGS (IOT)

Sougata Senapati
EE2018/055(3rd year)

Introduction:

Internet of Things (IoT) is a new paradigm that has changed the traditional way of living into a high-tech life style. Smart city, smart homes, pollution control, energy saving, smart transportation, smart industries are such transformations due to IoT. A lot of crucial research studies and investigations have been done in order to enhance the technology through IoT. However, there are still a lot of
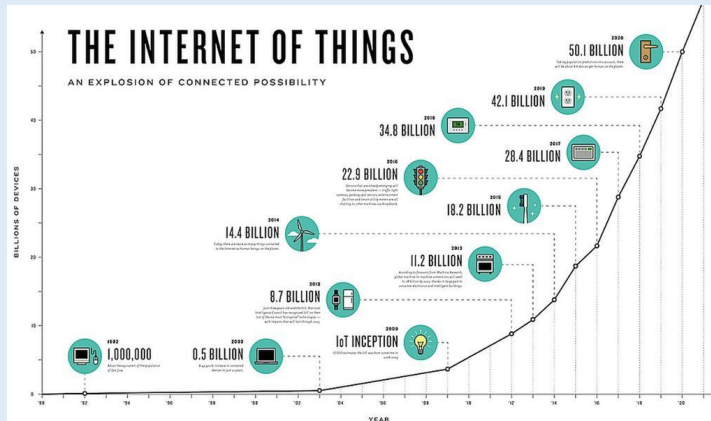

challenges and issues that need to be addressed to achieve the full potential of IoT. These challenges and issues must be considered from various aspects of IoT such as applications, challenges, enabling technologies, social and environmental impacts etc.

History:

The concept of connected devices itself dates back to 1832 when the first electromagnetic telegraph was designed. The telegraph enabled direct communication between two machines through the transfer of electrical signals. However, the true IoT history started with the invention of the internet—a very essential component—in the late 1960s, which then developed rapidly over the next decades.

The 1980s: This might be hard to believe, but the first connected device was a Coca-Cola vending machine situated at the Carnegie Melon University and operated by local programmers. They integrated micro-switches into the machine and used an early form of the internet to see if the cooling device was keeping the drinks cold enough and if there were available Coke cans. This invention fostered further studies in the field and the development of interconnected machines all over the world.
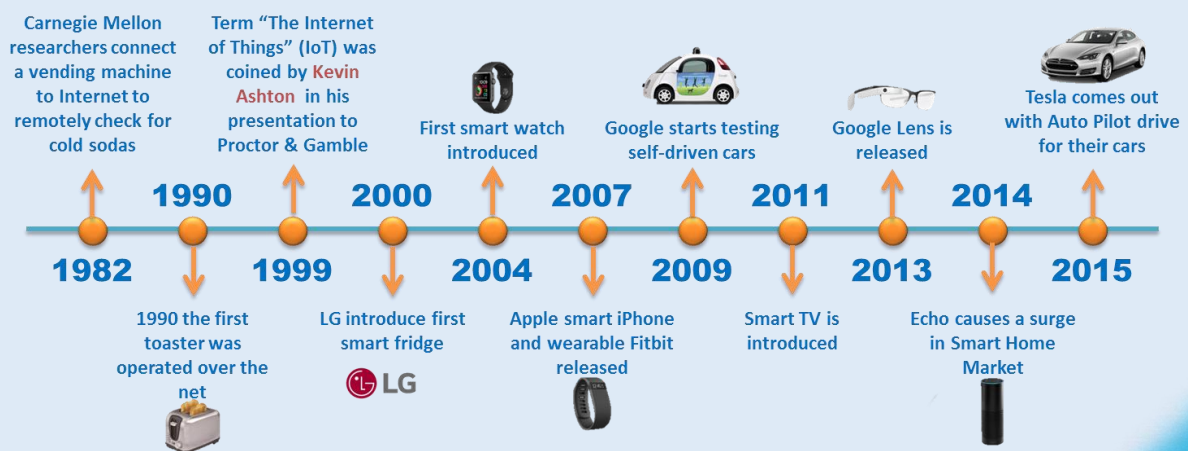
The 1990s: In 1990, John Romkey connected a toaster to the internet for the very first time with a TCP/IP protocol. One year later, University of Cambridge scientists came up with the idea to use the

first web camera prototype to monitor the amount of coffee available in their local computer lab's coffee pot. They programmed the webcam to take pictures of the coffee pot three times per minute, then send the images to local computers, thus allowing everyone to see if there was coffee available.

The year 1999 was easily one of the most significant for the IoT history, as Kevin Ashton coined the term "the internet of things." A visionary technologist, Ashton was giving a presentation for Procter & Gamble where he described IoT as a technology that connected several devices with the help of RFID tags for supply chain management. He specifically used the word "internet" in the title of his presentation in order to draw the audience's attention since the internet was just becoming a big deal that time.

The 2000s: At the beginning of the 21st century, the term "internet of things" came into widespread use by the media, with outlets like The Guardian, Forbes, and the Boston Globe making mention of it. Interest in the IoT technology was steadily increasing, which led to the 1st International Conference on the Internet of Things held in Switzerland in 2008, where participants from 23 countries discussed RFID, short-range wireless communications, and sensor networks.

Moreover, several major developments fostered the IoT evolution. One was a refrigerator connected to the internet that was introduced by LG Electronics in 2000, allowing its users to shop online and make video calls. Another essential development was a small rabbit-shaped robot named Nabaztag created in 2005 that was capable of telling the latest news, weather forecast, and stock market changes.

Even back then the number of interconnected devices surpassed that of people on Earth, according to Cisco.
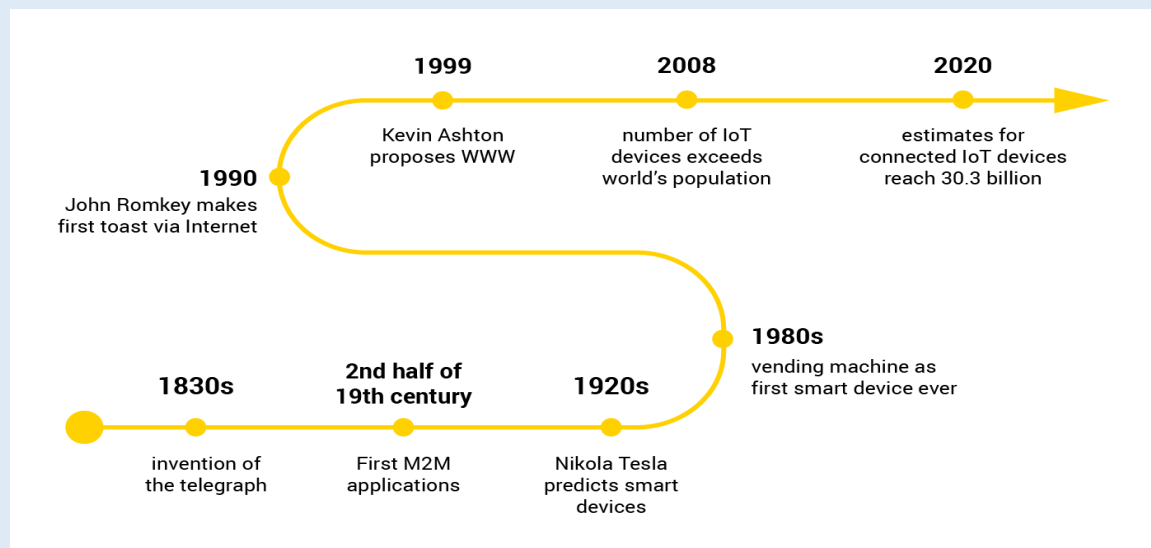
The 2010s: The IoT boom was supported by its addition to the Gartner Hype Cycle for emerging technologies in 2011.

In the same year, IPv6—a network layer protocol that is central to IoT—was launched publicly.

Since then, interconnected devices have become widespread and commonplace in our everyday lives. Global tech giants like Apple, Samsung, Google, Cisco, and General Motors are focusing their efforts on the production of IoT sensors and devices—from interconnected thermostats and smart

glasses to self-driving cars. IoT has found its way into almost every industry: manufacturing, healthcare, transportation, oil & energy, agriculture, retail, and many more. This dramatic shift has us convinced that the IoT revolution is right here, right now.

As of today, IoT platforms maintain a strong hold on their position among the top trends in this year's Gartner Hype Cycle, along with virtual assistants, connected homes, and level 4 self-driving cars. The technology will reach its plateau of productivity in 5–10 years.

DRIVERLESS VEHICLE

A Revolution in Automotive Arena

Debasis Indu

EE2020/L010(2nd year)

- **Introduction**:-

A new type of driverless vehicle has been developed with Innovative Computer Vision Guidance Technology that enables the vehicle to locate itself on a roadway reliably and inexpensively. The technology based on two stages. The aim of the first stage is to identify all the significant points in the immediate environment of the path followed, in a video recorded during an initial journey in which the vehicle is driven manually. The second stage corresponds to the automatic mode during which the vehicle continuously monitors its path, ensuring that the images provided by the on-board cameras. The filmed video thus plays the role of a virtual track that the vehicle must follow when it travels in autonomous mode. A driverless car, self-driving Car or robotic car is an autonomous vehicle capable of fulfilling the transportation capabilities and updating their maps based on sensory input, allowing the vehicles to keep track of their position even when conditions change or when they enter enchanted environment.

- **History Behind**:-

A new innovation has a long history to establish the present one. In 1925, Houdina Radio control first widely demonstrated the radio controlled driverless vehicle Linrrican Wonder at New York. It was equipped with two different cars. The first one sent a radio impulse and the second one caught the impulse through the transmitting antennae fitted on the car. The second car which was driverless followed the first car. In 1958, this system again revolute by RCA lab and the state of Nebraska. Here a series of lights along the edge of the road and the lights were able to send impulses to guide the car and determine the presence and velocity of any metallic vehicle on its surface. The RCA collaborated with General Motors, who paired two standard models with equipment consisting of special radio receivers and audible and Visual warning devices those were able to simulate automatic steering, accelerating and brake Control. During the 1960's the United Kingdom's Transport and Road Research Laboratory tested a driverless Citroen DS that interacted with magnetic cables that were embedded in the road. It went through a test at 80 miles per hour (130 km/h) without deviation of speed or direction in any weather conditions, and in a far more effective way than by human control. Research continued in the 70's with cruise control devices activated by signals in the cabling beneath the tracks. In the 1980's, a vision-guided Mercedes-Benz robotic van, designed by Ernst Dickmanns and his team at the Bundeswehr University Munich in Munich, Germany, achieved a speed of 39 miles per hour (63 km/h) on streets without traffic.

- **Progression Forwarded:-**

Since the 2000s, a number of companies have sought to make cars autonomous using expensive and sometimes unreliable technologies. In 2003, a researcher at Institute Pascal decided to work on automated driving of urban electric vehicles using simple video cameras. Since 2006, the researchers at Institute Pascal, in collaboration with Ligier Group, have been developing automatic driverless shuttle vehicles that can transport up to lo people along short routes. The vehicles, which are designed to be used at specific sites Such as industrial sites, airports and amusement parks, are able to deal with obstacles thanks to laser rangefinders fitted on all four sides of the vehicle. Many major automotive manufacturers including General Motors, Ford, Mercedes Benz, Volkswagen, Audi, Nissan, Toyota, BMW and Volvo are testing driverless car systems as of 2013. Volkswagen began testing a Temporary Auto Pilot (TAP) system that will allow a car to drive itself at speed of up to 80 miles per hour (130 km/h) on the highway. Although as of 2013, fully autonomous vehicles are not yet available to the public, many contemporary car models have features offering limited autonomous functionality. In October 2014 Tesla Motors announced its first version of 'Auto Pilot. Cars equipped with this system are capable of lane control with autonomous steering, braking and speed limit adjustment based on signals image recognition. The system also provides autonomous parking and is able to receive software updates to improve skills over time. In 2014, the only self-driving vehicles that are commercially available are open-air shuttles for pedestrian zones that operate at 12.5 miles per hour (20.1 km/h). It is a prototype demonstration car.

- **Technology Incorporated:-**

The main system incorporated with Vehicular Communication Systems. Vehicular communication systems use vehicles and roadside units as the communicating nodes in a peer-to-peer network, providing each other with information. As a cooperative approach vehicular communication systems can allow all cooperating vehicles to be more effective. Individual vehicles may benefit from information obtained from other vehicles in the vicinity, especially information relating to traffic congestion and safety hazards. Through the implementation of Global Positioning System (GPS), navigation of the autonomous vehicles is simplified. The location of the vehicle can also be acquired by the longitude and latitude obtained by the GPS. In 2012, computer Scientists at the University of Texas in Austin began developing smart intersections designed for autonomous cars. The intersections will have no traffic lights and no stop signs, instead using computer programs that will communicate directly with each car on the road.

- **Technology View:-** (Circuit Diagram of A Model Car)
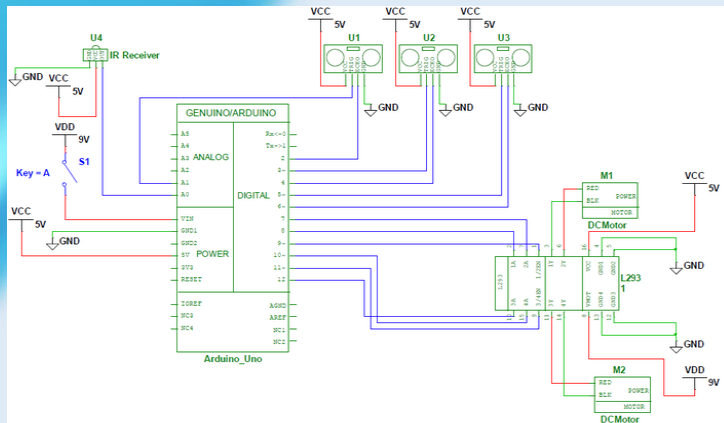
- **Components:-**

  1. 1x Car Chassis Kit: YIKESHU 2WD Smart Motor Robot Car Chassis
  2. 2x Gear Motor
  3. 1x Car Chassis
  4. 2x Car Tire
  5. 1x 360° Wheel
  6. 1x Arduino Nano
  7. 1x Mini Breadboard
  8. 1x Motor Drive L293D
  9. 3x Ultrasonic Sensor HC SR04
  10. 3x Sensor support - 3D printed (see drawing below)
  11. 1x 9v Battery
  12. 1x On-off switch
  13. 5x 100uF capacitors
  14. 2x 0.1uF capacitors
  15. 1x IR Receiver
  16. 1x Remote Control

- **Potential Advantages:-**

  An increase in the use of autonomous cars would make possible such benefits as:-

  1. Fewer traffic Collisions, due to an autonomous system's increased reliability and faster reaction time compared to human drivers.
  2. Increased roadway capacity and reduced traffic congestion due to reduced need for safety gaps and the ability to better manage traffic flow.
  3. Relief of vehicle occupants from driving.
  4. Higher speed limit for autonomous cars.

- **Potential Obstacles:-**

   In spite of the various benefits to increased vehicle automation, some challenges persist:-

   1. Liability for damage.
   2. Resistance by individuals to forfeit control of their cars.
   3. Software reliability.
   4. A car's computer could potentially be compromised, as could a communication System between cars.

- **Conclusion Ended:-**

   The transition from self-driving cars with varying levels of autonomy to fully autonomous vehicles is yet to be made. However, modern AI technologies and machine learning development are making rapid leaps forward in this direction, and that is what's driving the industry forward. Top automotive brands such as General Motors, Ford, and Tesla are in the final stages of testing their driverless vehicles which means we are on the verge of seeing a revolutionary change in the way we commute.

TESLA COIL

MOUSUMI DAS

EE2020/L04 (2nd year)

Some might know that wireless electricity is an old concept which Nikola Tesla demonstrated before many decades ago. The idea has not quite translated into anything substantial yet. **Nikola Tesla** was the first to introduce the concept of wireless electricity through his invention of 'Tesla Coil' around 1891.
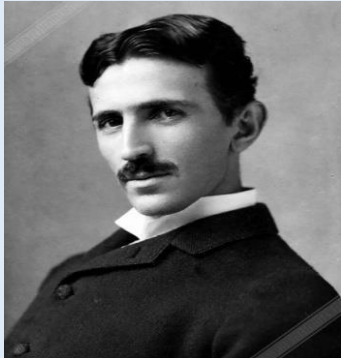
A Tesla coil a type of resonant transformer circuit. It is used to produce high voltage relatively high current and high frequency alternating current electricity.

Introduction:

The Tesla coil is an air-core transformer with primary and secondary coils tuned to resonate. The primary and secondary function as a step-up transformer which converts relatively low-voltage high current to high-voltage low current at high frequencies.

The Tesla coil demonstrates the fundamental principles high frequency electrical phenomena. It illustrates the principles of ionization of gases and behavior of insulators and conductors when in contact with high frequency electrical fields.

Working Principle:

This coil has the ability to produce output voltages up to several million volts based upon the size of the coil. The Tesla coil works on a principle to achieve a condition called resonance. Here, the primary coil emits huge amounts of current into the secondary coil to drive the secondary circuit with maximum energy. The fine-tuned circuit helps to shoot the current from primary to secondary circuit at a tuned resonant frequency.

Circuit Diagram:

This coil has two main parts a primary coil and a secondary coil, with each coil having its own capacitor. A spark gap connects the coils and capacitors. The two coils and capacitors are connected by a spark gap-a gap of air between two electrodes that generates the spark of electricity. An outside source hooked up to a transformer powers the whole system. Essentially, the Tesla coil is two open electric circuits connected to a spark gap.

A Tesla coil needs a high-voltage power source. A regular power source fed through a transformer can produce a current with the necessary power.
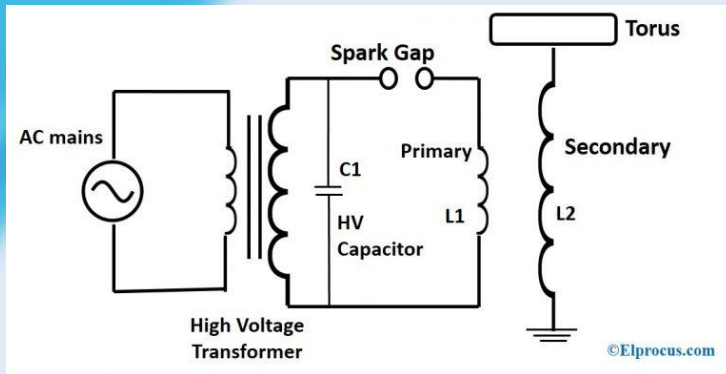
In this case, a transformer can convert the low voltage of main power into the high voltage.

This design is favored when a relatively fragile neon sign transformer is used Alternative circuit configuration. With the capacitor in parallel to the first transformer and the spark gap in series to the Tesla coil primary, the AC supply transformer must be capable of withstanding high voltages at high frequencies.

How Tesla coil works?

The power source is hooked up to the primary coil. The primary coil's capacitor acts like a sponge and soaks up the charge. The primary coil itself must be able to withstand the massive charge and huge surges of current, so the coil is usually made out of copper, a good conductor of electricity. Eventually, the capacitor builds up so much charge that it breaks down the air resistance in the spark gap. Then, similar to squeezing out a soaked sponge, the current flows out of the capacitor down the primary coil and creates a magnetic field.

The massive amount of energy makes the magnetic field collapse quickly, and generates an electric current in the secondary coil. The voltage zipping through the air between the two coils creates sparks

in the spark gap. The energy sloshes back and forth between the two coils several hundred times per second, and builds up in the secondary coil and capacitor. Eventually, the charge in the secondary capacitor gets so high that it breaks free in a spectacular burst of electric current. The resulting high-frequency voltage can illuminate fluorescent bulbs several feet away with no electrical wire connection.
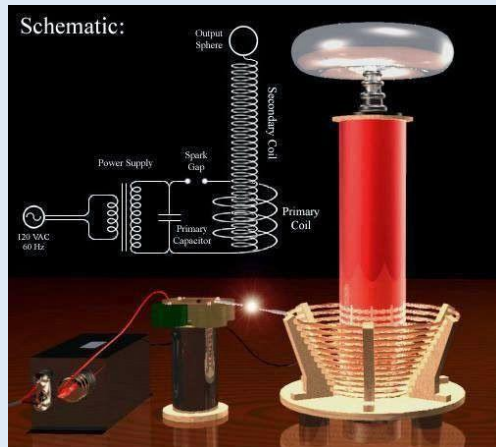
In a perfectly designed Tesla coil, when the secondary coil reaches its maximum charge, the whole process should start over again and the device should become self-sustaining. In practice, however, this does not happen. The heated air in the spark gap pulls some of the electricity away from the secondary coil and back into the gap, so eventually the Tesla coil will run out of energy. This is why the coil must be hooked up to an outside power supply. This happens when the primary coil shoots the current into the secondary coil at just the right time to maximize the energy transferred into the secondary coil. Think of it as timing when to push someone on a swing in order to make it go as high as possible.

Setting up a Tesla coil with an adjustable rotary spark gap gives the operator more control over the voltage of the current it produces. This is how coils can create crazy lightning displays and can even be set up to play music timed to bursts of current.

While the Tesla coil does not have much practical application anymore, Tesla's invention completely revolutionized the way electricity was understood and used. Radios and televisions still use variations of the Tesla coil today.

Applications of Tesla Coil:

- Nowadays, smartphones are released with built-in wireless charging, which uses the principle of a Tesla coil.
- Tesla coils were used for wireless telegraphy, radio transmitters and early models of televisions. However, they have been replaced by modern systems now. Sparks produced by Tesla coils continue to be used as spark plugs in vehicles to initiate fuel combustion. They are also used in electrical equipment to prevent generation of dangerous voltage spikes.

Advantages of Tesla Coil:

- High performance.
- Voltages build up at a slower pace so there is less chance of damage.
- Distributes the same voltage across all winding coils.
- Powers The use of 3-phase rectifiers for higher powers can provide tremendous load sharing.

Disadvantages of Tesla Coil:

- The coil and its equipment are very dangerous as they produce very high voltages and currents which cannot be ensured by the human body.
- Circuit construction takes a long time as it needs to be perfect to resonate.
- Buying a larger DC smoothing capacitor involves more costs.

Conclusion:

After studying and developing the model of TESLA COIL we came to following conclusion:-

We are able to generate high voltage with high frequency and it can be used for testing the apparatus for switching surges. It can also be used for study of visual corona and ionization of gases under the electrical stress. It can also transmit the electrical power wireless up to certain distance depends upon its ratings.

Title: Catching Lightning for Alternative Energy

Name:- Poulami Das

Roll No.-EE2019/038(2nd year)

Introduction

Many people in the Democratic Republic of the Congo (DRC) are without a consistent energy source, and are subjected to frequent and consistent thunderstorms throughout the year. It is also financially unviable to connect rural areas to the country's main energy infrastructure. In considering these


factors, the provision of small lightning capture facilities to harness this yet untapped natural, renewable energy source has been proposed. It is believed that the quality of life for the impoverished in these areas can be improved by providing them with low cost energy by harvesting lightning.

About Lightning

Lightning is an electrical discharge caused by imbalances between storm clouds and the ground, or within the clouds themselves. Most lightning occurs within the clouds. "Sheet lightning" describes a distant bolt that lights up an entire cloud base. Other visible bolts may appear as bead, ribbon, or rocket lightning.

During a storm, colliding particles of rain, ice, or snow inside storm clouds increase the imbalance between storm clouds and the ground, and often negatively charge the lower reaches of storm clouds. Objects on the ground, like steeples, trees, and the Earth itself, become positively charged—creating an imbalance that nature seeks to remedy by passing current between the two charges. Lightning is extremely hot—a flash can heat the air around it to temperatures five times hotter than the sun's surface. This heat causes surrounding air to rapidly expand and vibrate, which creates the pealing thunder we hear a short time after seeing a lightning flash.

Nature of Lightning
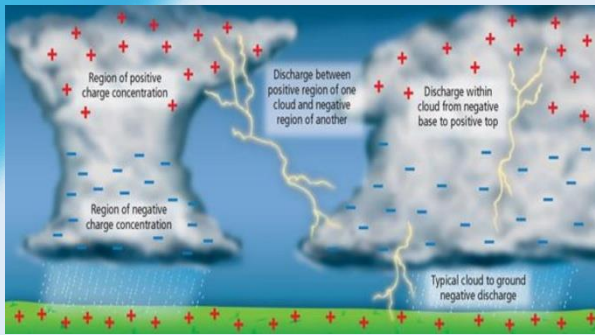
During thunderstorm, when a charged cloud passes over an uncharged cloud, uncharged cloud acquires opposite charge by induction and the two clouds attract. When they combine with each other, they produce a large amount of heat, light and sound also known as lightning. Lightning can occur between clouds or between cloud and ground. Thunder clouds (rain clouds) carry electric charges and these charges separate out within the cloud. The lower portion of a cloud generally carries negative charges and the upper portion carries positive charges. These charges

inside the clouds build up. They cannot flow from one cloud to another or to the ground because the air between them acts as an insulator, but when huge amount of charges build up, the insulating property of the air suddenly breaks down. As a result, an electric discharge takes place between two oppositely charged clouds or between a charged cloud and the surface of the earth. This causes the flash of lightning that we see in the sky.

Types of Lightning

- Cloud-to-Ground (CG) Lightning.
- Negative Cloud-to-Ground Lightning (-CG).
- Positive Cloud-to-Ground Lightning (+CG).
- Cloud-to-Air (CA) Lightning.
- Ground-to-Cloud (GC) Lightning.
- Intracloud (IC) Lightning.

Nature of Demand

It was put forward that there would be transmission lines from the facility to some sort of long-distance grid, or perhaps directly to the communities that would benefit. There would be issues in the production of large scale AC, lowering efficiency. DC transmission was also considered, but the power losses in the lines could only be solved by providing a large voltage and a small current, which would later be difficult to transform. A standard lead-acid car battery outputs around 12V, but is charged using a 14V supply. Hydrogen in an oxygen rich environment is dangerous, as a spark can ignite it, causing an explosion. To avoid this, the voltage across the terminals of the battery should be kept below 14.4V. A single cell in a battery (of which there are usually six in series) reaches 70% capacity in around 5-8 hours, and the rest over 7-10 hours, at a constant current.
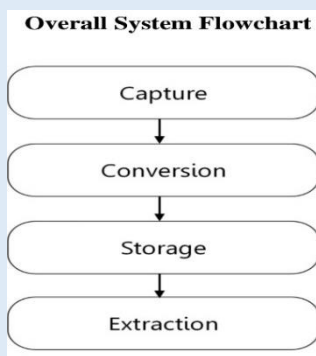

Figure 2 shows a simplified model of the steps necessary to convert the energy from a lightning strike into a form suitable for charging car batteries. For this project, the conversion, storage and extraction stages were given the primary focus. It has been assumed that a system would be in place that would allow the lightning to be captured efficiently. Various options for the remaining stages are detailed below.
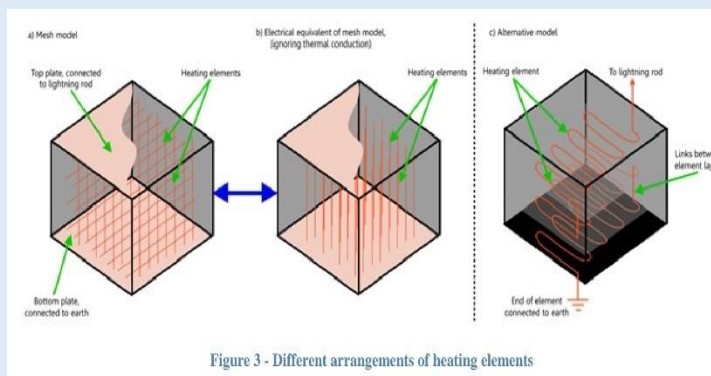
Capacitive Circuits

The lightning strike is assumed to be captured as a high power impulse whilst the output should be low voltage DC. Another consideration is the duration of the input; a small yet constant output is desired. These characteristics form the basis of any requirements of an electrical conversion system. The capacitors could then be discharged through an electronic switch, such as an insulated-gate bipolar transistor (IGBT) and converted to a lower voltage suitable for battery. To solve this problem a large capacitor bank could be charged by the impulse, after which the discharge could be controlled. Since super capacitors are unfeasible under this constraint, capacitor technologies must be considered. Drawbacks include a larger leakage current and effective series resistance (ESR) compared to other technologies. Once the energy is stored in the capacitor bank, it must be connected to a conversion system which will reduce the voltage to 14V. The theoretical maximum performance of a SMPS can be 100% but a very well designed buck converter may have 95% efficiency as there are always parasitic impedances.

Hydrogen Storage

Electrolysis is the phenomenon in which molecules become ions when a large voltage is applied across electrodes. In addition to electrolysis, hydrogen can also be produced by thermal splitting, in which water molecules break down into hydrogen and oxygen when heated. The temperature required for this process is 2000K, although more splitting occurs at higher temperatures Regardless of the method used to produce it, the hydrogen can then be stored in a fuel cell, and can then be used to produce energy at a later time. In particular, a system that produced hydrogen using lightning would likely have no way of protecting itself against multiple lightning strikes occurring in quick succession, and the consequences could be catastrophic.

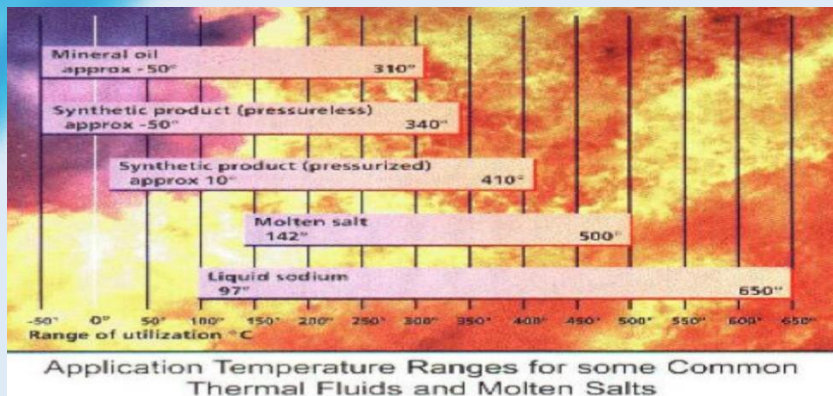**Introduction to Thermal Storage**

With both capacitive conversion and hydrogen storage nulled out, the best remaining option is to store the Energy thermally. Heating Elements most heating elements are made of copper due to its high thermal conductivity. In this case, the source consists of the lightning conductor and the lightning channel. However, so minimizing the source resistance (resistance of the conducting tower) and having a larger load resistance is desirable. Note that the efficiency is unity when the load resistance is infinity, but then there is no power transfer. If a dissipated energy of 200 MJ and a current of 30kA which lasts for 200ms is considered, then a 1.1 Ω resistance is required, given by. This calculation has to be performed using the upper threshold of energy, but if the duration of the current is shorter or the average current is lower, the resistance needed to dissipate that energy is much greater. Therefore, it is desirable for the resistance of the heating element to be greater than 1.1Ω.To give the highest rate of heat transfer the surface area of the conductor should be maximized. To model this system the copper adjoining every node can be considered as a resistor, creating a 3D network of resistors with the top surface connected to the lightning conductor and the bottom surface connected to ground. By inspection it can be deduced that the voltage at any point on a horizontal plane is the same, so resistors that lie in the horizontal plane can be omitted. Another aspect to consider is the electrical insulation

Figure 3 - Different arrangements of heating elements

of the conductor as the concrete is hydrated.

Thermal Oils

Application Temperature Ranges for some Common Thermal Fluids and Molten Salts

Thermal oils are extensively used in heating process applications, as a method of transferring heat from one material to another. They are possibly the ideal fluid for the purposes of the project since the can be used in a non-pressurized system, whereas alternatives, such as steam, require higher pressure.

Water

It is also far cheaper than any other storage material, so costs (at least, those associated with the storage medium) would be minimized. However, there are several problems associated with the use of water. While a larger volume could be used, the same could be said for alternative storage media, which could then store even more energy. In addition, if the water is impure, heating can cause precipitation. As stated before, hydrogen is both flammable and explosive, and thus poses a safety hazard (in particular, the system would have no protection against multiple strikes occurring within a fairly short interval.

Molten salts

Another possible storage medium for the energy is molten salts (often a mixture of sodium and potassium nitrate).

CSA

The thermal conductivity of CSA concrete is high, and it is inflammable. The Tube register is used for transporting and distributing the heat transfer medium (thermal oils) while sustaining the fluid pressure. The storage concrete stores the thermal energy.

Insulation

Insulators are predominantly described by their thermal conductivities. However, such materials are expensive, costing up to £50 per square metre. It would therefore be a good idea to use a storage material that uses latent heat instead of sensible heat.

Thermionic Generation


Figure 5 - Thermionic Generator
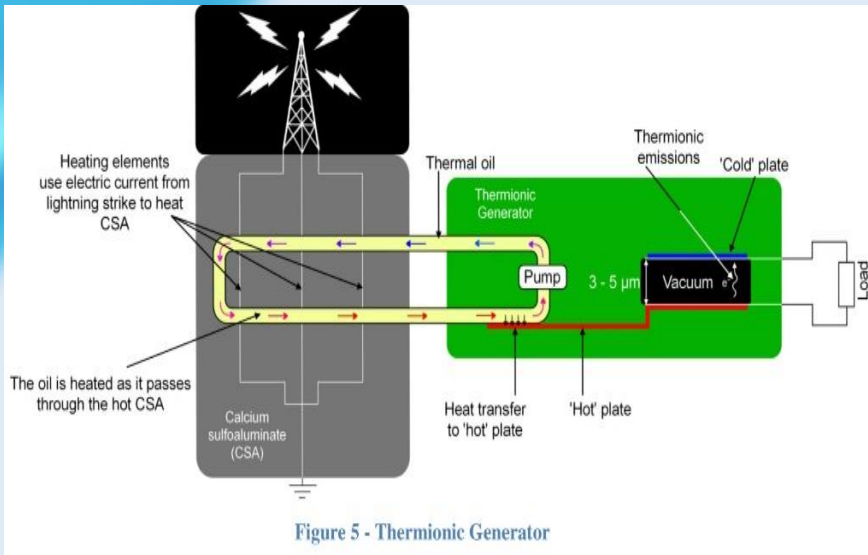
Thermionic generators turn heat into electrical energy by use of a temperature difference between two metallic plates, that are separated by a vacuum. The heat stored in the system would be used to heat the 'hot' plate .That would cause electrons to be emitted from its surface and be collected on the surface of the 'cold' plate. As a result, a charge difference will develop between the two plates, which can drive usable electric current. Thermionic generators are more efficient than steam turbines, and an efficiency of 40% can be achieved. The current produced can

Conclusion
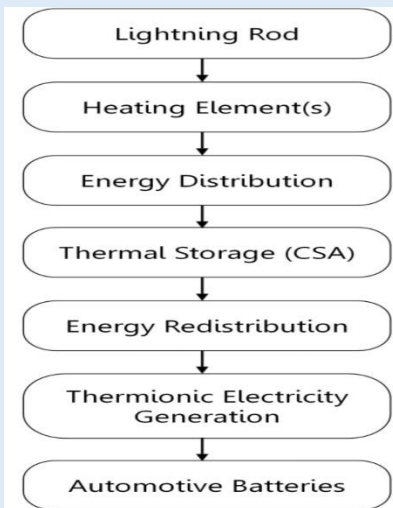
Based on the assumption that the power carried by lightning strikes has been successfully captured via a conducting tower, this power is transferred thermally into the heating elements. By substantially increasing the temperature of the heating elements, the thermal energy can be further distributed so that the thermal oils passing through the tubes are heated. These tubes are then passed through an innovative type of concrete (CSA) in order to transfer the energy and storing it by exploiting the properties of the CSA which above all include energy storage for later use. The tubes carrying the thermal oils extend at both sides of the concrete so that the energy contained in the oils is used to heat up the lower 'hot' plate of the thermionic generator. The temperature difference between these two plates is then used to produce a current to charge up the car batteries.

Lower level system Flow Chart
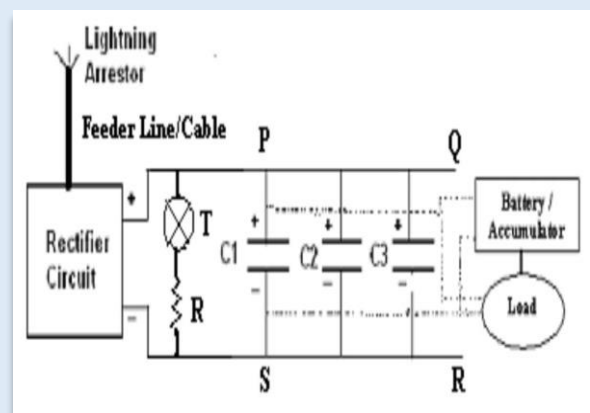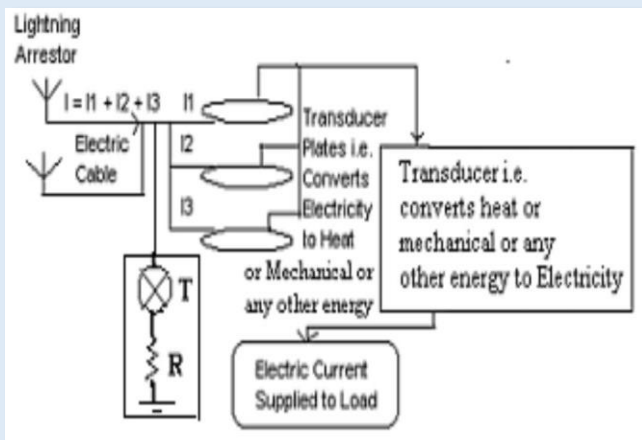
How many volts are in a lightning strike?

We learn that lightning bolts carry from 5 kA to 200 kA and voltages vary from 40 kV to 120 kV. So if we take some averages, say, 100 kA and 100 kV, this bolt would carry this much power, P:

P = 100×103 A x 100 x 103 V

= 10,000 x 106 VA or Watts

= 1 x 1010 Watts

Recall that 1010 Watts is 10,000,000,000 or 10 billion Watts.
Now assume this energy is released in 1 sec. So the power is:
1010 W-sec. On your electric bill, you'll see you pay for Watt-hours or Wh. So let's convert W-sec to Wh:

Pl = 1010 Ws x 1 hr/3600 s
Pl = 1/36 x 108 Wh
= 0.0277 x 108
= 2.7 x 106 Wh or Watt-hour per our average lightning bolt.

But can that power a town? And if so, for how long?
How much power does a single house consume? Again we have to play with averages. So let's assume one house needs 2,000 Watts/hour to keep the frig, furnace, computer, and all things plugged in going. In one day, 24 hours, the house consumes
Ph = 2,000 Watts x 24 hr.
= 48,000 Wh

So if we divide the power draw for the house into the power of a lightning bolt, we'll have the number of houses that bolt can power:
N = 2.7 x 106 Wh per bolt / 4.8 x 104 Wh/house
= 0.5625 x 102
= 56 houses/bolt of lightning for one day.

 So the answer to the original question is that a big bolt could power a small, 56-house town for a day.

That assumes we can catch all of that average bolt of lightning in a large capacitor. If you assume a capture efficiency, that would add a few more calculations. Still, the original question is intriguing.

The Impact of a Lightning Strike

Lightning is not only spectacular, it's dangerous. Hundreds more survive strikes but suffer from a variety of lasting symptoms, including memory loss, dizziness, weakness, numbness, and other life-altering ail level ments. Strikes can cause cardiac arrest and severe burns, but 9 of every 10 people survive. The average people of the world has 5,000 chance of being struck by lightning during a Lightning's extreme heat will vaporize the water inside a tree, creating steam that may blow the tree apart. Many houses are grounded by rods and other protection that conduct a lightning bolt's electricity harmlessly to the ground.

We Power Cities with Lightning

One of these places is Tampa Bay, Florida.A large city that needs a lot of power and happens to be in one of the most struck places in the world. But there's a catch…Lightning is ridiculously unpredictable. And each lightning attractor would need a ton of infrastructure to handle the massive power going from the sky to the storage system in fractions of a second. This storage system would have to mostly be capacitors if it wanted any hope of actually capturing the power, but capacitors have nearly no storage capacity so while their charge speed is ludicrously fast (like lightning-fast) it would not be able to store much of the power per unit. I mean you could put a really tall tower up to increase your chances, but then you have to have a storm nearly directly above you and hit at least a couple of times a month, probably more to make this make any sense given the investment needed to actually harness the power of the storm. This isn't making too much sense. At least electrically. There are a ton of other problems I didn't even mention like the need to ground a large amount of the lightning to keep from frying the capture system and how difficult any long term storage would be. Electrically this would be a very difficult proposition. There is, however, another way: Heat. For lightning, we would need to run nearly all of the power from the lightning strike to a water reservoir where it would enter through thousands of steel heating filaments and vaporize as much of the reservoir's water as there is energy in the strike. This way many lightning rods can be used to generate steam for the system and it can be done for far cheaper compared to a capacitor bank. Additionally, this electricity can simple plugged into an existing power plant already outfitted with the water reservoir and the turbine. There have been attempts to harness the power of lightning to varying degrees in the past but no one has found a profitable method of doing so electrically. Furthermore, we do not really know how much power is in a lightning strike. Lighting has a large charge window from 10,000 amps all the way up to 200,000 amps. There is a strong positive charge in the soon to be struck area could help predict the strength of the discharge depending on the strength of the positive charge. Just a second or two warning would be plenty of time for the valves and electronic controls to be ready for the strike and to optimize the power production from it. If it did not meet that maximum it would be highly inefficient and if it went over that maximum all the power that could not be converted would be wasted, put in the ground.

Augmented Reality: A Real world Perception

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Abstract- Augmented reality (AR) is an interactive experience of a real physical world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information and digital visual elements including other sensory stimuli like sound, auditory, heptic and olfactory. It is a growing trend among companies involved in mobile computing and business applications and in also in education. The combination of AR technology with the educational content creates new type of automated applications which enhance the effectiveness and attractiveness of teaching and learning for the students in real life scenarios. This article introduces the technology of augmented reality (AR) and its possible application.

1. Introduction to Augmented Reality

Augmented reality (AR) is one of the biggest technological trends right now. AR technology enable us to see the real-life environment right in front of us like; trees swaying in the park, dogs chasing balls, kids playing soccer with a digital augmentation overlaid on it. For example, a pterodactyl might be seen landing in the trees, the dogs could be mingling with their cartoon counterparts, and the kids could be seen kicking past an alien spacecraft on their way to score a goal. The most famous application of AR technology is the mobile app Pokemon Go, which was released in 2016 and quickly became an inescapable sensation. In the game, players locate and capture Pokemon characters that pop up in the real world location.

Bedside games, numerous application of AR have been practicing in different fields. Few of them are highlighted as follows:

- Augmented Reality is being used in navigation system to superimpose a route over the live view of the road.
- During games, broadcasters utilize AR to draw lines on the field to illustrate and analyze games strategy.
- Corporate & business sectors are interested in employing AR for the design and the recognition of their products and samples (Fig. 1 & 2).
- Military pilots see an AR projection of their altitude, speed, and other data on their helmet visor, by which they don't need to waste focus by glancing down to see them (Fig. 3).
- Neurosurgeons using an AR projection of a 3-D brain to help them in surgeries (Fig. 4).
- AR can project views of ancient civilizations over today's ruins, bringing the past to life.
- Ground crew at airport also wear AR glasses to see information about cargo containers, speeding up loading times
- Educationist and researcher have eager to apply AR to classroom-based learning and to adopt it into augmented books and student guides

2. Augmented Reality (AR) vs Virtual Reality (VR)

VR and AR are the two sides of a coin. Augmented reality imitates artificial things in a real environment whereas VR creates an artificial environment to inhabit. The main difference between them is where virtual reality aims to replace the real world while augmented reality respectfully

supplements it. In augmented reality, 3D graphics are used to superimpose the computer-generated images over the user's view of the real world. This is possible because computers make use of sensors and algorithms to determine the orientation of a camera. However, in Virtual Reality, the computer makes use of similar senses and algorithms. But, the major difference arises when instead of making use of real cameras within the physical environment, VR technology utilizes the user's eyes to locate within the imitated environment. This clearly means that, if the user's head turns then the graphic are going to react accordingly. VR technology offers a convincing and interactive world in which the user responds.

Fig. 1 AR in smart phone Wallpapers

Fig. 2 Online shopping using AR

Fig.3 Military in AR based camouflage suit

Fig. 4 Neurosurgeon wearing AR glass for surgery

3. Augmented Reality in Games

AR and virtual reality (VR) are going to redefine the gaming industry with its revolutionary actions. Nowadays, VR has turned out to be the burning topic for gaming trends which has gained the attention of the potential market. It provides lots of benefits to its users such as offers appealing virtual objects and possesses the capacity to take the user into the game of real-time A number of games were developed, such as AR air hockey, Titans of Space, collaborative combat against virtual enemies. Augmented reality allowed video game players to experience digital game play in a real world environment. *Niantic* released the augmented reality mobile game ―Pokémon Go‖ (Fig. 5). *Disney* with collaboration with *Lenovo* has created augmented reality game ―Star Wars‖ Augmented reality gaming (ARG) is also used to market film and television entertainment properties.

4. AR in Education & Training

There are many different ways which are being used to educate and train people with regard to specific requirements and skills. Augmented Reality (AR) is one technology that dramatically shifts the

location, timing and methods of education and training. Professionals are applying AR in classroom-based learning within subjects like chemistry, mathematics, biology, physics, and also technical subjects. AR can make easy demonstration of complicated mechanisms and theories and understandable by the students with contextually enriched interaction.

Augmented Reality can also be used to enhance collaborative tasks. It is possible to develop innovative computer interfaces that merge virtual and real worlds to enhance face-to-face and remote collaboration. One of the interesting applications of AR is augmented reality textbooks (Fig. 6). These books are printed normally but point a webcam to the book brings visualizations and interactions designed which is possible by installing special software on a computer, using special mobile apps or a web site. This technology allows any existing book to be developed into an augmented reality edition after publication and then textbooks will became dynamic sources of information.

Fig. 5 Pokémon GO games using AR
AR text book

Fig. 6 Role of AR in education

5. Potentiality of AR in Business & Retail

AR in conjunction with VR blends the ways of adoption and communication of things between the physical and digital world. They offer a new way of interacting with customers, colleagues, and the world around us. Augmented reality has a lot to offer in business and more appealing to the market due to its features. One way augmented reality is used in business is 3D modeling. For retail businesses, AR offers a way for customers to try products before they buy.

For example, *Sephora* has an app that lets customers see how their makeup products will look, and *Wayfair* uses AR to show customers how furniture will look in their home. Smartphone apps that allow customers to see what their purchase would look like at home before they buy it. Furniture Company IKEA has already applying AR app for its business and has become very popular. There are several AR based products in market; *Microsoft HoloLens*, *Google Glass*, *Magic Leap* and *AR headset* among them. Before investment for any product, it is required to sure about the weigh, costs, features, development kits, and other features to determine the best for your needs.

6. Application of AR in Manufacturing Industry

AR technology is already creating on the industrial manufacturing plant floor. AR aims to produce efficient operations by cutting down production downtime, quickly identifying the problems and keeping all the services and processes going. Industrial professionals frequently collaborate with other remote experts using AR and they can now connect more effectively with their peers. Virtual manuals

help manufacturers to adapt rapidly various product designs, as digital instructions are more easily edited and distributed compared to physical manuals reducing mental effort of the operators (Fig. 7). AR makes machine maintenance efficient because it gives operators direct access to a machine's maintenance history. The use of AR can increase operators' feeling of safety when working near highload industrial machinery by giving operators additional information on a machine's status and safety functions, as well as hazardous areas of the workspace (Fig.8).

Fig. 7 AR in manufacturing industry of motor

Fig 8. AR service for Temp. Monitoring

7. Conclusions and Future :

The future of AR as a visualization technology looks bright, as shown by the interest generated in business and industrial circles as well as discussed in popular periodicals and research papers in the education and training fields. Many questions still linger in terms of efficiency and when compared to traditional methods, particularly given the investments needed in research and design. However, there is much optimism of AR in education and training for the future. New technologies and information communications are not only powerful and compact enough to deliver AR experiences via personal computers and mobile devices but also well developed and sophisticated to combine real world with augmented information in interactively seamless ways.

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Human Vs. Mind

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The Human Brain versus computers in the past few decades we have seen how computers are becoming more and more advance, challenging the abilities of the human brain. We have seen computers doing complex assignments like launching a rocket or analyzing from outer space. But the human brain is responsible for, thought, feelings, creativity, and other qualities that make us humans. So the brain has to be more complex and more complete than any computer. Besides if the brain created the computer, the computer cannot be a better warm-bloodedwarm blooded creatures by joining ultrasound-actuated warming impact and hereditary qualities, which they have named sonothermogenetics. It is likewise the main work to show that the ultrasound-hereditary qualities blend can vigorously control conduct by animating a particular objective somewhere down in the cerebrum. Consequences of the three years of examination, which were financed partially by the National Institutes of Health's BRAIN Initiative, were distributed online in Brain Stimulation on May 11, 2021. The senior examination group remembered prestigious specialists for their fields from both the McKelvey School of Engineering and the School of Medicine, including Jianmin Cui, teacher of biomedical designing; Joseph P. Culver, educator of radiology, of physical science and biomedical designing; Mark J. Mill operator, a partner teacher of medication in the Division of Infectious Diseases in the Department of Medicine; and Michael Bruchas, once of Washington University,presently educator of anesthesiology and pharmacology at the University of Washington. Our work gave proof that sonothermogenetics summons social reactions in openly moving mice while focusing on a profound mind site. Sonothermogenetics can change our methodologies for neuroscience explore and reveal new strategies to comprehend and treat human cerebrum problems." Hong Chen, Assistant Professor, Biomedical Engineering, McKelvey School of Engineering Utilizing a mouse model, Chen and the group conveyed a viral build containing TRPV1 particle channels to hereditarily chose neurons. At that point, they conveyed little eruption of warmth utilizing low-force centered ultrasound to the select neurons in the cerebrum through a wearable gadget. The warmth, a couple of degrees hotter than internal heat level, enacted the TRPV1 particle channel, which went about as a chance to kill the neurons on or. "We can move the ultrasound gadget worn on the head of free-moving mice around to target various areas in the entire mind," said Yaoheng Yang, first creator of the paper and an alumni understudy in biomedical designing. "Since it is noninvasive, this method can be increased to huge

creatures and conceivably people later on." The work expands on research directed in Cui's lab that was distributed in Scientific Reports in 2016. Cui and his group figured out interestingly that ultrasound alone can impact particle channel movement and could prompt new and noninvasive approaches to control the action of explicit cells. In their work, they tracked down that engaged ultrasound balanced the flows coursing through the particle channels on normal by up to 23%, contingent upon channel and improvement power. Following this work, scientists discovered near 10 particle channels with this capacity, yet every one of them are mechanosensitive, not thermosensitive. The work additionally expands on the idea of optogenetics, the mix of the focused on the articulation of light-touchy particle channels and the exact conveyance of light to invigorate neurons somewhere down in the mind. While optogenetics has expanded disclosure of new neural circuits, it is restricted in infiltration profundity because of light dissipating and requires careful implantation of optical filaments. Sonothermogenetics has the guarantee to focus on any area in the mouse mind with a millimeter-scale goal without making any harm to the cerebrum, Chen said. She and the group keep on streamlining the method and further approve their discoveries.Even technology on its own is improving a lot with due help of humans. There are no ends to improvement and there seems to be no end to it.Innovation that will wed tests that can distinguish malignant growth tumors through the

skin with a high-accuracy automated medical procedure is to be produced for use in emergency clinic settings without precedent for a venture drove by the University of Warwick. The Terabotics undertaking will utilize tests that utilization terahertz radiation, or T-beams, to examine for tumors under the skin while clinical evaluation careful robots will be adjusted to utilize these sweeps to control them in eliminating tumors in skin and colorectal malignant growth

patients all the more definitely. If effective, the scientists trust it could prompt continuous analysis for disease patients, more limited hanging tight periods for malignant growth medical procedure, and more extensive evacuation of tumors with a decreased requirement for follow-up medical procedure. The task, which has gotten financing of £8 million from the Engineering and Physical Sciences Research Council, a piece of UK Research and Innovation, is a cooperation between the University of Warwick, University Hospitals of Coventry and Warwickshire, the University of Leeds, and the University of Exeter. The five-year project beginning in September 2021 expects to in the end preliminary the innovation with patients going to malignancy administrations at University Hospitals Coventry and Warwickshire and Leeds Teaching Hospitals NHS Trust. Terabotics will utilize research from the University of Warwick into terahertz (THz) radiation, or T-beams, which sit in the middle of infrared and WiFi on the electromagnetic range. Past work from the University of Warwick's Department of Physics has shown that these can be utilized to recognize unpretentious changes in the peripheral layers of skin, and the method has effectively been exhibited on solid volunteers. This will be the first occasion when that it will be concentrated in patients inside a functioning disease measure. Just as evaluating how successful T-beam innovation is in diagnosing malignant growths contrasted with standard consideration, the undertaking expects to consolidate the innovation into careful robots to direct them all the more precisely when distinguishing tumors during colonoscopy and eliminating
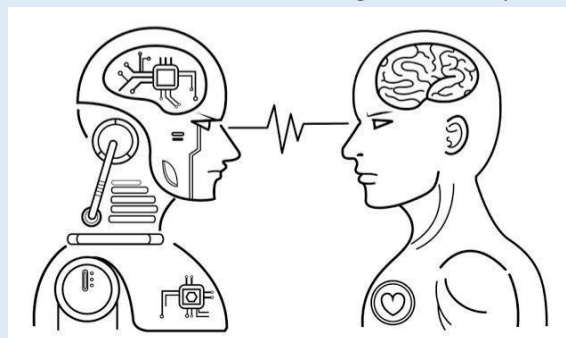
them during the medical procedure. What we will test is our theory that we can identify a covered or covered-up tumor. We think our terahertz test will want to distinguish those through taking a gander at the transient reaction of the skin." Emma Pickwell-MacPherson, Professor and Principal Investigator, Department of Physics, University of Warwick. "Someone may as of now be determined to have disease however the genuine degree of that malignancy may not be known. For instance, in skin malignancy patients, the THz test will picture the noticeable tumor and the encompassing region to all the more likely decide the degree of the tumor that is underneath the surface. This will empower the entire tumor to be taken out in one go, as opposed to steadily. Thus, this empowers better anticipating reproduction and rates up the technique." At first, the scientists will zero in on adjusting the T-beam tests to work with the careful robots, scaling down the innovation, and refining the plan to give more symptomatic boundaries. Later phases of the task will include testing the innovation with patients with a known or suspected disease. Those going to malignant growth administrations at University Hospitals Coventry and Warwickshire will be offered the chance to take part close by their normal consideration. Colorectal disease patients will be seen at the University of Leeds, where an endoscopic test is being grown explicitly to inspect the colon. Very much like our skin, the colon is an epithelial covering and might be examined by T-beams similarly. As of now, analysis of skin malignancy depends upon a visual investigation by a clinician and a biopsy. There are more than 150,000 new instances of skin malignant growth in the UK every year (1) and a few million all around the world (2), numbers which are set to ascend because of the expanded future. 1 of every 15 UK guys and 1 out of 18 UK females will be determined to have entrail malignant growth in the course of their life and it is the second most normal reason for disease demise in the UK. (2) Educator Joseph Hardwicke, Medical Lead for the undertaking at University Hospitals of Coventry and Warwickshire, said: "This method is an approach to analyze the skin at a more profound and more specialized level than what we can right now. The fundamental expectation, particularly for skin disease, is to decide the degree of the spread locally and to conceivably analyze these malignant growths without the requirement for a biopsy in the future. "This is a different space of diagnostics, similar to how MRI during the 1980s altered clinical imaging. I think this is an opportunity for terahertz joined with mechanical technology to give us that more prominent exactness. Although we are as yet constructing proof, there is by all accounts a lot of bits of the jigsaw that bode well." Educator Pickwell-MacPherson adds: "If we can offer a quantitative response utilizing our innovation that would be extraordinary, and at last that will accelerate the throughput of patients. That thusly will diminish holding up occasions and expenses, it will imply that the surgeries can be better arranged and accomplished all the more proficiently, the number of follow-up techniques can be decreased, at that point that has suggestions monetarily to the NHS. "This region is best in class and terahertz advanced mechanics is turning into an intriguing issue. It has for some time been recommended that THz innovation could be utilized for malignancy discovery and this task will push the innovation forward

to make it a reality. We trust that by showing its application to skin and colon malignancies we will open up the way to applying the innovation to profit different diseases as well and change malignancy treatment conventions." Educator Pietro Valdastri of the University of Leeds said: "Advanced mechanics are progressively utilized in the working venue as it brings predominant exactness and dumps a portion of the weight of the method from the specialist. At Leeds, we are fostering the up-and-coming age of careful robots to recognize colorectal malignant growth prior and eliminate it all the more adequately. Adding THz insight capacities to our robots is another energizing road of examination that can improve malignancy patient personal satisfaction in the following 5 to 10 years." The task is among 20 creative activities reported to reform medical care, improve therapies for a great many individuals with a wide scope of conditions, and set aside the NHS cash. The activities are upheld by £30.8 million of financing by the Engineering and Physical Sciences Research Council (EPSRC), part of UK Research and Innovation (UKRI). Four undertakings were co-supported by UKRI's Medical Research Council (MRC). EPSRC Executive Chair Professor Dame Lynn Gladden said: "Advances and approaches spearheaded by UK analysts can upset therapy for a wide scope of conditions, from gut disease to diabetes." and, "The tasks declared today epitomize this potential and may assume a critical part in improving the existences of millions of individuals."

But no matter how much farther the technology upgrades, the human brain still holds the most complex emotions and safeguard their beloved with small lies when needed. AI might learn emotions but the superpower of expressing the same thing with different feelings will still be missing to known date.

Restoration of Ecosystems

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Ecosystem :-

An ecosystem is a geographic area where plants , animals and other organisms , as well as weather and landscapes work together to form a bubble of life the two main components of ecosystem are : -
➢ Abiotic Components – All non living components of an ecosystem including air , water , light , soil , rocks , minerals and nutrients are examples of abiotic components .
➢ Biotic Components - All living components of an ecosystem including producers consumers and decomposers are example of biotic components .

Importance of ecosystems :-
It provides habitat to wild plants and animals . It provides various food chains and food webs . It controls essential ecological processes and promotes lives . Involved in the recycling of nutrients between biotic and abiotic components .

Causes of ecosystem destruction :-

As we know that is small change in an ecosystem , such as elimination or introduction of one species , can cause changes in the entire ecosystem . So ecosystem maintains a very delicate balance . Various human activities threaten to disrupt this balance and destroy the world's ecosystems which includes :-
➢ Pollution
➢ Climate change
➢ Land clearing
➢ Resource exploitation
➢ Declining of animal population

Impact of ecosystem destruction :-

The impact of ecosystem destruction are the following :-
➢ Increased flooding due to the erosion of soil and lack of trees.
➢ Climate change causes the sea levels rising due to the melting of glaciers.
➢ More a likelihood that natural disasters such as tsunamis , earthquakes , droughts will be common place.
➢ Disruption of the food chain when the apex predators become extinct.
➢ Water shortage - the supply of fresh drinking water is limited with only a few water bodies being fit for human consumption .
➢ Food shortage as the lands become barren and the oceans become devoid of fish and other marine life.
➢ Loss of bio-diversity as a whole species of living things disappear due to deforestation .
➢ Pollution will eventually become unmanageable and affect the health of the human population . Rising temperatures may be too much to bear for every living organisms on the planet .

Ecosystem recovery solution :-

The one and only way to improve and recover the ecosystem is ecological restoration . Ecological Restoration is the process of assisting the recovery of an ecosystem that has been degraded , damaged or destroyed . It has as its goal , an ecosystem that is resilient and self -sustaining with respect to structure , species composition and function , as well as being integrated into the larger landscape and supporting sustainable livelihoods .
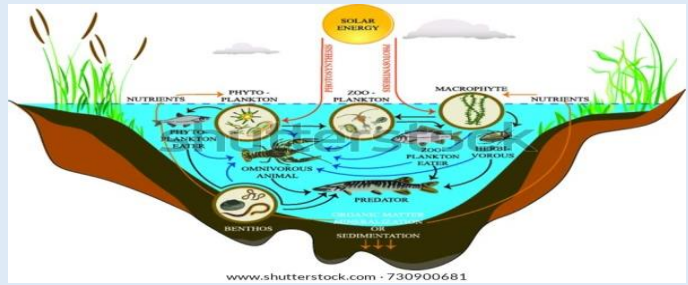
Process of restoration :-

We can restore an ecosystem by following steps :-
- ➢ We should inventory and map our land .
- ➢ We should investigate historic conditions .
- ➢ We should interpret landscape changes .
- ➢ We should developed goals and objectives .
- ➢ We should develop our restoration plan .
- ➢ We should develop a good monitoring program .
- ➢ We should implement the plan .
- ➢ We should maintain good records .
- ➢ We should review the project .
- ➢ We should share the restoration process .

Challenges we may face :-

The circumstances that we seek to address are often very challenging . The areas of degraded land now present in various parts of the world are large . Some systems are severely degraded and will be costly to repair . Further , many of these degraded systems are still being used by people and many of these people are poor . We may not succeed in fully eradicating the causes of degradation in this circumstances but there is sufficient evidence from a variety of case studies for us to be optimistic . This evidence makes it clear that ecological restoration will be a key element not only of conservation but also for sustainable development worldwide .

Conclusion :-

We come to the conclusion that discretion can be large scale or small scale , it cannot be carried out by an individual , it should be carried out by few individuals or via government programs involving thousands of participants . Utes have to come forward and take the initiative to carry out the purposes of restoration . It can be well resourced and modestly

funded ,. In all cases ecological Restoration will improve the biological diversity on degraded. landscapes , increase the populations and distribution of rare and threatened species , enhance landscape connectivity , increased availability of environmental goods and services , and contribute to the improvement of human well being

Smart Grid: The Future

Mr. Sarbojit Mukherjee
*Assistant Professor,*
Dept. of Electrical Engg. RCCIIT

What is a Smart Grid?

A smart grid is a modern power generation, transmission and distribution system that can automate and manage the increasing complexity and needs of electricity in the 21st century. The technology aims to; integrate and support renewable energy sources like solar, wind and hydro, empower consumers with real-time information about their energy consumption and assist utility companies to reduce outages.
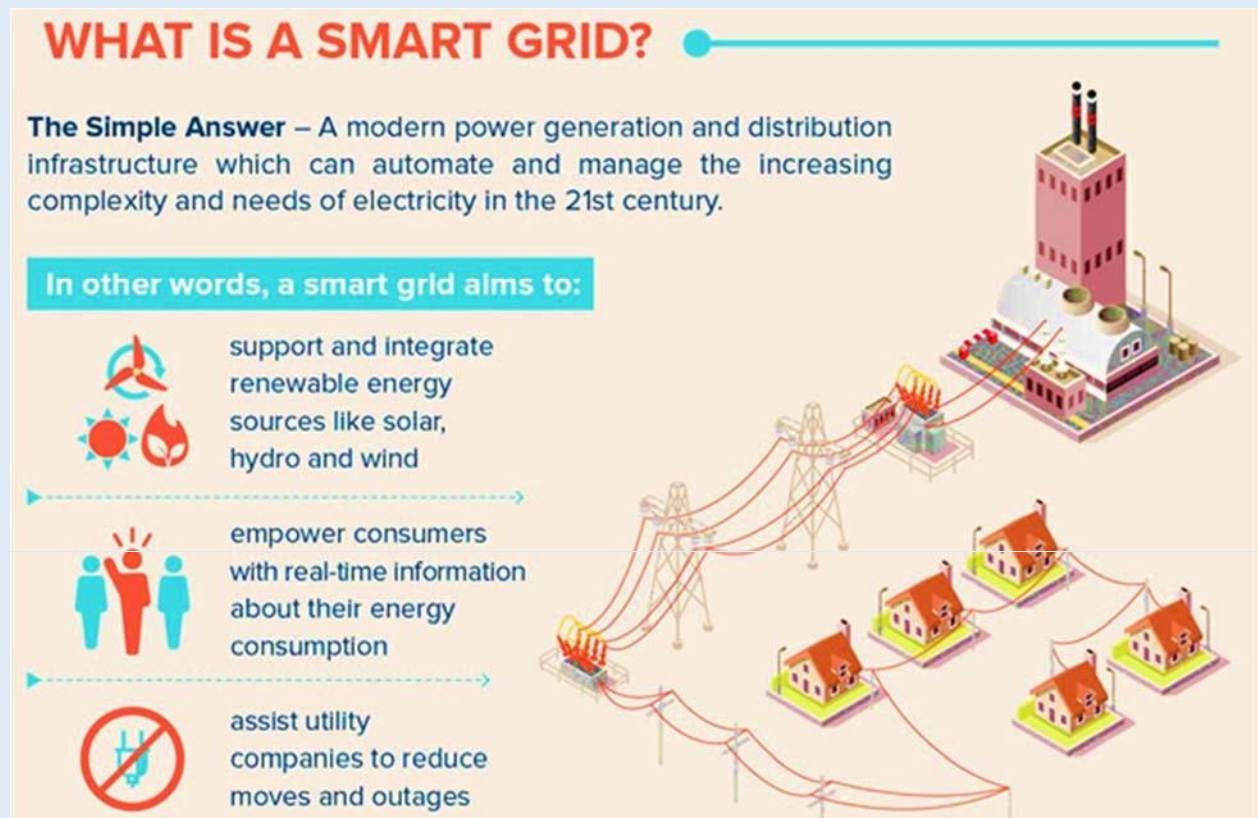
Definition of Smart Grid

What Makes up a Smart Grid?
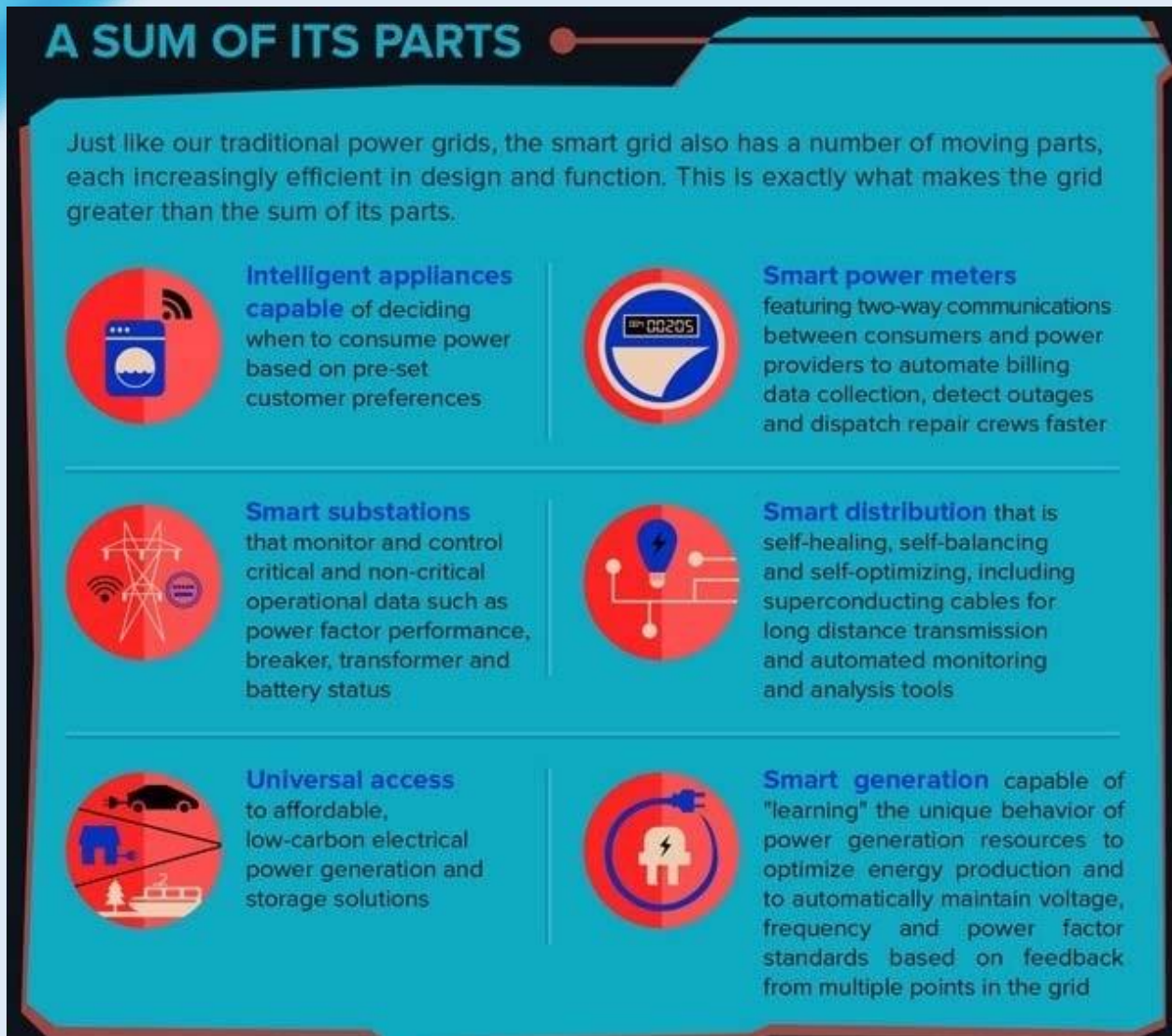
Component of Smart Grid

Just like traditional grids, smart grids have a number of moving components. However, smart grids have parts that are more efficient in terms of design and functionality. For instance, there are intelligent appliances that are capable of deciding when to consume power based on the pre-set user preferences. There are also smart substations that control critical and non-critical operational data, such as power factor performance, breaker, battery and transformer status.

Another critical component of a smart grid is the smart power meter that is capable of two- way communication between the consumer and power provider. This makes detection of power outages, billing, data collection and dispatching of repair crews easier and faster. There is also smart distribution characterized by auto outages, billing, data collection and dispatching of repair crews easier and faster. There is also mated monitoring and analysis tools, superconducting cables for long-distance transmission, self-healing, self optimization and self balancing.

Smart generation is another key component of a smart grid. The system is capable of "learning" the unique behavior of power generation resources to optimize energy production and to automatically maintain voltage, frequency and power factor standards based on feedback from multiple points in the grid. There is also universal access to affordable, low-carbon electrical power generation and storage solutions.

Why Do We need Smart Grids?
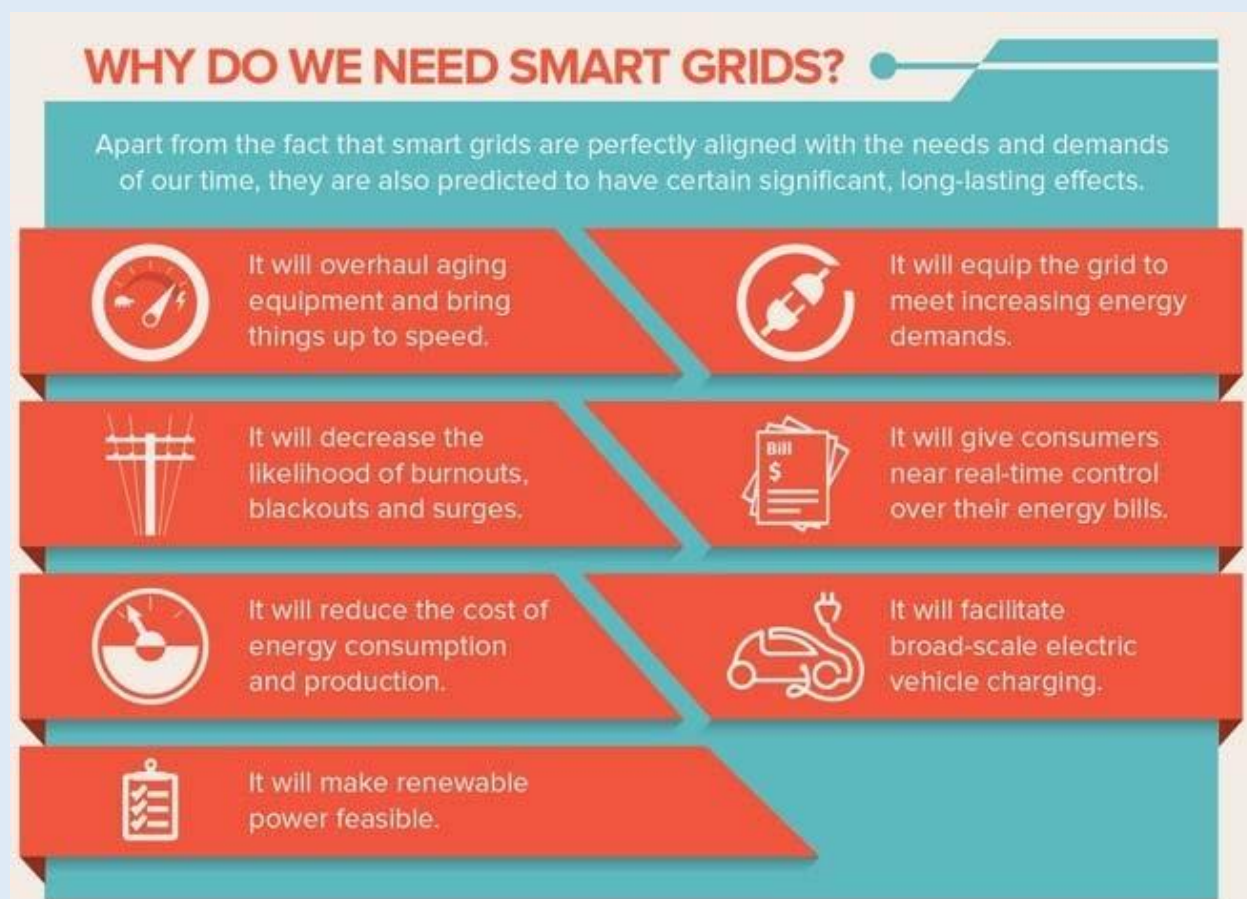
Smart Grid Need

Smart grids are not only aligned perfectly with the needs and demands of our time, they are also predicted to have significant long-lasting effects. For instance, the technology will overhaul aging equipment and bring things up to speed. This will help to reduce the likelihood of blackouts, burnouts and power surges. The technology will also reduce both the cost of energy consumption and production. With its full implementation, smart grids will make renewable power feasible and equip the grid to meet increasing energy demands. More importantly, however, the technology will give consumers near real-time control of their energy bills and facilitate large- scale electric vehicle charging.

Smart Grid in INDIA:

In 2015, Ministry of Power, Government of India, established National Smart Grid Mission NSGM) to plan and monitor the implementation of policies and programs related to the smart grid activities in India. Role of ISGTF was merged into NSGM, NSGM is also coordinating for development of smart grids in the smart cities under Smart Cities Mission. NSGM promotes deployment of Smart Grid

technologies like Advanced Metering Infrastructure (AMI), substation renovation and modernization with deployment of Gas Insulated Substations (GIS) wherever economically feasible and Distributed Generation in the form of Rooftop Solar PVs, real-time monitoring and control of Distribution Transformers, creation of Electrical Vehicle (EV) charging Infrastructure for supporting proliferation of EVs, development of medium sized Micro-grids and provision of power quality improvement measures. Government of India is promoting deployment of Smart Grid projects under the NSGM through funding support of 30% on capital expenditure. The details of smart grid projects being implemented under NSGM are given below.

	S. N.	Utility	Smart Grid Implementing Agency	Date of Award	Sanctioned Cost (million US$)	Consumer Base
Pilot Projects	1	CESC, Mysore	Enzen	Mar'14	5.05	21824
	2	UHBVN, Haryana	NEDO Japan	Apr'14	5.57	11000
	3	HPSEB, Himachal Pradesh	Alstom	Feb'15	3.01	1554
	4	APDCL, Assam	Phoenix IT	Mar'15	4.64	15083
	5	PSPCL, Punjab	Kalkitech	Mar'15	1.57	2737
	6	WBSEDCL, West Bengal	Chemtrols	Jun'15	1.09	5265
	7	TSECL, Tripura	Wipro	Sep'15	9.83	45290
	8	TSSPDCL, Telangana	ECU	Oct'15	6.48	11906
	9	PED, Puducherry	Dongfang	May'16	7.14	33499
	10	AVVNL, Ajmer	USAID PACE-DTA	Sep'15	Not Available	1000
	11	UGVCL, Gujarat	Genus and Fluentgrid	March 17 (LOI)	12.81	23760
	12	IIT-K Smart City Pilot	IIT Kanpur	OCT'15	1.94	20 households
				Sub Total	59.12	

	S. N.	Utility		Date of Award	Sanctioned Cost	Consumer Base
Under NSGM	1	Chandigarh, CED#	-	Under Progress	4.43	29433
	2	Amravati, MSEDCL#	-	Under Progress	13.95	148000
	3	Congress Nagar (Nagpur), MSEDCL#	-	Under Progress	21.56	125000
	4	Kanpur, KSEC	-	Under Progress	49.51	539000
				Sub Total	89.44	
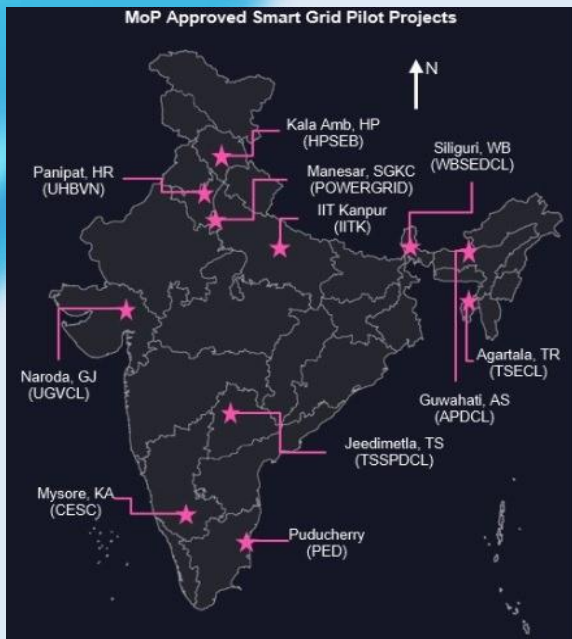
Smart Grid Pilot Project in INDIA Mission

Smart Grid in INDIA under National smart grid

Research & Development Priorities on Smart Grids

A list of the areas identified under four different themes, based on the need of the country and having potential benefit of collaborative efforts with the MI country partners, are listed below.

1. **Operation, Control & Protection**

   • Operation and control of large, medium and small scale renewable energy sources (R,D,M,C)

   • Protection technologies for AC and DC smart grids (R,D,M)

   • Wide area monitoring, protection and control (WAMPC) (R,D,C)

   • Energy management techniques(R,D,M,C)

   • Supervisory control of network with multiple micro and nano grids(R,D,M,C)

   • Network analysis and optimal power flow(R,D)

   • Modeling and simulation of large power grids (including cyber systems)(R,D,C)

   • Seamless Grid operation involving TSO and DSO (R,D,M,C) • Forecasting of renewable and loads (R,D,M,C)

2. **ICT & Cyber security**

   • Reliable wired and wireless communication technologies(R,D,M,C)

   • Interoperability and ICT architecture (R,D,M,C)

   • Audit and validation tools for cyber security features (R,D,M)

   • HAN, WAN, and Internet of things(R,D,C)

- Threat models and Cyber security (R,D,M,C)

- Information privacy and handling challenges(R,D,M,C)

- Cloud Computing, data storage and big data analytics(R, D, M, and C).

3. **Devices and Technology (Converters)**

- Fault ride through enhancement of converter interfaced to renewable energy sources (D, M,C)

- Grid interfacing and islanding issues along with seamless transfer technology(D,M,C)

- Ancillary services participation (R,D,M,C)

Optimal design of flexible power converters (D,M,C)

- Coordination and control of multiple converters and modular multi-level converters (R,M,C)

- Converter technologies for HVDC and MVDC systems(R,D,C)

- Multi-functional hardware smart grid enablers (D,M,C)

- Smart and unified control of converters (M,C)

- Hot swappable converters for smart grids (R,D,M)

- Standardization of voltage and power levels (R,D,M,C)

- Network voltage regulation and power quality (R,D,M,C) • Wide band gap devices (GaN, SIC) (R,D,M,C)

4. **Distributed Energy Resources, Storage and Deployment Issues**

- Policy, regulatory and market design issues (R, D, M, C).

- Demand side management with optimization and forecasting techniques for storage and renewable energy source (RES)(R,D,M,C)

- Inertial issues of renewable energy resources with stochastic behavior(R,D,M)

- Optimal mix, siting and sizing of energy storages at various levels of network(R,D, M)

 (Note: R – Regional, D – Distribution, M – Micro-grid, C - Cross- Innovation)

Reference
https://www.nsgm.gov.in/en/

Concept of Solar Wind Hybrid Systems

Name:- Chirantan Bhattacharya

Roll No.-EE2018/051(3ʳᵈ Year)

Introduction:

Energy demand is ever increasing in the world, searching for fossil fuel is done on priority basis. These fuels are not sustainable, they pollute the environment. Shortage of fossil fuels resources and adverse environment affects made use of Renewable Energy Sources (RES) as Solar energy and Wind energy essential. Solar energy and Wind energy are natural resources which are not depleted by use and are more popular. Availability and ease to obtain electric power made Solar and Wind power as alternative energy sources.
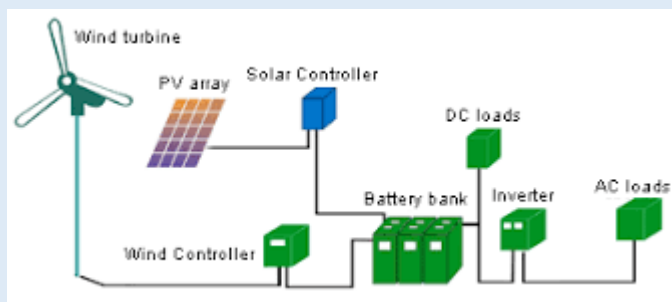
Solar energy and Wind energy combined to form Solar-Wind Hybrid Power System (SWHPS), which will enhance the qualities of each other and another. To reduce the power demand on the conventional power generation sector, the optimized utilization of these natural resources is essential to produce power. Various methodologies are in practice for generation of power using Solar-Wind Hybrid System with Maximum Power Point Tracking (MPPT). Constant voltage method is used for maximum power transfer. This method should have some key features to increase the stability and efficiency.

Description:

Solar hybrid power systems are hybrid power systems that combine solar power from a photovoltaic system with another power generating energy source. A common type is a photovoltaic diesel hybrid system, combining photovoltaics (PV) and diesel generators, or diesel gensets, as PV has hardly any marginal cost and is treated with priority on the grid. The diesel gensets are used to constantly fill in the gap between the present load and the actual generated power by the PV system.

As solar energy is fluctuating, and the generation capacity of the diesel genesets is limited to a certain range, it is often a viable option to include battery storage in order to optimize solar's contribution to the overall generation of the hybrid system.

The best business cases for diesel reduction with solar and wind energy can normally be found in remote locations because these sites are often not connected to the grid and transport of diesel over long distances is expensive. Many of these applications can be found in the mining sector and on islands.

Solar/wind hybrids use solar panels and small wind turbine generators to generate electricity. They work in small capacities. Typical capacities are in the range of 1 kW to 10 kW for the solar panel and the wind turbine combined system.

The solar wind hybrid systems are used where the load is relatively small. In commercial and industrial sectors, the systems are used (for example) in rural offices or small tourist hotels where power shortage

is chronic. It can be used in schools especially in rural and urban fringe areas. It can be used for military (charging of communication units) as well as in railways (track signalling).

The solar panel and the wind turbine works in tandem to charge a battery via a controller. The wind turbine could be a vertical axis wind turbine or a horizontal axis wind turbine (wind mills of megawatt level capacities are always horizontal axis). In a typical hybrid system, the battery is first charged by the Solar, then by Wind and if necessary, by grid.

Advantages:

It is hard to determine precise payback periods for solar wind hybrid systems. The solar wind hybrid systems work best in industrial-commercial situations where the grid power is in chronic short supply or where the remoteness of the terrain makes power supply unreliable (military, railway application) or where the power is expected all the time (high end apartment owners have such expectations). One type of industrial-commercial area which can use this product is small rural offices: rural health centers, e-governance canters, agricultural center offices, Village Level entrepreneurs' kiosks/chauppals. These small rural offices will run on a few fans and lights, one or two computers and a laser/bio-metric scanner. It will typically consume 3-4 units of power per day. The discharge/charge cycle below will explain the benefit:

Time	Grid Supply	Charging/Discharging
During the Day (9 AM to 7 PM)	Intermittent Supply	From the Solar and Wind, from grid , depending on conditions, Solar supports load and battery charging simultaneously. Battery may be fully discharged at the end of some days.
Till late night/early morning (1 AM)	Grid not available	Battery charged to 15-20% by wind
From early morning (1 AM) to sunrise (6 AM)	Grid available	Battery charged to 90% by grid
From sunrise to office commencement (9 AM)	Grid available	Battery charged by solar/grid to 100%m

Configuration & Cost of meeting the 3 units of power required per day:

A range of typical configurations is as follows:

Solar	600W	1 kW	3.5 kW
Wind	500W	1 KW	3.5 kW
Number of electricity units produced per day (kwhr)	4	8	28
Capital Cost	Rs. 2,50,000	Rs. 4,00,000	Rs. 12,00,000

ISRO- It's past and future missions

Name:- Debleena Das

Roll No.-EE2018/047(3rd year)

Origin:

Indian Committee for Space Research(INCOSPAR) later renamed as Indian Space Research Organization (ISRO) is the pioneer space exploration agency of the Government of India, headquartered at Bengaluru. INCOSPAR was the 'brainchild' of the great visionary, Dr.Vikram Sarabhai, the "Father of Indian Space Program". He was the first person to point out the relevance of space program in a developing nation. His vision was to make India technologically advanced in all prospects nationally.

ISRO was formed in 1969 with a vision to develop and harness space technology in national development, while pursuing planetary exploration and space science research. Over the years, ISRO has been successful in making it's place among the elite space agencies of the world in the most cost effective and innovative way.

Journey so far:

INCOSPAR set up it'sfirst rocket launching stationin 1962, at Thumbanear Trivendrum in Kerala. The first Indian Satellite , Aryabhatta was build by ISRO and launched with the help of the Soviet Union on April 19, 1975. The year 1980 marked the launch of Rohini, which was the first satellite to be successfully placed in the orbit by SLV-3, an Indian made launch vehicle. ISRO has launched several space systems, including the Indian National Satellite (INSAT) system for telecommunication, television broadcasting, meteorology and disaster warning and the Indian Remote Sensing (IRS) satellites for resource monitoring and management. The first INSAT was launched in 1988, and the program expanded to include geosynchronous satellites called GSAT.

ISRO also developed it's own cryogengenic technology.Indian scientists conducted the first successful cryogenic engine test in the year 2003 and the first successful flight was conducted in 2014. ISRO subsequently developed three other rockets: the Polar Satellite Launch Vehicle(PSLV) for putting satellites into polar orbit, the Geostationary Space LaunchVehicle (GSLV) for placing satellites into geostationary orbit and a heavy-lift version of the GSLV called the GSLV Mark III or LVM. Those rockets launched communication satellites and Earth-observation satellites as well as missions to the Moon (Chandrayaan-1, 2008; Chandrayaan-2, 2019) and Mars (Mars Orbiter Mission, 2013). Recently ISRO made a breakthrough by sending it's Polar Satellite Launch Vehicle successfully launching the 714 kg Cartosat-2 Series Satellite along with

103 co-passenger satellites on February 15, 2017 from Satish Dhawan Space Centre SHAR, Sriharikota. This is the thirty eighth consecutively successful mission of PSLV. The total weight of all the 104 satellites carried on-board PSLV-C37 was 1378 kg.

Future Missions:

ISRO continues to move up the success ladder through gradual technological development. Some of the enthralling future missions of ISRO include Aditya L-1; Solar Observation mission, Gaganayan;the crewed spacecraft mission. Others than these two are Chandrayaan-3, MOM-2, NISAR, Sukrayan-1 and so on. I would like to specially describe in breif about the first two upcoming missions as mentioned.

ADITYA L-1: It is India's first scientific expedition to study the sun. It is 400kg class satellite carrying one payload The Visible Emission Line Coronagraph(VELC). A Satellite placed in the halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system has the major advantage of continuously viewing the Sun without any eclipses. Therefore, the Aditya-L1 will be inserted in a halo orbit around the L1, which is 1.5 million km from the Earth. The satellite carries additional six payloads with enhanced science scope and objectives. It will study the coronal heating, solar wind acceleration, the space environment around earth by measuring energetic magnetic fluxes,the magnetic field of solar wind and solar storms. It's possible lifetime is around 3-5 years. It is planned to be launched by 2022 from Sriharikota.
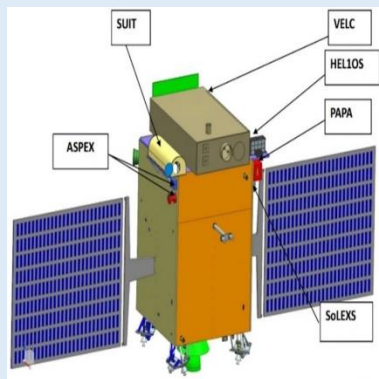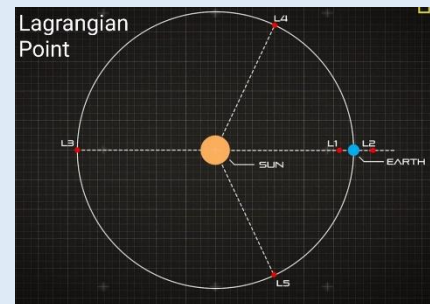
Gaganayaan: Gaganayaanis India's first manned mission to space and a technical breakthrough in the history of ISRO's achievements in space. It aims to send a three-member Indian crew to space for a period of five to seven days and safely return them to Earth. ISRO's heavy lift launcher, GSLV MkIII is identified for the Gaganyaan Mission and the process for human rating of GSLV MkIII is in progress. The high thrust solid propellant strap-on boosters S200 play an important role in the Human Rated GSLV MkIII. The astronauts of the Gaganayaan mission are named as Vyomnauts. In sanskrit'Vyom' means sky.

Conclusion:

ISRO has not only accelerated India's journey to spacebut it alsonarrates the story of some of the greatest luminaries of the nation. The great leaders and exemplary teachers like Dr.Vikram Sarabhai, Prof. Satish Dhawan, Dr.A.P.J.AbdulKalamhave always illuminated the youth of the country by their life and worksand will keep inspiring the nation across it's length and breadth.

   Although it is impossible to sum up ISRO's achievements in so less words yet, I am left with no other option but to terminate the brief note hoping that , may the tremendous energy of all the eminent leaders flow within us and may we carry forward their vision to develop a technologically competent India internationally.

Wireless Charging (Charger)

Name:- Debanta Chatterjee

Roll No.-EE2018/044(3rd year)

Introduction:

Wireless charging has been around since the late 19th century, when electricity pioneer Nikola Tesla demonstrated magnetic resonant coupling – the ability to transmit electricity through the air by creating a magnetic field between two circuits, a transmitter and a receiver.

But for about 100 years it was a technology without many practical applications, except, perhaps, for a few electric toothbrush models.

Today, there are nearly a half dozen wireless charging technologies in use, all aimed at cutting cables to everything from smartphones and laptops to kitchen appliances and cars.

How wireless charging works:
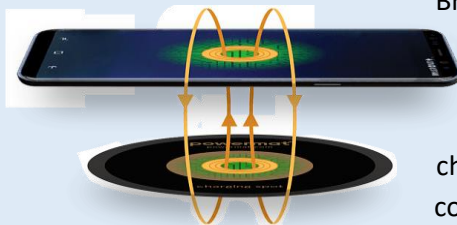
Broadly speaking, there are three types of wireless charging, according to David Green, a research manager with IHS Markit. There are charging pads that use tightly-coupled electromagnetic inductive or non-radiative charging; charging bowls or through-surface type chargers that use loosely-coupled or radiative electromagnetic resonant charging that can transmit a charge a few centimeters; and uncoupled radio frequency (RF)wireless charging that allows a trickle charging capability at distances of many feet. Both tightly coupled inductive and loosely-coupled resonant charging operate on the same principle of physics: a time-varying magnetic field induces a current in a closed loop of wire.

$$P_r = G_r G_t P_t \left(\frac{\lambda}{4\pi r}\right)^2$$

Friis Equation for Power transfer between antennas: The power received decreases by the square of the distance between the antennas (e.g., distance increases by 2x, power is reduced to 25%)

Uses of wireless charging:

Wireless charging is making inroads in the healthcare, automotive and manufacturing industries because it offers the promise of increased mobility and advances that could allow tiny internet of things (IoT) devices to get power many feet away from a charger.

The most popular wireless technologies now in use rely on an electromagnetic field between a two copper coils, which greatly limits the distance between a device and a charging pad. That's the type of charging Apple has incorporated into the iPhone 8 and the iPhone X.
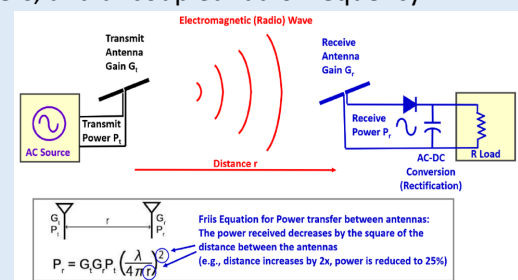
Node MCU (TCP IP based wifi enable microcontroller)

Mr. Budhaditya Biswas
Assistant Professor, Dept. of Electrical Engg. RCCIIT

Introduction

Node MCU is an open-source LUA (Lua is a powerful and fast programming language) based firmware developed for the ESP8266 wifi chip. By exploring functionality with the ESP8266 chip, Node MCU firmware comes with the ESP8266 Development board/kit i.e. Node MCU Development board.
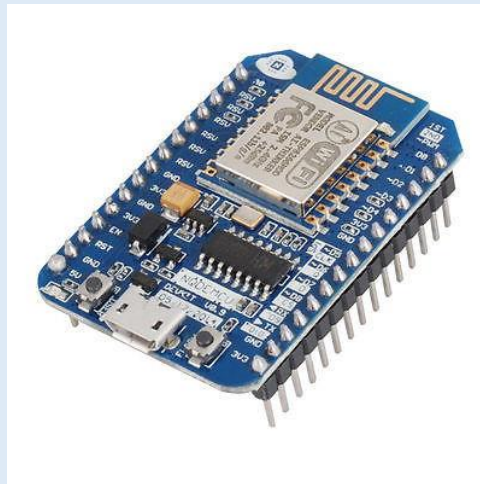
Node MCU Development Board/kit v0.9 (Version1)

Since Node MCU is an open-source platform, its hardware design is open for edit/modify/build.

Node MCU Dev Kit/board consist of ESP8266 wifi enabled chip. The **ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol.

There is Version2 (V2) available for Node MCU Dev Kit i.e. **Node MCU Development Board v1.0 (Version2)**, which usually comes in black color PCB.

Node MCU Development Board/kit v1.0 (Version2)

Node MCU Dev Kit has **Arduino like** Analog (i.e. A0) and Digital (D0-D8) pins on its board.

It supports serial communication protocols i.e. UART, SPI, I2C, etc.

Using such serial protocols, we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards, etc.

How to start with Node MCU

Node MCU Development board is featured with wifi capability, analog pin, digital pins, and serial communication protocols.

To get started with using Node MCU for IoT applications first we need to know about how to write/download Node MCU firmware in Node MCU Development Boards. And before that where this Node MCU firmware will get as per our requirement.

There are online Node MCU custom builds available using which we can easily get our custom NodeMCU firmware as per our requirement.

How to write codes for NodeMCU

After setting up ESP8266 with Node-MCU firmware, let's see the IDE (Integrated Development Environment) required for the development of Node MCU.

Node MCU with ESPlorer IDE

Lua scripts are generally used to code the Node MCU. Lua is an open-source, lightweight, embeddable scripting language built on top of C programming language.

Node MCU with Arduino IDE

Here is another way of developing Node MCU with a well-known IDE i.e. Arduino IDE. We can also develop applications on Node MCU using the Arduino development environment. This makes it easy for Arduino developers than learning a new language and IDE for Node MCU.

The difference in using ESPlorer and Arduino IDE

Well, there is a programming language difference we can say while developing an application for Node MCU using ESPlorer IDE and Arduino IDE.

We need to code in C\C++ programming language if we are using Arduino IDE for developing Node MCU applications and Lua language if we are using ESPlorer IDE.

Basically, Node MCU is Lua Interpreter, so it can understand Lua script easily. When we write Lua scripts for Node MCU and send/upload it to Node MCU, then they will get executes sequentially. It will not build a binary firmware file of code for Node MCU to write. It will send Lua script as it is to Node MCU to get executed.

In Arduino IDE when we write and compile code, the ESP8266 toolchain in the background creates a binary firmware file of code we wrote. And when we upload it to Node MCU then it will flash all Node MCU firmware with newly generated binary firmware code. In fact, it writes the complete firmware.

That's the reason why Node MCU not accept further Lua scripts/code after it is getting flashed by Arduino IDE. After getting flashed by Arduino sketch/code it will be no more Lua interpreter and we got an error if we try to upload Lua scripts. To again start with Lua script, we need to flash it with Node MCU firmware.

Since Arduino IDE compiles and upload/writes complete firmware, it takes more time than ESPlorer IDE.

Getting started with NodeMCU

Introduction

The **ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol.

Node MCU is an LUA based firmware which we need to download on the ESP8266 chip.

To Download Node MCU firmware, go to https://nodemcu-build.com/

Enter your email.

Select branch to Build

Select branch to build from

◉ master <> ○ dev <> ○ 1.5.4.1-final (frozen, for 512KB modules) <>

Click the <> to verify on GitHub that the selected branch actually contains what you expect it to.

Watch-out! Make sure you understand which SDK you get with a particular NodeMCU version. Double check the release notes and remember that NodeMCU master == latest release. When upgrading familiarize yourself with the upgrade notes in the docs.

Select the modules that you want to install.

E.g. If you want to use an analog sensor with Node MCU then select the ADC model which will provide access to in-built ADC.

Select modules to include   **Select the modules that you want to use**

☐ ADC	☐ gdbstub	☐ PWM	☐ Switec
☐ ADS1115	☑ GPIO	☐ RC (no docs)	☐ TCS34725
☐ ADXL345	☐ HDC1080	☐ rfswitch	☐ TM1829
☐ AM2320	☐ HMC5883L	☐ rotary	☑ timer
☐ APA102	☐ HTTP	☐ RTC fifo	☐ TSL2561
☐ bit	☐ HX711	☐ RTC mem	☐ U8G
☐ BME280	☐ I²C	☐ RTC time	☑ UART
☐ BMP085	☐ L3G4200D	☐ Si7021	☐ UCG
☐ CoAP	☐ mDNS	☐ Sigma-delta	☐ websocket
☐ Cron	☐ MQTT	☐ SJSON	☑ WiFi
☐ crypto	☑ net	☐ SNTP	☐ WPS
☐ DHT	☑ node	☐ Somfy	☐ WS2801
☐ encoder	☐ 1-Wire	☐ SPI	☐ WS2812
☐ end user setup	☐ PCM	☐ struct	☐ XPT2046
☑ file	☐ perf		

Click the 📖 to go to the module documentation if you're uncertain whether you should include it or not.

The selected default modules will give you a basic firmware to start with. Select as few modules as possible as to keep the firmware small. See the FAQ.

I'd really like to offer some guidance as to which modules to select but the NodeMCU team doesn't provide a documented dependency matrix yet. See #386 for details.

We can select the miscellaneous option for TLS/SSL support, debug as well as FatFS support as shown below

Miscellaneous options

☐ TLS/SSL support provided by mbed TLS: TLS 1.0 / 1.1 / 1.2 and most common cipher suites including DH/ECDH (ECDSA-based disabled by default).

☐ debug ON, *turn it on only if you're troubleshooting an issue with NodeMCU developers as it will increase the size of the firmware and decrease its performance*

☐ FatFS support for reading from SD Cards

Click on **Start your Build.**
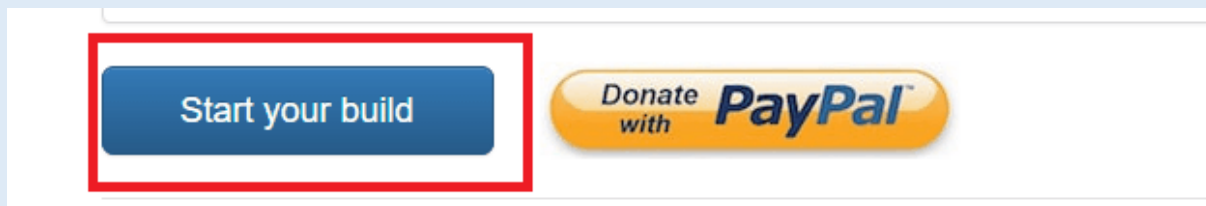
After the build is completed, you will receive an email with a link to download your custom firmware. Click on the link to download it.

Note that you will get two links of Custom firmware, one is Node MCU with floating support and the second is Node MCU without floating support i.e. integer.

Download the integer support firmware bin file if floating support is not needed, else, download the floating support firmware bin file.

We need to flash the above-downloaded custom firmware on the ESP8266 chip. There is a tool called ESP8266Flasher which is used to flash the ESP8266 chip.

Download **ESP8266Flasher.exe** from

32bit: https://github.com/nodemcu/nodemcu-flasher/tree/master/Win32/Release

64bit: https://github.com/nodemcu/nodemcu-flasher/tree/master/Win64/Release
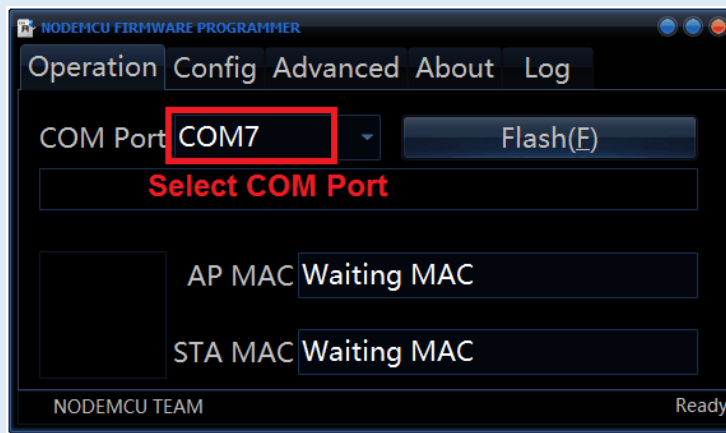
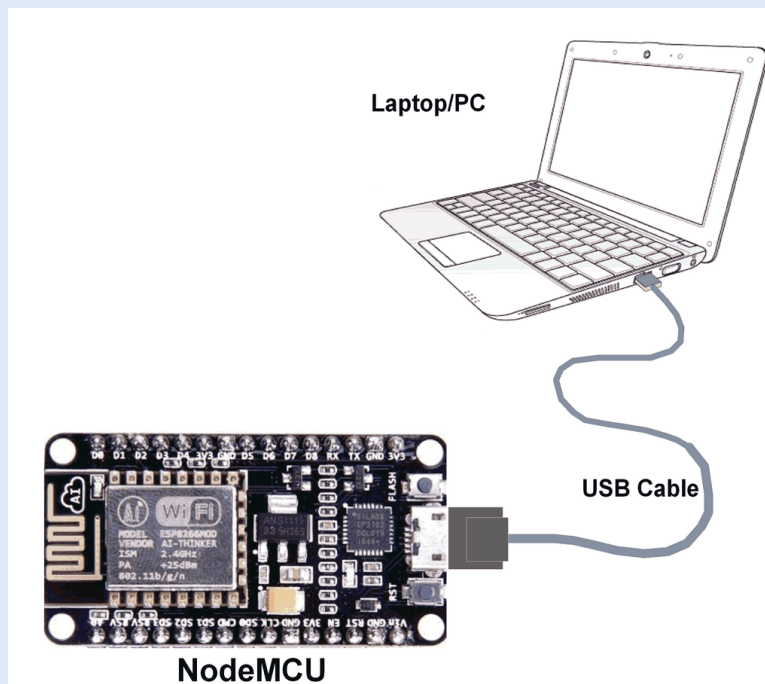Open **ESP8266Flasher.exe** and click on **Config.**
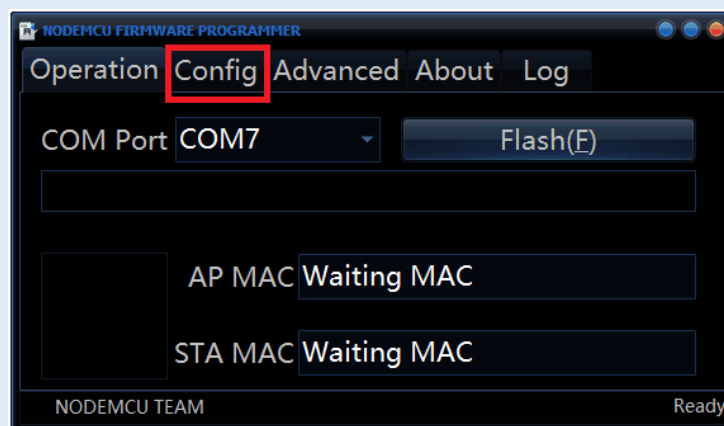
Click on the Setting icon and then select the firmware which was downloaded in the first step
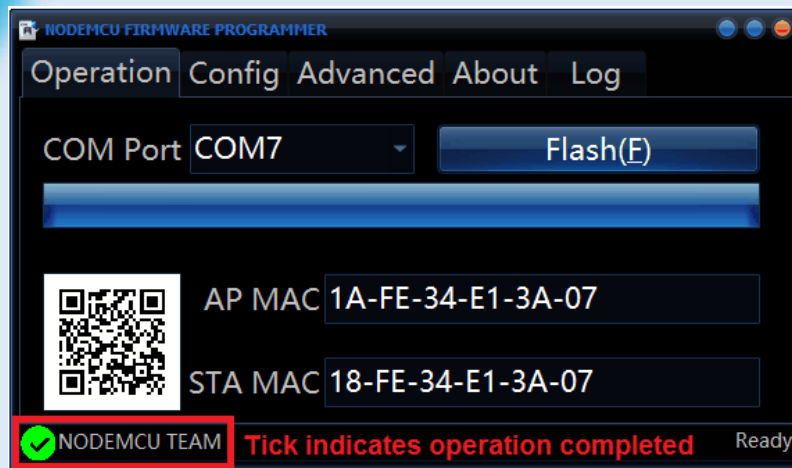
Select the COM port (In my case it is COM 7)

Connect the USB cable to the Node MCU module as shown in below image

and then click on Flash. A green tick will appear after the firmware is installed

Your setup of ESP8266 with Node-MCU firmware is completed!

After setting up ESP with Node-MCU firmware, let's see the IDE (Integrated Development Environment) required for the development of Node MCU.

Node MCU with ESPlorer

Lua scripts are generally used to code the Node MCU. Lua is an open-source, lightweight, embeddable scripting language built on top of C programming language.

NodeMCU with Arduino

Here is another way of developing Node MCU with a well-known IDE i.e. Arduino IDE. We can also develop applications on Node MCU using the Arduino development environment. This makes it easy for Arduino developers than learning a new language and IDE for Node MCU.

Getting Started with Node MCU using ESPlorer

Introduction

ESPlorer is a Lua based IDE used to develop applications for Node MCU. Lua scripts are generally used to program the Node MCU. Lua is an open-source, lightweight, embeddable scripting language built on top of C programming language i.e. it has a base of C programming language.

To start with the Lua script for Node MCU, we can use ESPlorer IDE. The ESPlorer is an IDE for ESP developers.

ESPlorer IDE allows you to establish serial communication with your ESP8266, send commands, upload code, and much more.

Download and Extract ESPlorer from

http://esp8266.ru/esplorer-latest/?f=ESPlorer.zip

You need to have JAVA installed on your computer. If you don't have,

go to this website: http://java.com/download

Download and install the latest version. It requires JAVA (SE version 7 and above) to be installed.

Example

Let's see how to write a simple Lua script of serial print using ESPlorer IDE for Node MCU.

First, connect Node MCU Development Kit with PC as shown in the below figure.

Congratulations! You have successfully taken your first step to master Node-MCU board

Getting Started with Node MCU using Arduino IDE

Introduction

Node MCU is Lua based firmware of ESP8266. Generally, ESPlorer IDE is referred for writing Lua scripts for Node MCU. It requires to get familiar with ESPlorer IDE and Lua scripting language.

There is another way of developing Node MCU with a well-known IDE i.e. Arduino IDE. We can also develop Node MCU applications using the Arduino development environment. This makes things easy for Arduino developers than learning a new language and IDE for Node MCU.

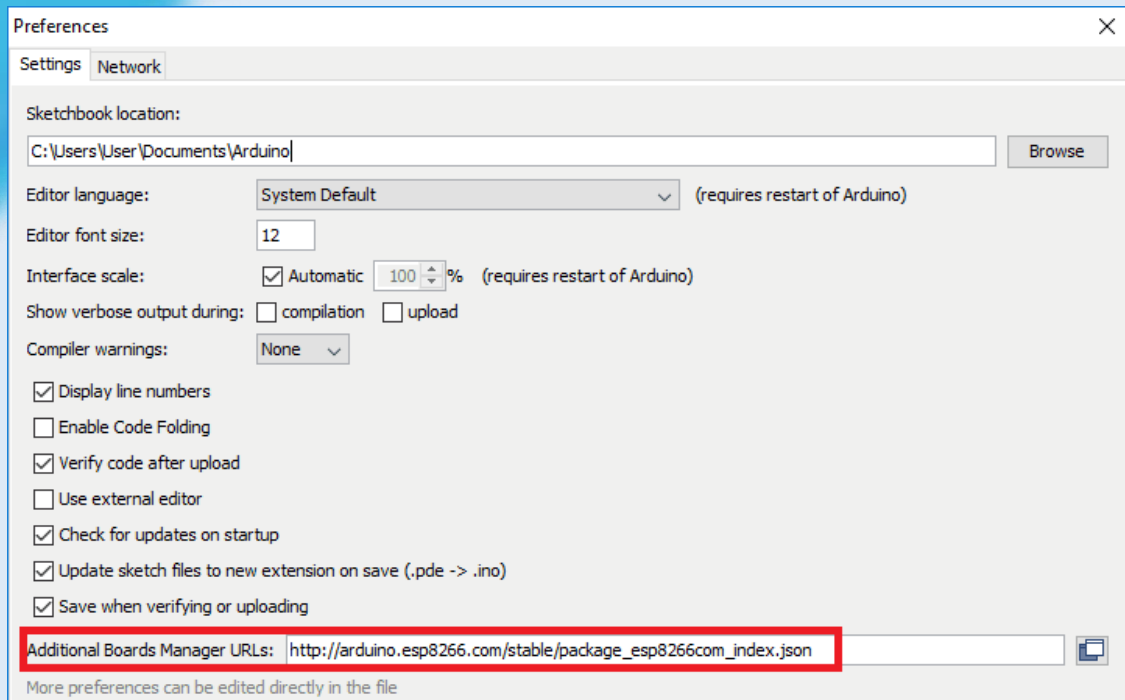Let's see about setting up Arduino IDE with Node MCU.

First **Download Arduino IDE (version 1.6+)** https://www.arduino.cc/en/Main/Software

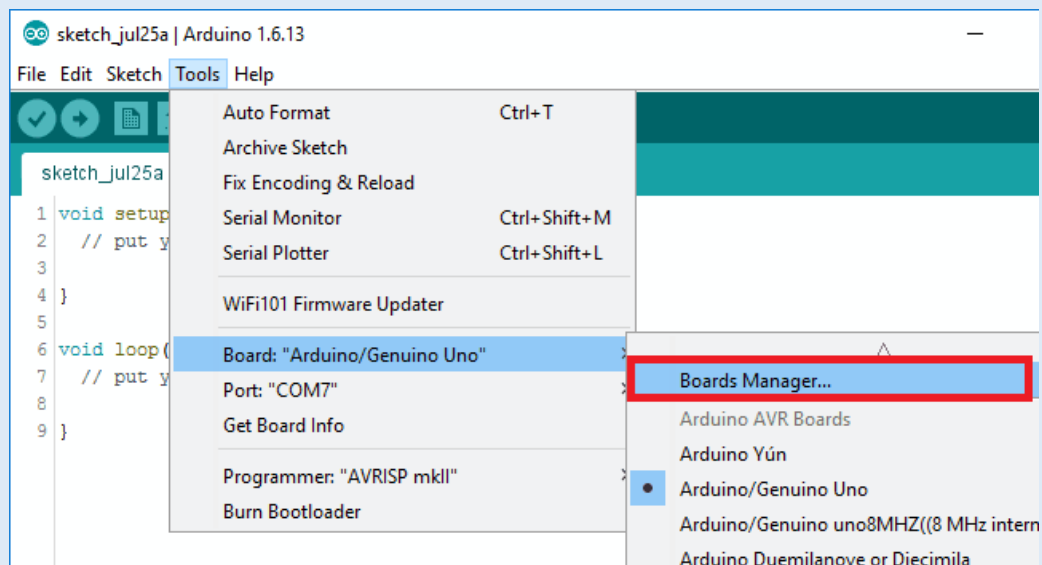**Open Arduino IDE** and **Go to File -> Preference**.
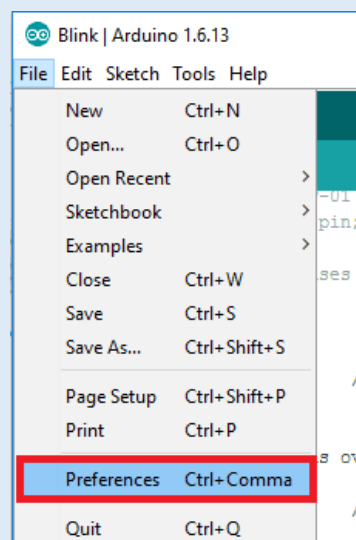
Now on the Preference window, **Enter below link in Additional Boards Manager URLs**
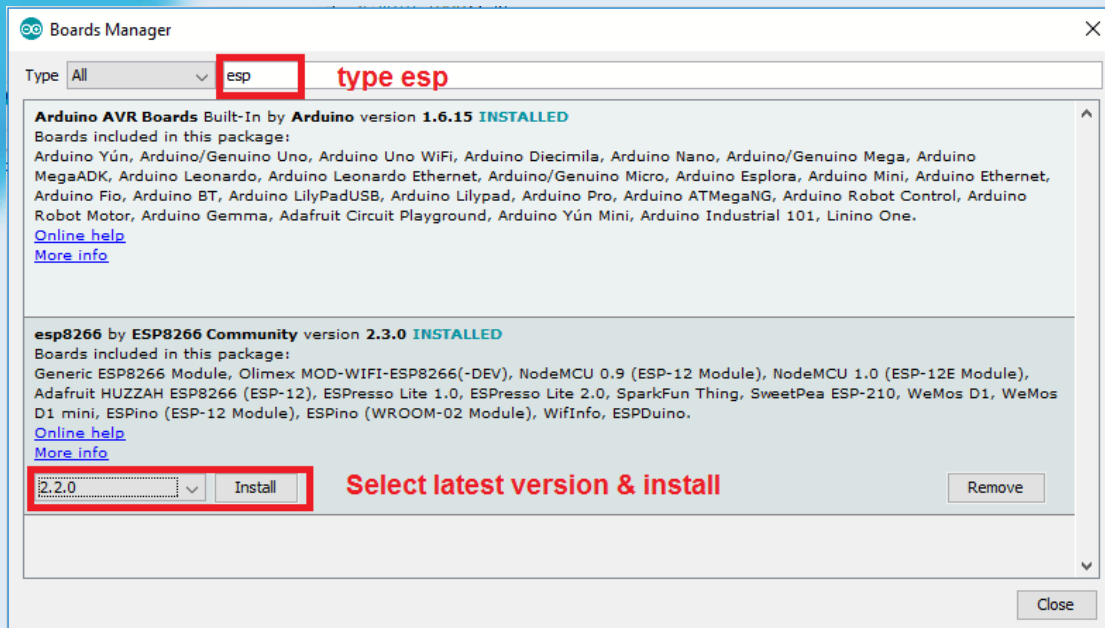
http://arduino.esp8266.com/stable/package_esp8266com_index.json
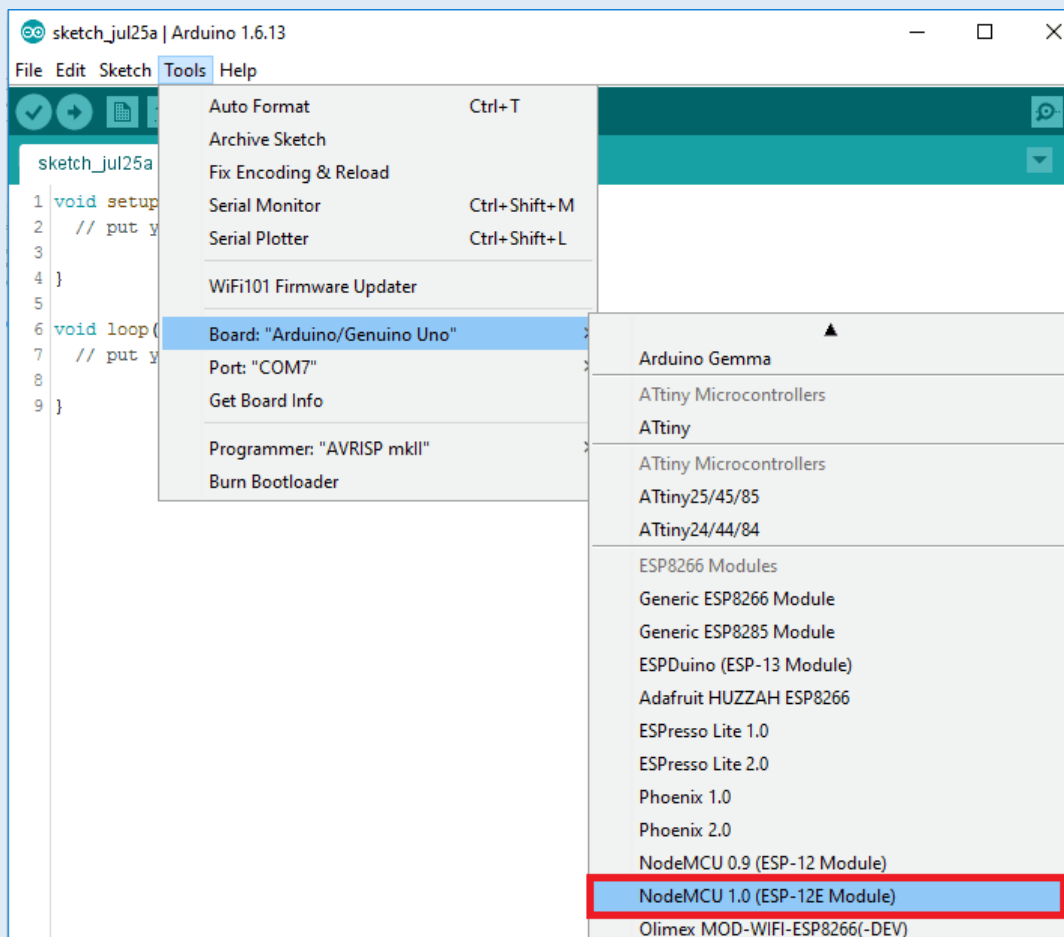
Now close the Preference window and **go to Tools -> Board -> Boards Manager**

In the Boards Manager window, Type esp in the search box, esp8266 will be listed there below. Now select the latest version of the board and click on install.

After installation of the board is complete, open **Tools->Board->and select Node MCU 1.0(ESP-12E Module).**

Now Your Arduino IDE is ready for Node MCU

Example

Let's see how to write a simple serial print sketch using Arduino IDE for Node MCU.

First, connect Node MCU Development Kit with PC as described earlier.

After setting up Arduino IDE for Node MCU, open Arduino IDE and write a simple sketch of serial print as shown below.

```
Arduino Sketch
void setup()
{
Serial.begin(9600);  /* initialise serial communication */
}

void loop()
{
Serial.println("RCCIIT"); /* print RCCIIT at new line per second */
delay(1000);
}
```
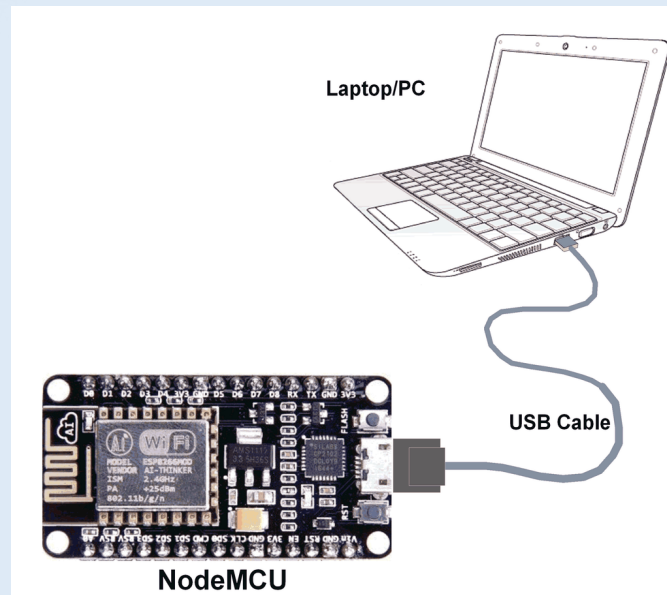
Ensure that you have selected the correct board as shown in the below figure. Also, **make sure that you have selected the appropriate COM port**.
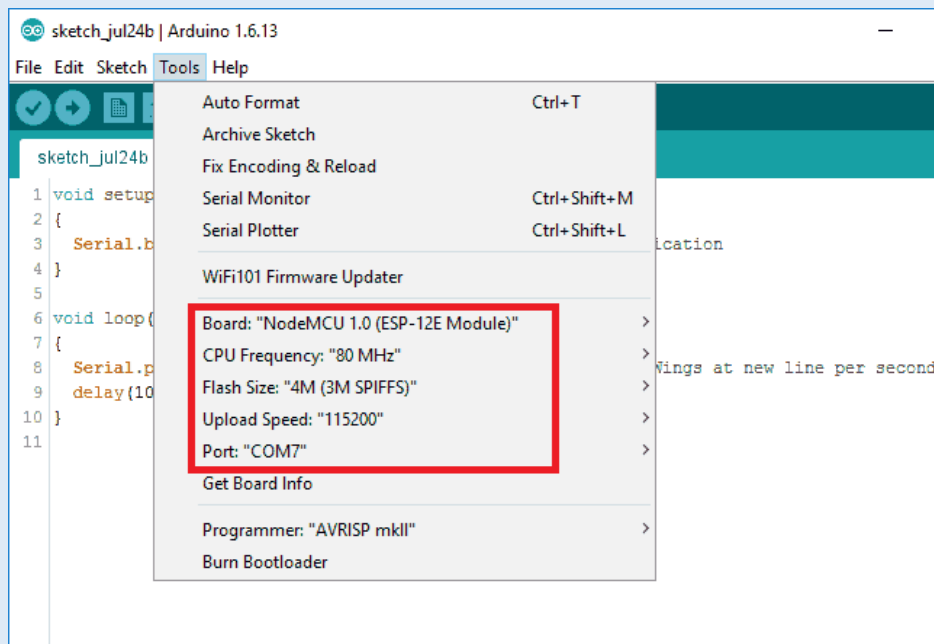
Now **compile & upload the written sketch** directly to the Node MCU DevKit by clicking on the upload button.

Now **Click on the Serial Monitor (upper right corner) option** to check the output on the serial monitor window of Arduino IDE.
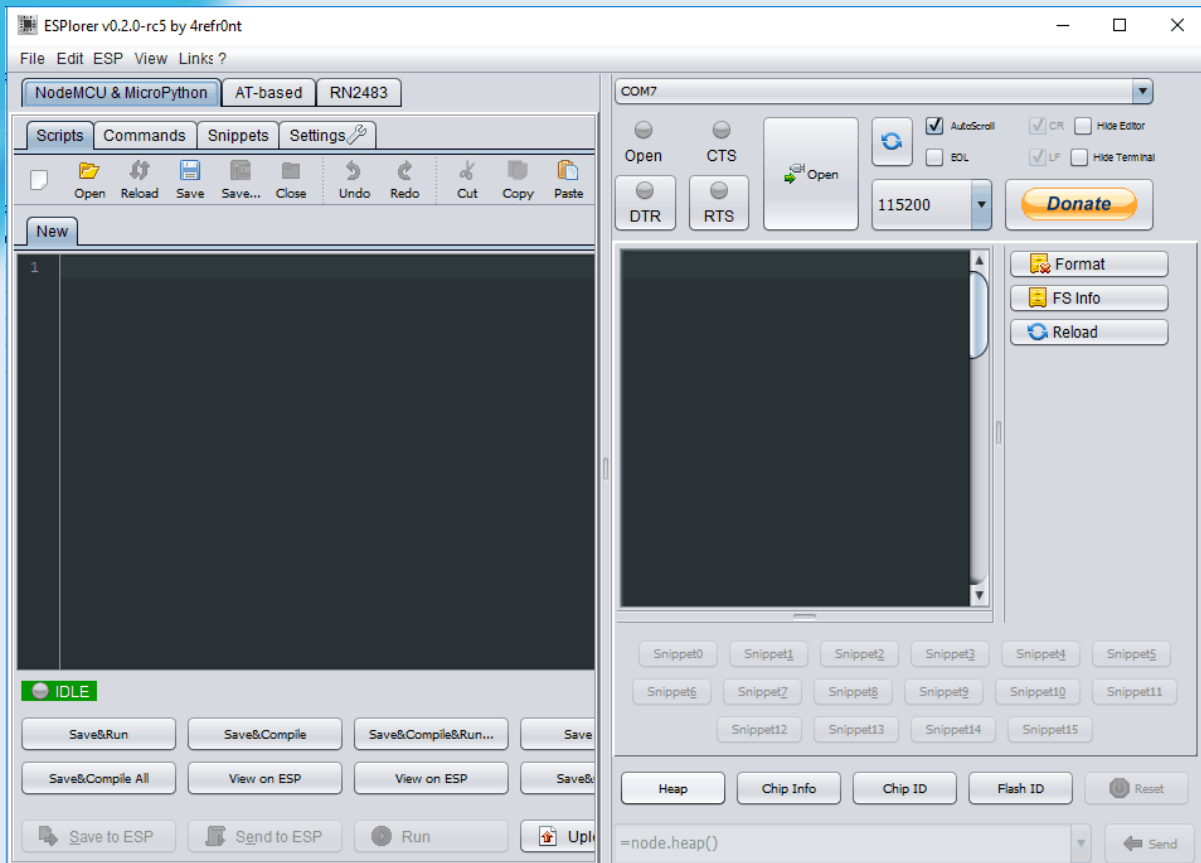
Node MCU connection with PC

Then go to the downloaded & extracted ESPlorer folder

Double Click on ESPlorer.jar executable file as shown in the below figure.
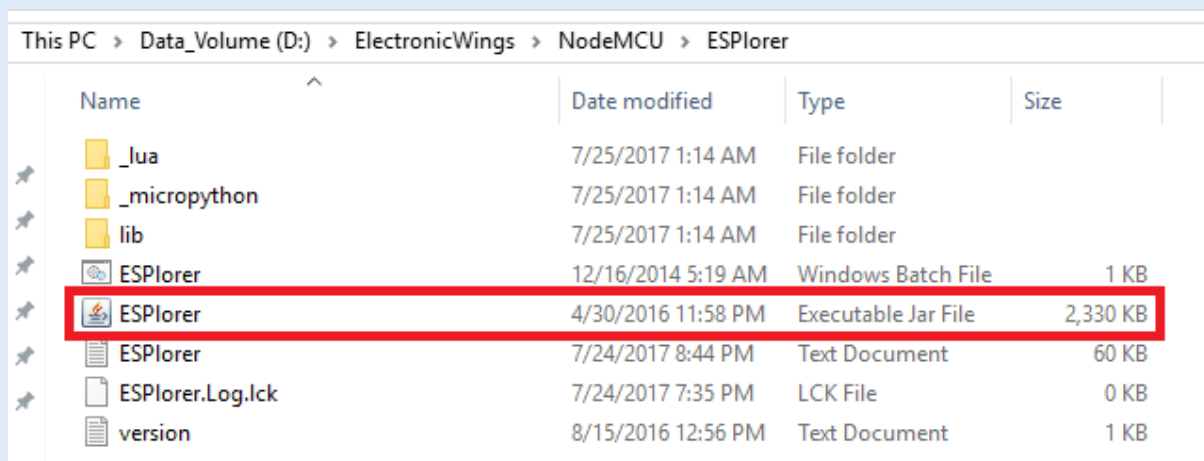
You will see the ESPlorer IDE start page as shown in the below image.

Select **COM Port** and **Baud Rate**
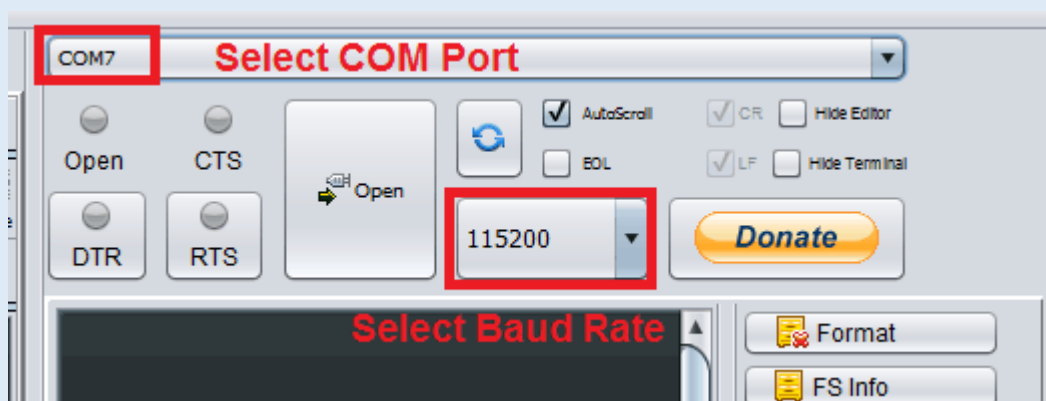
Now Click **Open and press reset on the Node MCU board.**
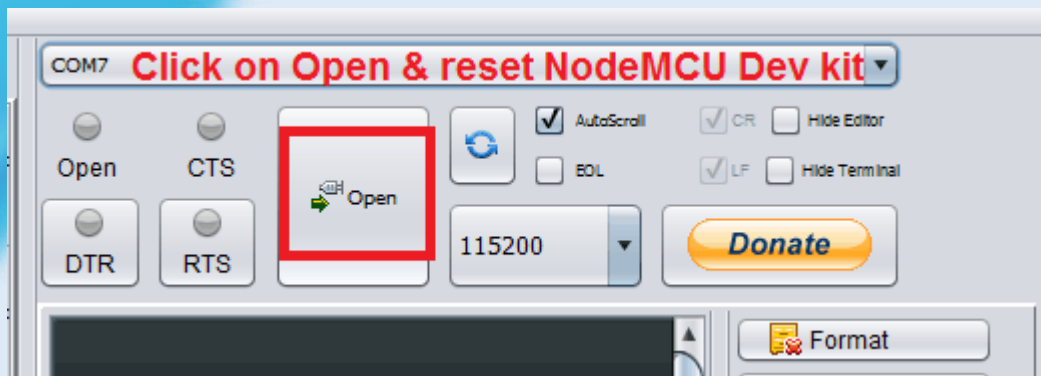
Here we need to reset the Node MCU kit while ESPlorer IDE is communicating with it. Also, we need to keep the baud rate at 115200 (default baud rate).

Now write a simple serial print program e.g. type **print('RCCIIT')**
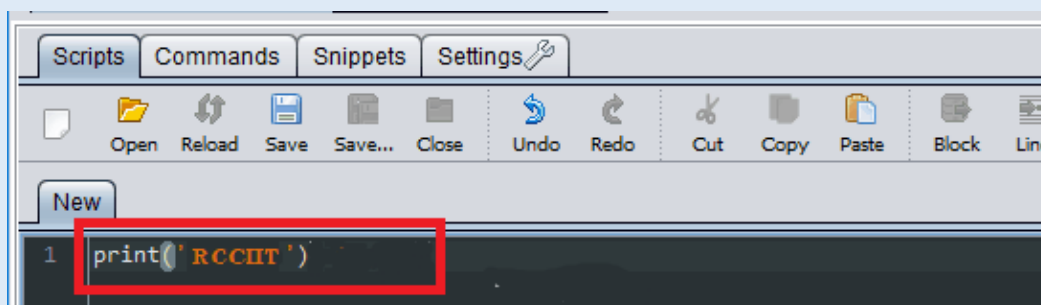
Now Click on **Send to ESP**
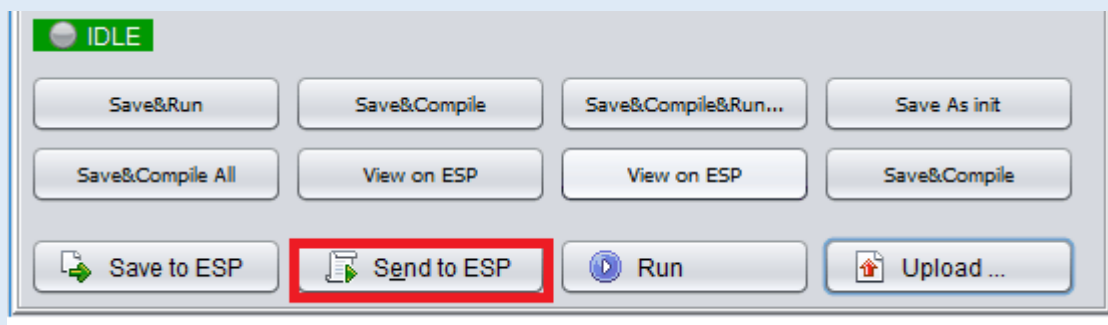
And see the output in the console window as shown in the below figure.

The serial monitor output window will pop up with output as shown in the below figure.

Color psychology paper

Name:- Riddhideb Chakraborty

Roll No.-EE2019/017(2nd year)

Research Question:

How does color effects one's mood?

Review of Literature:

Colors may just seem simple and unimportant but they affect our daily lives more than we may know. If someone is feeling angry, it could just be because they're angry, or it could be perhaps that they are surrounded by or looking a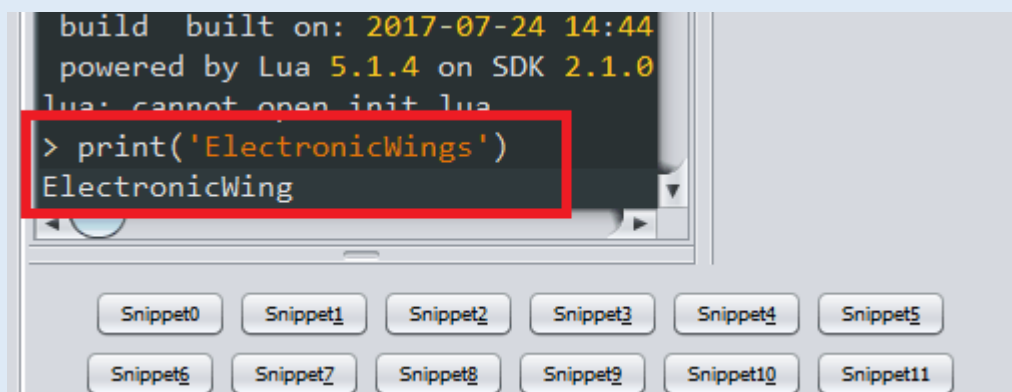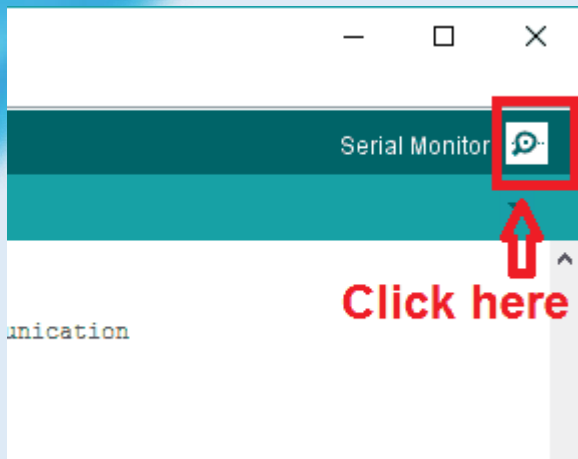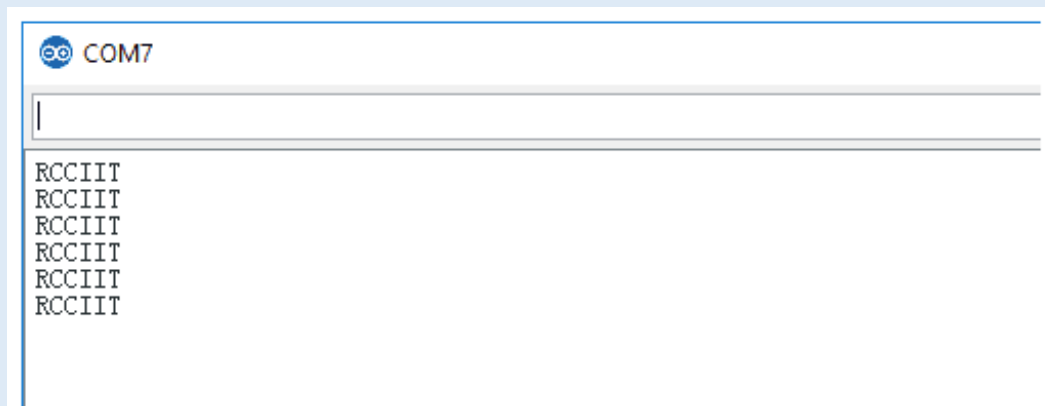t the color red. That's right! People's moods can change just because they are looking at different colors! There are many theories on how just a simple color can change one's whole mood.

According to Johnson (2007), color does affect mood by producing certain chemicals and stimulating different feelings such as hunger. For example, blue can make one feel calm because it releases calming chemicals, and red can make one hungry because it is an appetite stimulant. Yellow can make one feel irritated, and it is a fact that people lose their temper most in yellow rooms. However, pink is tranquillizing and can make one feel weak. In conclusion, Johnson says that depending on the color, one's body can do things (like producing chemicals) that cause a certain emotional reaction (mad, sad, etc.).

Another idea, by Smith (2007), is that the effect color produces is based on what one's body does in response. For example, yellow is mentally stimulating, and activates memory, whereas red increases confidence. Also, brown can make a person feel orderly and stable, while a dark blue can make one feel sad. Therefore, Smith says that different colors do in fact change one's mood and the consequences can be negative or positive.

A third writer, Wollard (2000) seems to think that color can affect one's mood, but the effect also can depend on one's culture and what one's personal reflection may be. For example, someone from Japan may not associate red with anger, as people from U.S. tend to do. Also, a person who likes the color brown may associate brown with happiness. However, Wollard does think that colors can make everyone feel the same, or close to the same mood. According to Wollard, pink reduces aggression, which is why the walls of the jail cells in the Seattle prison are pink! Also, brown can make one feel comfortable.

Eric, John and Paraag's (2007) main point about color psychology is that color has both a physiological and psychological effect. For example, green makes people feel relaxed because it relaxes their muscles and makes them breathe deeper and more slowly. Furthermore, blue lowers blood pressure, which makes one feel calm. Eric, John and Paraag conclude that color affects one's mood because of what it does do the body.

Virtual Reality: An Alternate World

Name:- Tuhina Dey

Roll No.-EE2019/001(2nd year)

Introduction: Virtualreality (VR) is a technology which is a computer-simulated environment of the real world or an imaginary world. It is a special kind of three-dimensional, interactive environment that is accessed using stereo headphones, stereo television goggles, and data-gloves or a controller.

History: In 1838, the first stereoscope was invented, which is a device by which two photographs of the same object taken at slightly different angles are viewed together. In 1956, Cinematographer Morton Heilig created the first VR machine named Sensorama (patented in 1962). It was a large booth that could fit up to four people at a time and all of them could see the 3D impressions of the city environment could smell and hear sounds of them. In 1965, Ivan E. Sutherland invented the Ultimate Display, a room in which a computer can directly control the existence of matter and it was the "window into a virtual world." In mid 1980s, NASA made Virtual Interface Environment Workstation (VIEW) in which a user can virtually explore a 360—degree synthesized or remotely sensed simulated environment.

Types of VR: There are 3 types of VR we use today - fully-immersive simulations, semi-immersive and non-immersive.

- **Fully-immersive simulations:** This give users the most realistic simulation experience with complete sight and sound. To experience and interact with it, the user needs the proper VR glasses or a head mount display (HMD). VR headsets provide high-resolution content with a wide field of view. The headsets create a stereoscopic 3D effect. This type of VR has been commonly adapted for gaming and other entertainment purposes.
- **Semi-immersive:** It provides users with a partially virtual environment. Semi-immersive technology provides virtual realism through 3D graphics, a term known as vertical reality depth. It creates simulations for users to feel a virtual world while being seated at one place. For example, we can think about a flight simulator.
- **Non-immersive VR**: These are commonly used in everyday life. It provides a computer-generated environment while allowing the user to stay aware of their physical environment.

For example, we can think about video games but here we need to use headphones, VR glasses and headgears(if needed).

Applications of VR: Virtual reality can be used in multiple ways.

- **VR in Military:** In UK and USA, virtual reality is used to train army, navy, coast guards, pilots and others to be prepared for any kind of attacks or special cases. Via simulation, they can also be well aware of boot camps, medic trainings, vehicle trainings and many more.
- **VR in medical trainings:** Students and learners can learn treatments and operations using virtual patients. Thus no one gets harmed during medical practices and students can learn without hesitations.
- **VR in sports:** Players and coaches use VR to have better match experience. Players can be trained more efficiently if they see and understand the certain simulation over again and again. And their skill will eventually increase. Viewers can enjoy simulations remotely. Video games are also there, but we need proper setup for that.
- **VR in education:** It would be easier for students to understand certain things which they can't perform practically. Simulations will help them out to understand the topic and gain more knowledge about them.
- **VR in fashion:** Store owners often use VR in order to have 360°experience of their stores which also helps them to organize their store in a proper way. Designers can also use VR to compare designs with each other and they can experience innovative ideas using this. Fashion shows and stores can use this technology to try outfits virtually and improves user experience.

Advantages:

- Virtual Reality creates simulations of the real world.
- Doesn't cost much for individuals.
- Easy to use.
- Comfortable to use it anytime, anywhere.
- Doesn't need to travel much to experience something. Can be experience while being seated at one place.
- Users can do various types experiments using this.

Disadvantages:

- These things are too much addictive.
- They can have functional issues.
- It consists of complex technology.
- Some of the equipment are very expensive.
- Using these things for a long time can cause vision damages.

Conclusion: Without any doubt, virtual reality is a blessing for us but extended use on electronic devices has also been shown to impact the brain in bad ways. Too much addiction can cause damage to brain and also affect our memory. If we can control ourselves from excessive use of this products, in future it will be fruitful for us

Wireless Power Transfer

Name:- Deepanjan Mondal

Roll No.-EE2019/026(2nd year)
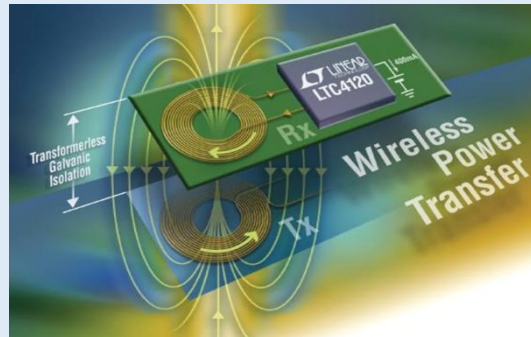
INTRODUCTION - In the present day, electricity is treated as one of the basic requirements of human beings. But, the cost of making electricity is risky for the environment. According to the energy information records, approximate 50% of all electricity plants are contaminating coal plants. Various changes in the environment have happened over the last thirty years, which are injurious to the forthcoming of this planet. To overcome this, here is a solution to diminish greenhouse gas emissions into the soil's atmosphere through an alternative power generation. One sustainable technology leading this charge is WPT (wireless power transmission) or IPT (inductive power transfer).

WPT (Wireless Power Transmission) Technology - WPT technology is old technology and it was demonstrated by "Nikola Tesla " in the year 1980. Wireless power transmission mainly uses three main systems such as microwaves, solar cells, and resonance. Microwaves are used in an electrical device to transmit electromagnetic radiation from a source to a receiver. Accurately the name WPT states that the electrical power can be transferred from a source to a device without using wires. Basically, it includes two coils they are a transmitter coil & a receiver coil. Where the transmitter coil is powered by AC current to create a magnetic field, which in turn induces a voltage in the receiver coil.
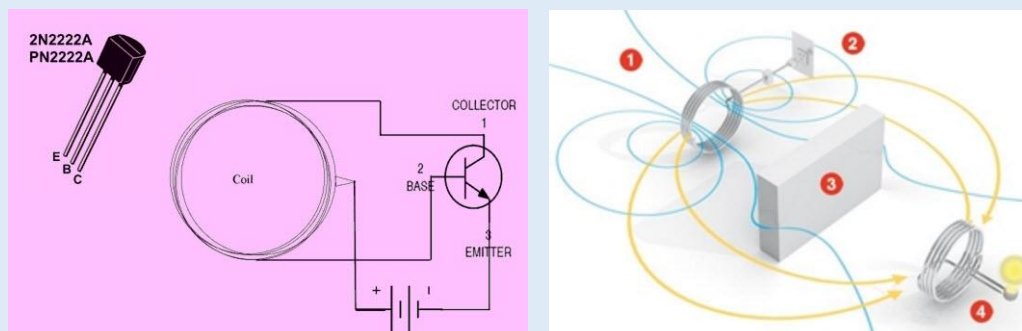
The basics of wireless power transmission include the inductive energy that can be transmitted from a transmitter coil to a receiver coil through an oscillating magnetic field. The DC current supplied by a power source is changed into high-frequency AC current by particularly designed electronics built into the transmitter.

In the TX (transmitter) section, the AC current increases a copper wire, which creates a magnetic field. Once an RX (Receiver) coil is located near to the magnetic field, then the magnetic field can induce an AC current in the receiving coil. Electrons in the receiving device convert the AC current back into DC current, which becomes working power.

Wireless Power Transfer Circuit

The simple wireless power transmission circuit is shown below. The required components of this circuit mainly include 20-30 magnet wire (gauge copper wire), A battery-1, transistor (2N2222) and LED. The construction of this circuit comprises a transmitter and a receiver.

Transmitter

Take a PVC pipe and whirl a wire on it seven times after whirling a wire about three inches make a loop for center terminal and continue the process. Now take transistor 2N2222 and connect its base terminal to one end of the copper coil, the collector terminal to the other end of the copper coil and now connect the emitter terminal to the negative (–ve) terminal of an AA battery. The center terminal of the copper coil will be connected with the positive (+ve) terminal of an AA battery. When then the receiver coil is placed 1 inch above the transmitter coil, then the LED will blink.

Wireless Power Transfer Circuit Working

The wireless power transmission can be defined as the energy that can be transmitted from the transmitter to a receiver through an oscillating magnetic field.

To accomplish this, power source (DC current) is changed into high-frequency AC (Alternating Current) by particularly designed electronics erected into the transmitter. The AC boosts a copper wire coil in the transmitter, which produces a magnetic field. When the receiver coil is placed in proximity of the magnetic field, the magnetic field can make an AC (alternating current) in the receiving coil. Electronics in the receiving coil then alter the AC back into DC which becomes operating power.

Applications of wireless power transfer

Basically WPT is used in moving targets like fuel-free-electric vehicles, fuel- free airplanes, fuel-free rockets and moving robots. The other applications of WPT are Wireless power source or Ubiquitous Power Source, RF Power Adaptive Rectifying Circuits and Wireless sensors.

Nowadays electricity is considered as one of the basic needs of human beings. The conventional power transmission system uses transmission lines to carry the power from one place to another, but it is costlier in terms of cable costs and also there exists a certain transmission loss. One maintainable technology leading this charge is a wireless power transmission (WPT) . It is also known as inductive power transfer (IPT).

Types of Wireless Power Transmission Methods:

There are different types of wireless power transmission methods: microwave power transmission, inductive-coupling-power transmission and laser-power transmission methods.

1. Microwave Power Transmission

William C Brown, the pioneer in the WPT technology, has designed and exhibited to show how power can be transmitted through free space by microwaves. The concept of the WPT is explained with a functional block diagram which is shown below.
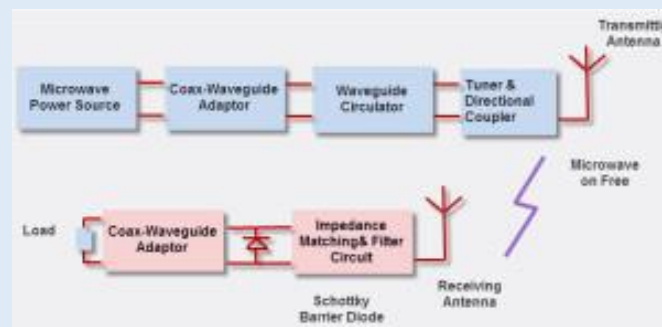
The functional block diagram of WPT consists of two sections: transmitting section and receiving section. In the transmission section, the microwave power source generates microwave power which is controlled by the electronic control circuits. The waveguide circulator protects the microwave source from the reflected power, which is connected through the co-ax waveguide adaptor. The tuner contests the impedance between the microwave source and transmitting antenna. Then, based on the signal propagation direction, the attenuated signals are separated by the directional coupler. The transmitting antenna emits the power regularly through free space to the receiving antenna.

2. Inductive Coupling Power Transmission:

Inductive coupling method is the most important methods transferring energy wirelessly through inductive coupling. Basically, it is used for near -field power transmission. The power transmission takes place between the two conductive materials through mutual inductance. The general example of inductive coupling power transmission is a transformer.
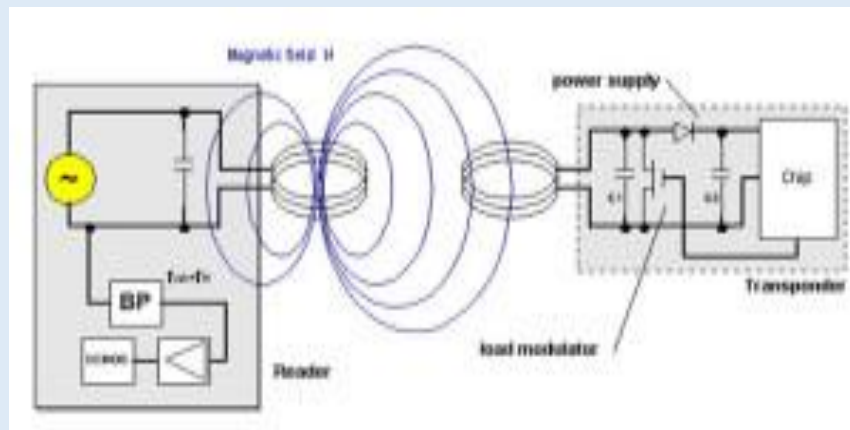
3. Laser Power Transmission:

In this type of power transmission method, a LASER is used to transfer power in the form of light energy, and the power is converted to electric energy at the receiver end. The LASER gets powered using different sources like sun, electricity generator or high-intensity-focused light. The size and shape of the beam are decided by a set of optics. The transmitted LASER light is received by the photo-voltaic cells, that converts the light into electrical signals. Usually, it uses optical-fiber cables

A LASER power Transmission System
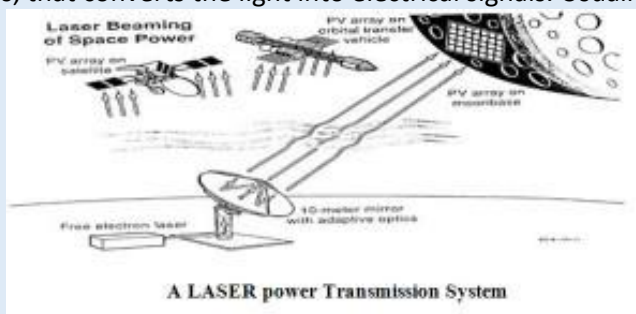
for transmission.

Benefits of WPT:

WPT system completely reduces existing high-tension power transmission cables, substations and towers between the consumers and generating station.

The cost of the distribution and transmission become less.

The cost of the electrical energy to the consumers also reduces.

The power could be transmitted to places to which the wired transmission is not possible.

Drones

Name:- Burque Naushad

Roll No.-EE2020/013(3rd year)

Drones, also called unmanned aerial vehicles (UAVs), have no human pilot and instead are either controlled by a person on the ground or autonomously via a computer program. These quiet craft are becoming increasingly popular, not just for war and military purposes, but also for everything from wildlife and atmospheric research to disaster relief and sports photography. Drones are becoming the eyes and ears of scientists by surveying the ground for archaeological sites, signs of illegal hunting and crop damage, and even zipping inside hurricanes to study the wild storms. Drones are now also used in weddings, you can even rent a personal drone to soar above the horizon and snap a photo or video.

Most people think of drones as a device with propeller on the four corners. But there are many other cool designs too, I have listed some of them below:

Hover Camera Passport

It's compact, foldable, and features face and body tracking. Hover Camera's Passport is great for those who want a hands-free selfie platform capable of 4K video. The only drawback is that it only has a flight time of 10 minutes before needing a recharge, so make those shots count.

Wingsland S6

The Wingsland S6 is one of the more compact selfie drones—about the size of a smartphone. It's also one that comes with the option of "packing heat" and other accessories for the more interested users. The drone features fold-in propeller-equipped winglets, making it one of the smallest pocket drones on the market. It measures out at 138 mm × 79 mm × 26.8 mm.

Makeblock Airblock
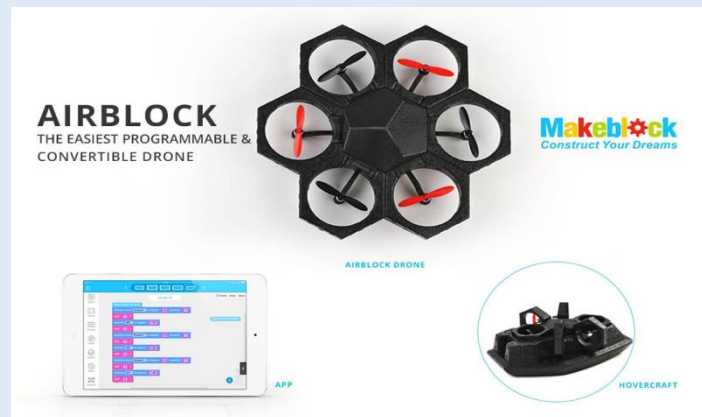
Build it, code it, fly it…That's the idea behind Makeblock's Airblock drone, designed to be an educational tool for kids looking to tackle the STEM fields. The drone is modular with the CPU, motors, and rotors all encased by hexagonal soft foam that magnetically connects to one another. This makes it easy to put back together if it falls from the air or hits a wall.

PowerVision PowerRay

Not all drones fly in the air. Some, like PowerVision's PowerRay, take to the water—or rather, under it, allowing you to explore the sea. Designed for fishing hobbyists, the PowerRay is capable of submerging up to 30 meters and staying there for up to four hours. It features a 4K UHD camera that provides clear images of life below the sea.

Yuneec Valet concept drone

The "Home Security Drone," the Valet will patrol your home and property and look for anything out of place before returning to its dock. If it does happen to encounter anything out of the ordinary, it will alert you via phone, allowing you to activate whatever in-house countermeasures you have equipped.

Bear in mind that this is just a concept by Yuneec and may never seen in the consumer market. Then again, maybe it will.

There are dozens of floods in our country every year, with the help of drones we can easily trace the trapped people and deliver them food, medicine and other essential items. But unfortunately we are not using this technology efficiently.

It is obvious that drone technology is an important part of the future of warfare and is set to become a big commercial industry. The fact that drones capabilities pose a threat to the liberties of people around the globe is also apparent.

Evolution of Microprocessors

Name:- Sanmoy Mallick
Roll No.-EE2019/005(2nd year)

Like we human beings have brains ,computers also consists of a brain which in technical terms is reffered as a central processing unit or CPU. This CPU consists of central unit which is in the formation of a small chip of having a dimension of few milimeteres .This chip is actually called the MICROPROCESSOR.

This microprocessor is the backbone structure of every specific computer which does all the complicated task consisting of different mathematical calculations, digital encryption ,decodings ,electronic sensation of different stimulations , logical operations,etc. The microprocessor is nothing but the CPU and it is an essential component of the computer. It is a silicon chip that comprises millions of transistors and other electronic components that process millions of instructions per second, a microprocessor is a versatile chip that is combined with memory and special-purpose chips and preprogrammed by software. It accepts digital data as i/p and processes it according to the instructions stored in the memory. The microprocessor has many functions like functions of data storage, interact with various other devices, and other time-related functions. But, the main function is to send and receive the data to make the function of the computer well.

The microprocessor is hailed as one of the most significant engineering milestones of all time. The lack of a generally agreed definition of the term has supported many claims to be the inventor of the microprocessor. The original use of the word "microprocessor" described a computer that employed a microprogrammed architecture—a technique first described by Maurice Wilkes in 1951. Viatron Computer Systems used the term microprocessor to describe its compact System 21 machines for small business use in 1968. Its modern usage is an abbreviation of micro-processing unit (MPU), the silicon device in a computer that performs all the essential logical operations of a computing system. Popular media stories call it a "computer-on-a-chip." A microprocessor consists of an ALU, control unit and register array. Where ALU performs arithmetic and logical operations on the data received from an input device or memory. Control unit controls the instructions and flow of data within the computer.
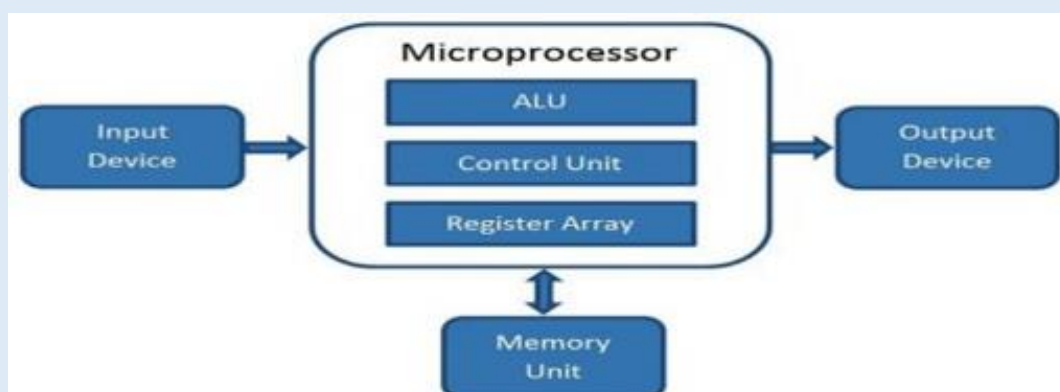
GENERAL BLOCK DIAGRAM OF EVERY PROCESSOR

In 1971, Intel produced the 4004 with a single CPU. This was marked as the first microprocessor. The computer was a 4 bits microprocessor, only allowing for symbols that were 4 bits wide. The 4004 itself was used in very few commercial applications because it was outpaced by superior microprocessor designs within months of its release. The known use cases of the 4004 include a pinball machine and a word processor. Hoff was honored in 2010 by US President Barack Obama with the National Medal of Technology and Innovation for his efforts. The microprocessor has become a more essential part of many gadgets. The evolution of microprocessor was divided into five generations such as first, second, third, fourth, and fifth-generation.

Fig 1.1 Hardware Architecture of 8085
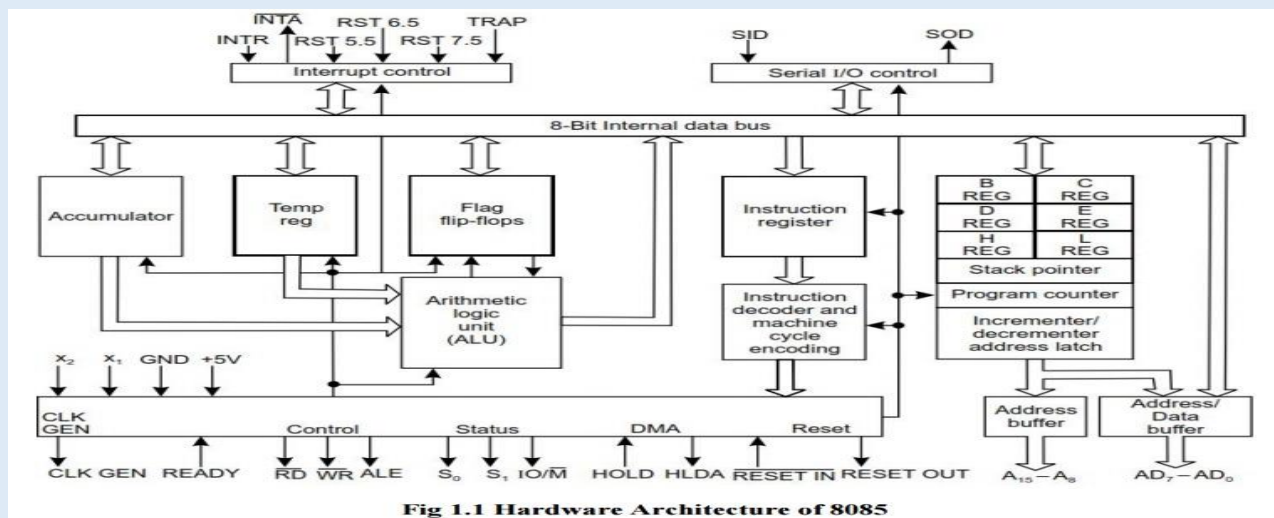
First Generation Microprocessors (4 Bit)

The first generation microprocessors were introduced in the year 1971-1972. The instructions of these microprocessors were processed serially, they fetched the instruction, decoded and then executed it. When an instruction of the microprocessor was finished, then the microprocessor updates the instruction pointer & fetched the follwing instruction, performing this consecutive operation for each instruction in turn.

INTEL 4004 PROCESSOR

Second Generation Microprocessors (8 Bit)
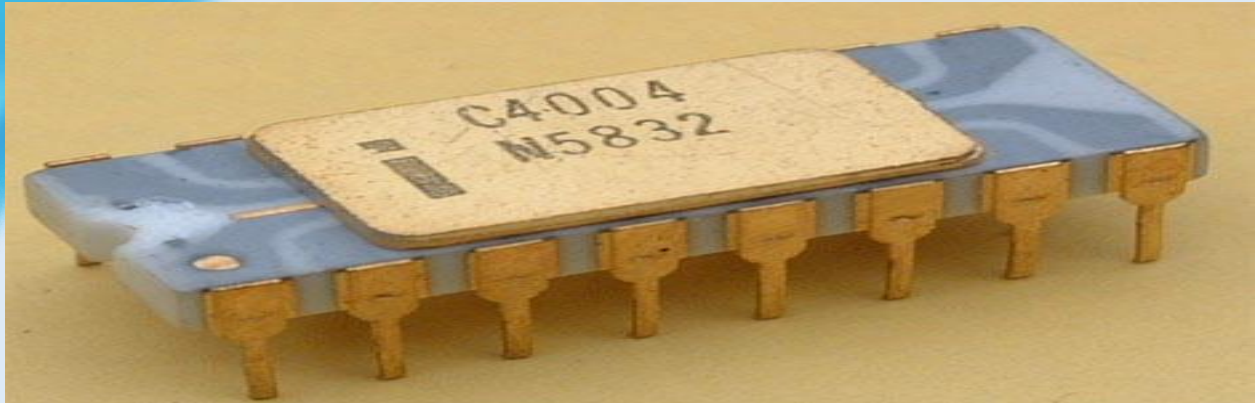
In the year 1970, a small number of transistors were available on the integrated circuit in the second-generation microprocessors. Examples of the second-generation microprocessors are 16-bit arithmetic 7 pipelined instruction processing, MC68000 Motorola microprocessor. These processors are introduced in the year 1979, and Intel 8080 is another example of these microprocessors. The second generation of the microprocessor is defined by overlapped fetch, decode, and execute the steps. When the first generation is processed in the execution unit, then the second instruction is decoded and the third instruction is fetched.

The difference between the first generation microprocessor and second-generation microprocessors was mainly the use of new semiconductor technologies to manufacture the chips. The result of this technology resulted in a fivefold increase in instruction, speed, execution, and higher chip densities.

INTEL 8080 PROCESSOR

Third Generation Microprocessors (16 Bits)

The third generation microprocessors were introduced in the year 1978, as denoted by Intel's 8086 and the Zilog Z8000. These were 16-bit processors with a performance like mini computers. These types of microprocessors were different from the previous generations of microprocessors in that all main workstation industrialists began evolving their own ISC based microprocessor architectures.

INTEL 8086 PROCESSOR

Fourth Generation Microprocessors (32 Bits)

As many industries converted from commercial microprocessors to in house designs, the fourth generation microprocessors are entered with outstanding design with a million transistors. Leading-edge microprocessors like Motorola's 88100 and Intel's 80960CA could issue & retire more than one instruction per clock cycle.
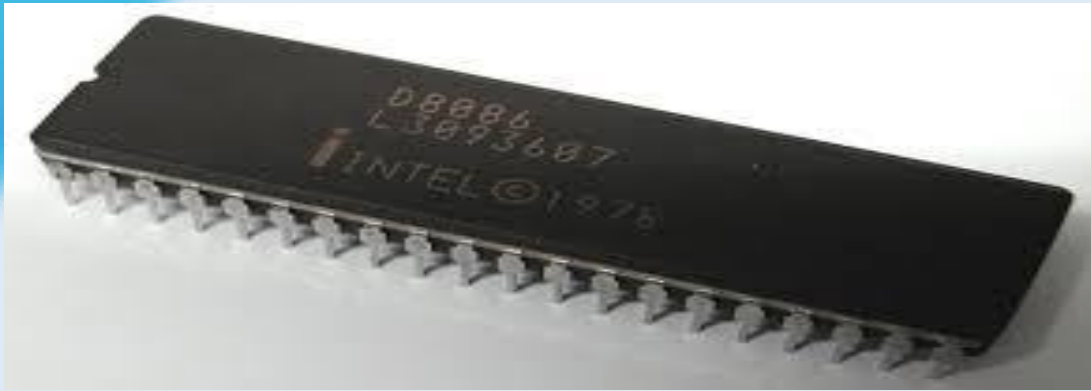
INTEL 80960CA PROCESSOR

Fifth Generation Microprocessors (64 Bit)
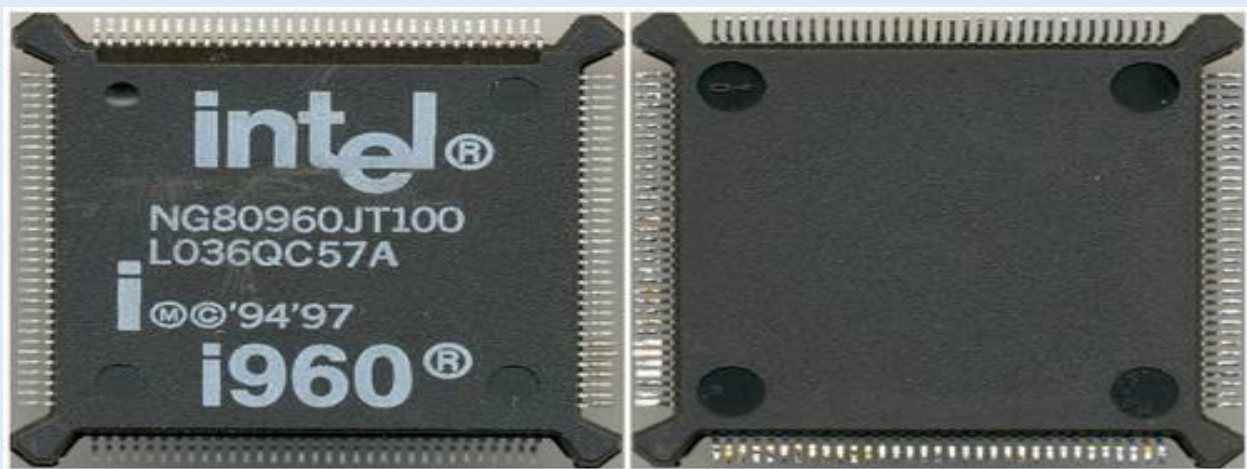
Fifth-generation microprocessors employed decoupled superscalar processing, and their design soon exceeded 10 million transistors. In the fifth generation, PCs are a low-margin, high volume business conquered by a single microprocessor. On Dec 23rd, 1947, the Transistor was invented in Bell lab whereas an integrated circuit was invented in 1958 by J Kilby in Texas Instruments. So, Intel or INTegrated ELectronics has invented the first microprocessor

.

INTEL i7 PROCESSOR

Technical Specifications Of Evolving Of Microprocessors

| Processors (Bit Wise)	Year Of Invention	Clock Speed	Number Of Transistors	Instrucions/Sec	Number Of Pins
4 Bit	1971	740 KHz	2300	60,000	16
8 Bit	1972	2 MHz	6500	70,000	40
16 Bit	1978	10 MHz	29000	2500000	40
32 Bit	1986	33 MHz	275000	8 KB Of Cache Memory	13214 X 14 PGA
64 Bit	2006 And Still Running	1.2 To 3.2 Ghz	291000000	64 KB of L1 Cache And 4 MB Of	587 To 1800

CONCLUSION

The microprocessor has seen formidable growth in its influence on humanity since its humble origins in 1969 as a proposal to optimize the cost of building a range of desktop calculators. The inescapable cost, performance and efficiency benefits of integrating all of the central functions of a computer onto a single microchip have driven the entire computer business into the microprocessor's clutches, and in the process the market for products with embedded computational intelligence has diversified in many directions to the point where now there are already more than ten computers for every human on the planet , a number which will increase by another order of magnitude over the coming decade as IoT becomes a pervasive reality. Since the spread of the PC through the 1980s, followed by the introduction of the worldwide web in the 1990s (making the Internet, which had already been around for a couple of decades, usable by the wider population) and concurrent developments in mobile (wireless) communications, computer and communications technology has become part of the infrastructure of human society everywhere. We have truly entered into a digital age, and the microprocessor is the engine of that digital age.

Robotics

Name:- Rohit Kumar Singh

Roll No.-EE2020/002(2nd year)

A robot is a mechanical or virtual intelligence agents that can perform tasks automatically or with guidance,typically by remote control. Robot has caught the attention of the human eye in the last some years.Robots have become the subjects of research, debates and movies. A device resembling a human body that can be programmed to perform to human instruction, a robot can record shows for its master,cook'sfood,play music's,run cars etc.In certain countries like Japan, Korea etc. robots are commonly used for household purpose,etc.Today robots have become technically so advanced that Isaac Azimov had to say a "you can't differentiate between a robot and the very best of human". Unquestionably a robot is a scientific marvel.Although the science of robotics only came about in the 20th century,the history of human invented automation has a muchlighterpost. In fact, the ancient Greek engineer Hero of Alexandria,produced two texts. Pneumatic and Automata,that testify the existence of hundreds of different kinds of wonders machines capable of automated movements. Of course,robotics in the 20th and 21st centuries has advanced radically to include machines capable of assembling other machine and even robot with a structure similar to the human body. Robotics has become a burgeoning science today as more and more money is being invested in it.The industrial robots are already in fashion in Japan, southKorea and many other parts of Europe. Additionally, robots have found a place in other spheres as toys and entertainment,military weapons,search and rescue assistance and many others jobs. However, robots so far have been the results of pure mechanical engineering which though, appears like a human body but are devoid of any human emotions.Efforts are now on the create robots thatthink, feel and learn like human too.
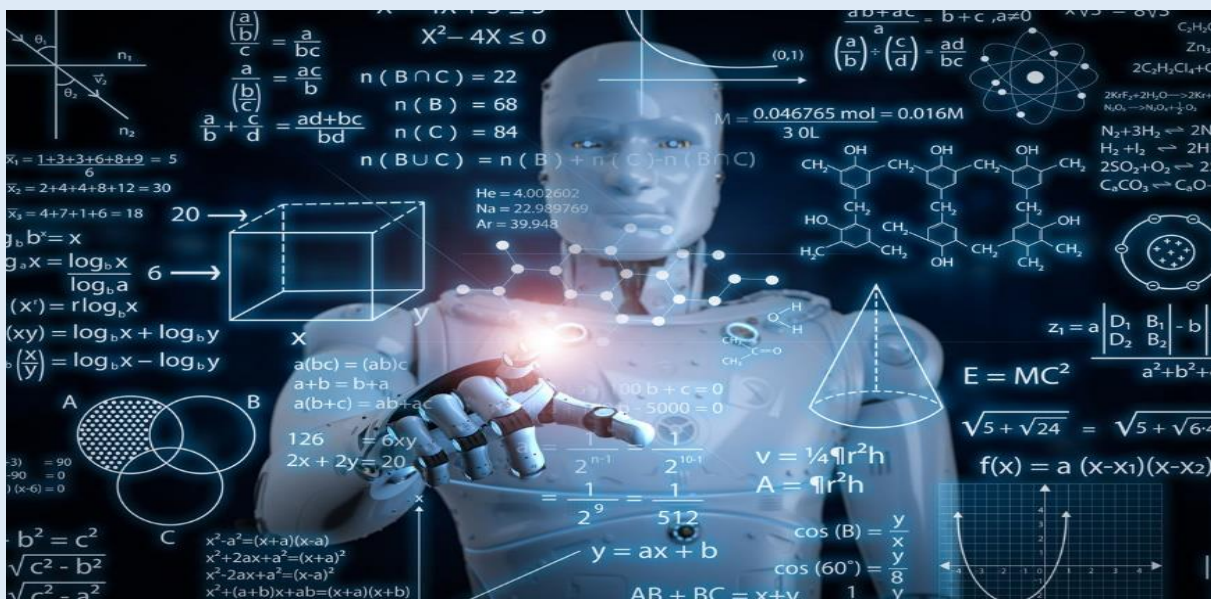
Future of the Earth depends on VLSI

Name:- Adrita Dutta

Roll No.-EE2019/002(2nd year)

Very large-scale integration (VLSI) is the process of creating an integrated circuit (IC) by combining millions of MOS transistors onto a single chip. VLSI began in the 1970s when MOS integrated circuit chips were widely adopted, enablin complex semiconductor and telecommunication technologies to be developed. The microprocessor and memory chips are VLSI devices. Before the introduction of VLSI technology, most ICs had a limited set of functions they could perform.

General Microelectronics introduced the first commercial MOS integrated circuit in 1964, In the early 1970s, MOS integrated circuit technology allowed the integration of more than 10,000 transistors in a single chip. This paved the way for VLSI in the 1970s and 1980s, with tens of thousands of MOS transistors on a single chip (later hundreds of thousands, then millions, and now billions).

The first semiconductor chips held two transistors each. Subsequent advances added more transistors, and as a consequence, more individual functions or systems were integrated over time. The first integrated circuits held only a few devices, perhaps as many as ten diodes, transistors, resistors and capacitors, making it possible to fabricate one or more logic gates on a single device. Now known retrospectively as *small-scale integration* (SSI), improvements in technique led to devices with hundreds of logic gates, known as *medium-scale integration* (MSI). Further improvements led to *large-scale integration* (LSI), i.e. systems with at least a thousand logic gates. Current technology has moved far past this mark and today's microprocessors have many millions of gates and billions of individual transistors.

In 2008, billion-transistor processors became commercially available. This became more commonplace as semiconductor fabrication advanced from the then-current generation of 65 nm processes. Current designs, unlike the earliest devices, use extensive design automation and automated logic synthesis to lay out the transistors, enabling higher levels of complexity in the resulting logic functionality. Certain high-performance logic blocks like the SRAM (static random-access memory) cell, are still designed by hand to ensure the highest efficiency.

The Advantages of VLSI Technology are

- Reduced size for circuits
- Increased cost-effectiveness for devices
- Improved performance in terms of the operating speed of circuits
- Requires less power than discrete components
- Higher device reliability
- Requires less space and promotes miniaturization

- Accurate detection of obstacles in front left and right direction.

- Detection of waist level height to head level height obstacles.

- Minimum physical interface

- Less training time

- Detection of ground level obstacles

- Can send a HELP message with the help of emergency button in   case of emergency.

- Easy navigation route through voice playback circuit.

The worldwide demand for performance-driven by telecommunications, the Internet, corporate networking and improved human interfaces-is increasing faster than the rate of the historical improvement in VLSI IC performance as described by Moore's Law. Internet traffic itself is increasing at five times the performance of ICs. Even more disturbing is that the new generation of microprocessors offers only a marginal advantage over the previous one, despite the major improvements in transistor speed wrought by next generation-process technology.Presently, technologies like smartphones and cellular communications afford unprecedented portability, processing capabilities, and application access due to VLSI technology. The forecast for this trend indicates a rapid increase as demands continue to increase.

A self made EV Model

Name:- Bitan Sarkar

Roll No.-EE2018/058(3rd year)
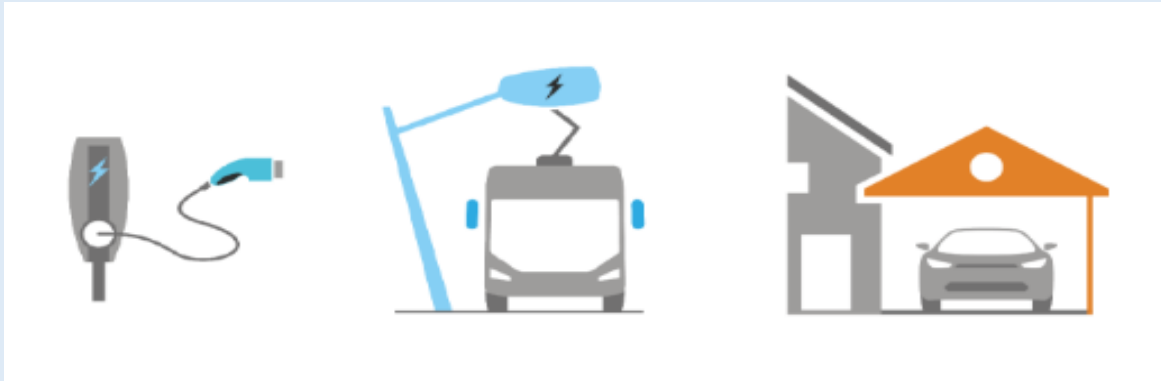
Before going to the designing process of an EV (Electric Vehicle), let us quick through about the brief background details about its definition and origin.

An <u>electric vehicle</u> is propelled by Electric Drive Train, taking power from a rechargeable battery or from portable source of electric energy (like fuel cell, solar cell, solar panel) which is manufactured for use on public road. At the crucial stage automobile technology development, both Electric Vehicle and Fossil Fuel Vehicles are invented but due to some observable reasons, Fossil Cars, which are propelled by Mechanical Drive Train, become popular for Public—

1) Due to <u>poor battery efficiency</u>, electric cars were in low range.

2) EV could never reached a long distance that can be covered by Gasoline Cars.

3) <u>Charging time</u> is too much for EV than Gasoline Car.

4) The mass production of cars like TESLA model-T made the Gasoline powered Car more affordable with <u>abundancy of fuel</u>.

But apart from that due to more technical advancement, EV's have the following advantages: 1) It has <u>no tail Pipe emissions</u>, 2) <u>Reduction in air pollution</u> in cities due to CO_2, SO_x, NO_x, particulate matter, which improves the liveability and air quality in our cities. 3) It can be charged by <u>Renewable energy sources</u> and it can take part <u>energy transition and storage</u>. *When Grid is overloaded then EVs can send back the power to Grid.*

Now coming to the point, we are supposed or suggested to design an Electric Car that is to be used for our purposes. For that we need to plan a specific, well effective and presentable structure/architecture of our self-made Electric Vehicle. The Following mentioned points contains those information sequentially---

(A) Type of the Car:

Here we are designing a *family car*. Generally now-a-days, for family usage, People like afford luxury cars like SUV which is of Boxy shape. Whether it will be family or a sports car (like cars used at FORMULA ONE race track) the internal criteria, on which the effectiveness of the car depends on, should be same. Our own designed will be of 4 seater with 4 doors, window seat arrangement, Air conditioning facility, Locking systems for Safety, Wiper for Rainy seasons, GPS System and lighting

features, with overall moderate dimension, capable of taking as much as possible loads, Luggage corner etc. Beside that it should be free from over-weightage due to internal manufacturing components. It should require less maintenance and it have to of easy to drive. Besides that the shape of the car should have low aero dynamical force, its wheel must rolling resistance force *lower in planer road and greater in rough surface road.* And appropriate gradient Force. All these are necessary to get perfect amount of Traction force. We can determine traction force by following equation,

$$F_{tract} = Ma + (F_{roll} + F_{aero} + F_{grad})$$

$$F_{tract} = Ma + [C_r.mg + 0.5C_dA_f\rho V^2 + mgsin\theta]$$

M= mass of car, g= gravity acceleration, a=linear acceleration, Cr= Rolling coefficient, Cd= aero dynamic coefficient, A_f= frontal area, V= velocity of car, ρ=Air density.


(B) Driveline:

Every types of driveline, whether it is Hybrid or Plug-in Hybrid Electric Vehicle (HEV or PHEV), Battery Electric Vehicle (BEV) or Fuel Cell Electric Vehicle (FCEV), they have their own advantage and drawbacks. (1) HEV and PHEV have electric drive train like normal EV in addition with fuel burning component which can recharge the battery. Their advantages are – *No range limitation, more savings in fuel and requires less maintenance for gear and drivetrain*. But for a long distance journey, reduction in emission would be less and efficiency also goes down. (2) BEV have no fuel burning part and no moving parts, that's why they are inherently of less weight. It runs fully on a cheap and relatively sustainable energy source, it requires little maintenance. Small batteries are enough for our design for covering 400-500 km which is more than sufficient for a family car usage. But charging time is much more. (3) FCEV has Fuel Cell battery pack as its energy source. It takes much shorter time for refilling the battery. Another benefit is that it has extended driving range compared to traditional ICE vehicle.

Based on above information, if we can compromise for the charging time the BEV design can be employed for our model otherwise, as a general view, Fuel Cell Electric Vehicle are the best and up-to-date choice.
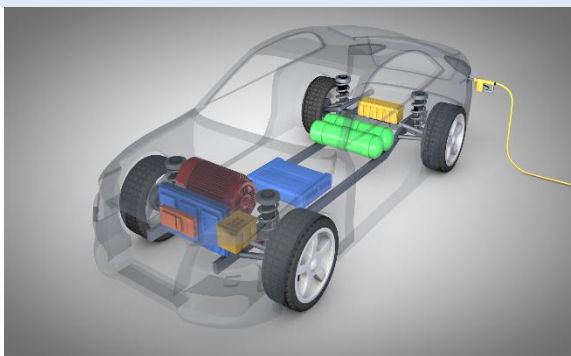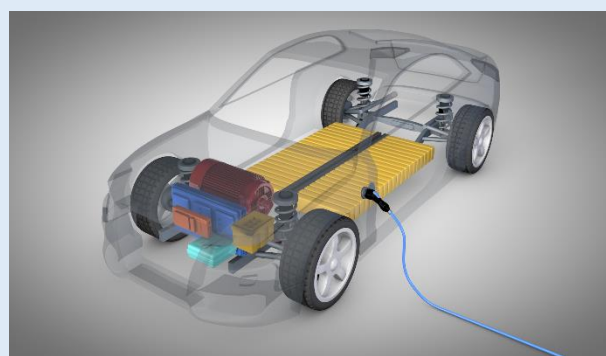
FCEV drivetrain   BEV drivetrain

(C) Motor:

Generally three types of motor are used and any one type of motor is incorporated into the Vehicle. Those types are 1. *Induction Motor*, 2. *Synchronous Reluctance Motor*, 3. *Permanent Magnet Motor*. We are not dealing with their internal feature or working principle but we can decide which should be in our design by discussing their significance.

1. Induction motors are simple and rugged in Structure, No brushes and Commutators are needed that's why less sparking occurs, Speed control is easy and it is self-starting. But this motor involves in rotor losses and heat dissipation. Moreover it is not lightest motor at all.

2. Permanent Magnet motors are lightest one and smaller motor. Their performance are not noisy and with greater efficiency at lower speeds. But they need to be controlled by means of Electronic controller, starting mechanism is necessary and position sensor is required in case of dynamic controlling.

3. Synchronous motors exhibit greater torque compared to PM motors, Efficiency at higher speeds and cheaper one. No permanent magnet is needed but its performance is quit noisy and torque ripple is also there.

So it is quite difficult to choose the optimum one but permanent magnet motors are the best one for our design, sacrificing cost of controllers and additional starter.
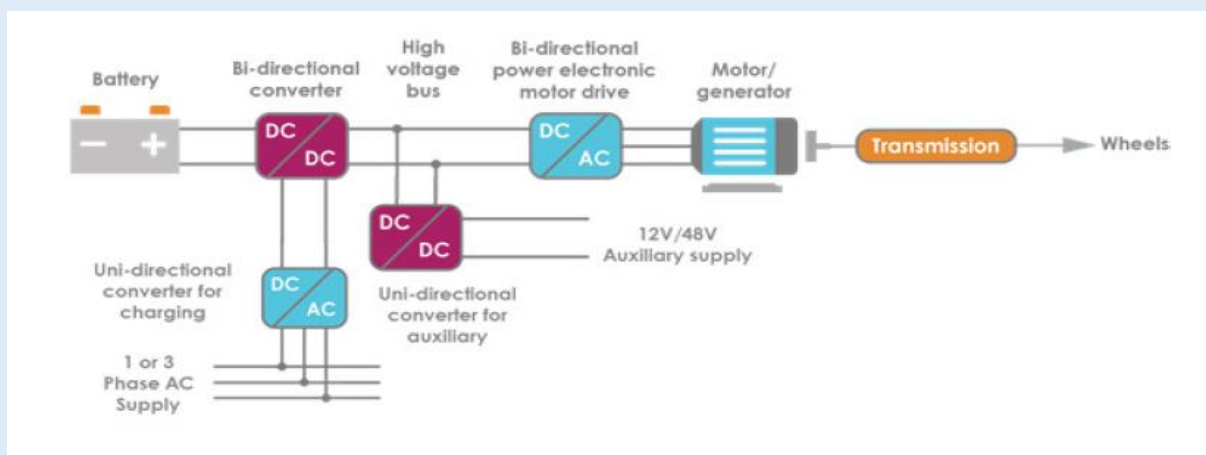

(D) Power Conversion:

Here two types of Power converters are used—DC/DC, AC/DC and DC/AC converters. Let us figure out their implementations. *At the time of charging*, 3φ AC supply is given to the vehicle and by means of AC/DC unidirectional converter, AC power is converted into DC power and to ensure the battery voltage capability, bidirectional DC/DC converter is used. *At the time of driving*, battery provides the DC power and passes through that bidirectional DC/DC converter to ensure the electric machine can provide the optimum power to propel the vehicle. Machine is energised by that incoming power through bidirectional DC/AC converter. To ensure power supply for auxiliary system like headlight, indicator, AC, wiper and other features; an auxiliary supply is incorporated into the system. Auxiliary battery is a small battery of 12V but its range can be extended up to 48V. In case of driving, DC/DC converter (Chopper) acts in Boost or Step up mode; on the other hand, in case of braking, that acts as Buck or Step Down mode. For all types of operation like forward driving/braking as well as backward driving/braking, a 4-quadrant chopper is needed. In general, the mechanical transmission is based on

fixed gearing and a differential, but there are many possibilities for BEV configurations, depending on cost and performance constraints.

$EKE = 1/2\ m\ v^2$ = Kinetic energy of the vehicle
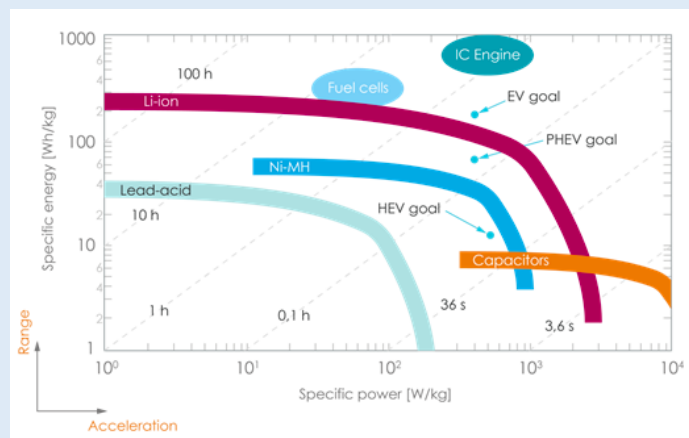$Eev = Pev\ t$ = Energy delivered to vehicle
$P_{batt} = V_{batt}\ x\ I_{batt}$ = Battery power
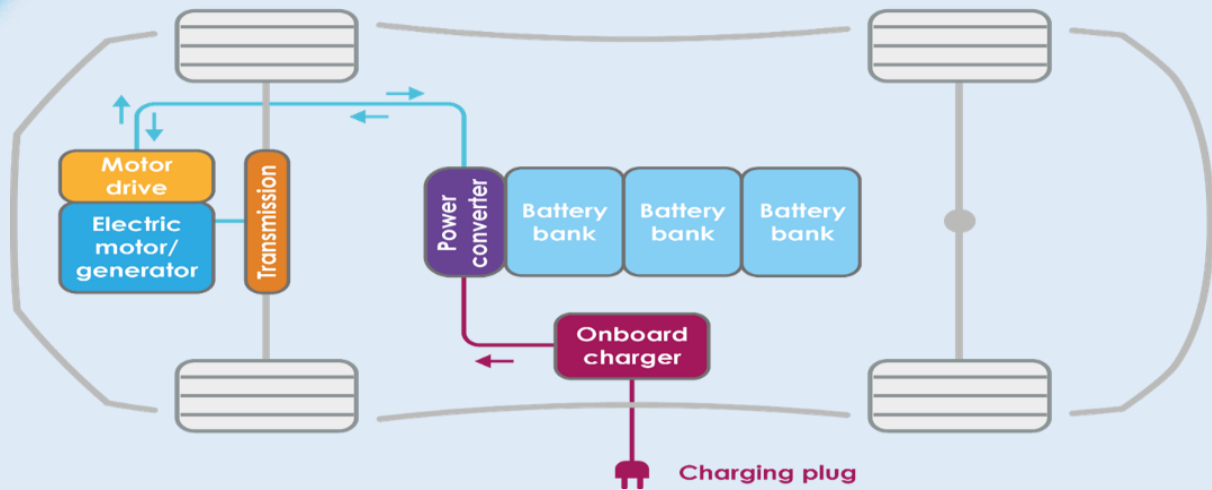
(E) Battery:

There are several types of batteries exist like Lithium based, Lithium manganese, Metal air, Lead Acid etc. But according to the *Regone Plot* given above, in case of BEV design Li-Ion batteries are the correct choice and for Fuel Cell vehicles, the Lead-Acid batteries are sufficient. FCEV cars need specific power 80-110 W/Kg and specific energy 100-1000 Wh/Kg and BEV cars need Sp. Power 1900-2800 W/Kg and Sp. energy 200-300. So, their batteries (i.e. LI-Ion and Lead-Acid respectively) must be of corresponding size. Here we can see from Regone Plot, FCEV vehicles have charging time from 36 sec. to 6 min. whereas the BEV takes only 4 – 36 sec. for charging.

To place the battery in appropriate position, a battery management system (BMS) is used to monitor, control and balance the pack. The main functions of a BMS are outlined in the figure below. Without balancing the battery pack, the battery is not only risking unnecessary damage, it is also operating sub-optimally. Because the worst cell is limiting the performance of all cells in the battery pack, it is very important to prevent big differences in cell's state of charge. Batteries for electric vehicles consist of many interconnected cells in combination forming a battery pack. Individual battery cells a show a reduction in capacity with increasing charge and discharge cycles, as well as variations in temperature. When cells are connected in a series or parallel configuration as in a battery pack, management and control of the charge and discharge conditions becomes crucial to extend the lifetime and limit ageing effects of individual cells.

- C-*rate* = *Pev / Enom = Ibatt / Qnom* = *Charging rate of battery;* Q_{nom}= *Nominal Amp-hour of the corresponding battery;* E_{nom}= *nominal energy supplied*
- *Average voltage x Capacity = Energy density*
- *Theoretical energy density = (Average voltage x Capacity) / Weight of battery electrode*
- *Practical energy density < theoretical one.*

(F) Charging:

During manufacturing an EV, two methods of charging is employed, 1. On-Board Charging and 2. Off-board charging.

Now if we employ the AC charging (max. 17.2 kW) then there are three categories-- A. Conductive Charging, B. Inductive Charging, and C. Battery Swap Technology. Normally Conductive method and Battery Swapping method is applied for efficient charging because of their following advantages:

- *Conductive Charging:* The battery can be recharged anywhere using the AC grid and the on-board EV charger The EV charger can easily communicate with the Battery Management System (BMS) and no additional power electronic converters are needed in the EV charger. This leads to a higher performance and lower cost.

- *Battery Swap:* No range anxiety, quick and easy refilling like a combustion engine car tank longer charging times available for the EV battery compared to fast DC charging, though the standardisation of battery is mandatory.

Inductive charging is not preferred generally because its misalignment problem, Variable coil structure and due to presence foreign particle on road.

But AC charging method lower specific power and this AC needs to be converted into DC with an on-board charger. That's why, DC charging (50 – 350 kW) is used because it gives higher power density. DC charging is always conductive and always fast charging facility can be obtained through only off-board charging. For any EV charger, it is important that the cable is flexible and lightweight for
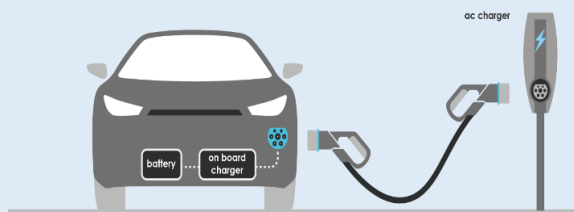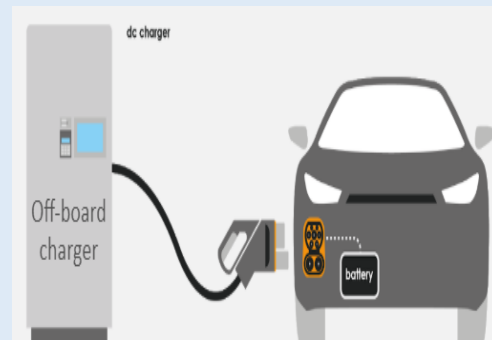
AC charging   DC charging
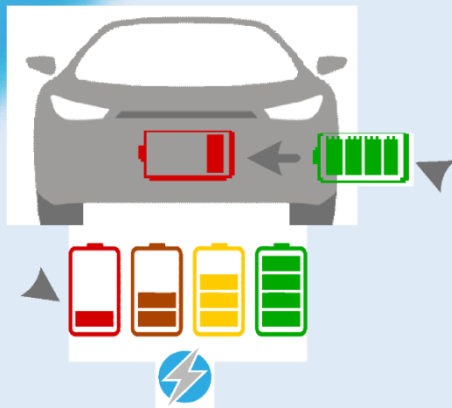
Battery Swapping   Inductive Charging

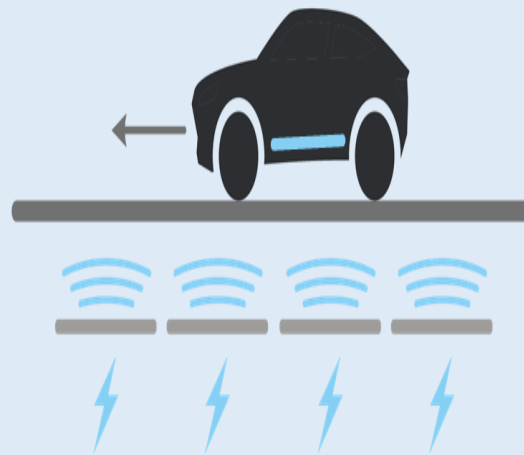people to use and connect it to the car. With higher charging power, thicker cables are needed to allow more charging current, else it will heat up due to the losses. In the future with currents above 250A, the charging cables would become heavy and less flexible to use. The solution would be to use thinner cables with cooling and thermal management to ensure that cables don't heat up. This is, of course, more complex and costly than using a cable without cooling. So, in case our design, for safe and efficient charging, AC charging is to be incorporated.

(G) Future development:

Development of this technology in the future depends upon many factors like availability of charging point at every local or highway area, business perspective, economic perspectives, publicity etc. The main challenges need to resolved, are the problem of longer charging time, less charging infrastructure available and higher capital cost. The ratio of energy returned to energy invested must be more in order to make it affordable in modern society with less range anxiety and less charging cost.

After that if those drawbacks are overcome then, it is also possible to make Self/Autonomous Driving technology. Self-driving with limited capabilities have already been built into existing electric cars such as those from Tesla. Self-driving vehicles open up a plethora of opportunities in the future such as shared and connected mobility, cities decongested of cars and parking spaces, higher utilization of vehicles, lower cost of mobility and more efficient point-to-point connectivity. A combination of different kinds of sensors such as a video camera, Light detection and ranging or LIDAR, Radar sensors, Ultrasonic sensors, and GPS are used by the vehicles to understand the environment, and a computer on board controls the movement of the car.

Autonomous driving is expected to be developed over 5 levels starting at Level 1 where the car can control either the steering or speed under certain conditions to Level 5 where the car can autonomously drive itself under all conditions.

Smart Security and Home Automation using IOT

*Name:- Arnab Debnath*

Roll No.-EE2019/032(2nd year)

Abstract: IoT enabled home or a Smart home is basically a wireless smart control and operation of all home appliances like lights, fans, heaters, air conditioners, refrigerators, washing machines etc. When these devices are connected to the internet they are a part of Internet of Things. The backbone of this automation system is a basic microcontroller Arduino UNO connected to the internet via USB serial or ESP8266 (ESP-01) Wifi Module. Models can be integrated as and when required and also to ease human efforts.

1. Introduction

In recent days it is very essential to utilize our resources so as to optimize between the availability and use. Therefore, one of the most concerns is the proper utilization of energy required in the household utilities. This is the main characteristic of smart home. Including above it also facilitate other factors to comfort our daily lives. Early concept of the first smart homes was an idea. For decades, the technology has explored the idea of home automationand control. First In 1898, Nikola Tesla created the first remote control to operate a toy boat. Tesla worked out a way to use radio waves to send instructions to his boat from a handheld device. After decades of progress in computing and developing electronics, the first ever a smart device was built- the ECHO IV. This machine is able to monitor the home's temperature and control other electrical appliances. In 1971, the microprocessor was invented, and technology steps into a new era of automation. Home automation had began to increase in popularity in the late 1990s and early 2000s as internet technology was developing fast and suddenly smart home became a much more affordable option for everyone.Today's concerns of homes are to make it smart and secure.Our smart homes are well maintained which also ensures avoidance of the waste unnecessary energy. It also helps us to alert intruders. Current trends in home automation include remote control using smart phones, automated lights, automated temperature control, mobile/email/text notifications etc.

2. Internet of Things

Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects that are provided with unique identifiers.Unique identifiers are logical addresses that usually follow IPv6.It's a network of devices without requiring human-to human/human-to-computer interaction.Storage/Transmission/Analytics of huge amount of sensor data. Communication takes place via Network/Gateway. The main device used to understand the iot is *Arduino-UNO microcontroller* and also **ESP8266 wifi module .**
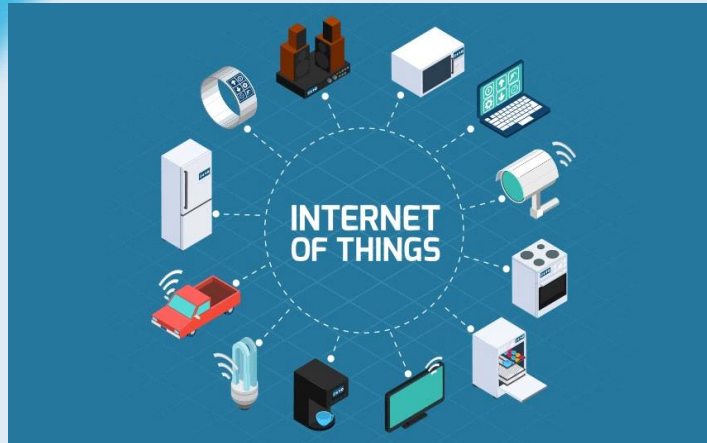
Arduino-UNO microcontroller

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

The word "uno" means "one" in Italian and was chosen to mark the initial release of Arduino Software. The Uno board is the first in a series of USB-based Arduino boards; it and version 1.0 of the Arduino IDE were the reference versions of Arduino, which have now evolved to newer releases. The ATmega328 on the board comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer.

Arduino-UNO microcontroller

The most important parts on the Arduino board high lighted in red:

1: USB connector
2: Power connector
3: Automatic power switch
4: Digital pins
5: Analog pins
6: Power pins
7: Reset switch
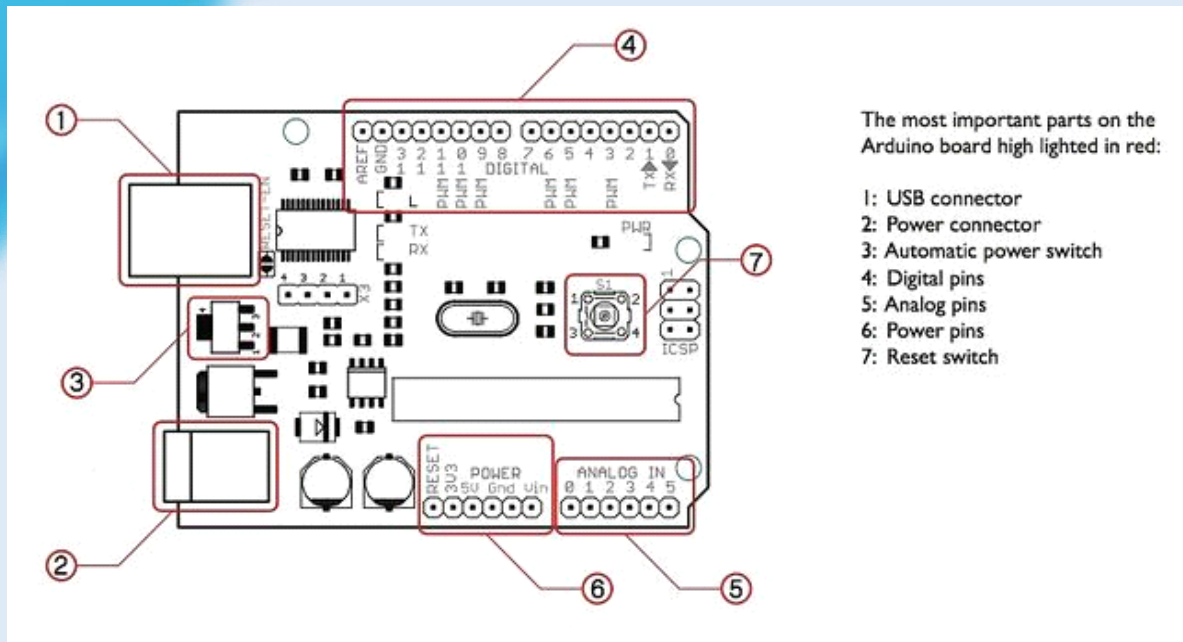
Important parts of Arduino-UNO

2.2 ESP8266 wifi module

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol which facilitates any microcontroller to access WiFi network. Each ESP8266 module (fig.1) is essentially programmed with an AT command set firmware so that it can simply hook this up to Arduino device and get about as much WiFi-ability as a WiFi Shield offers.The ESP8266 supports APSD for VoIP applications and Bluetooth coexistence interface, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.
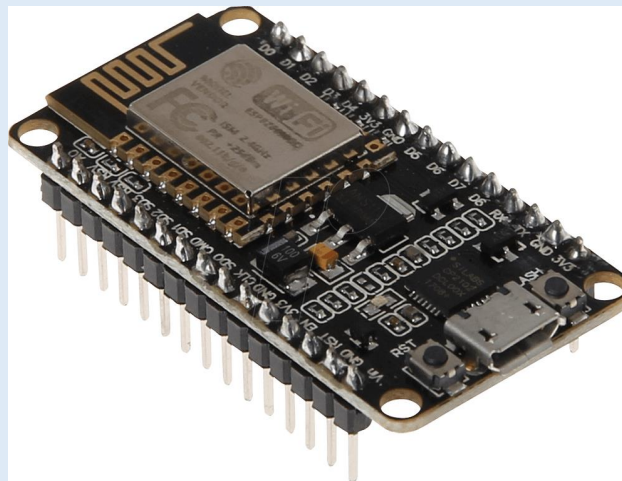
ESP8266 wifi module
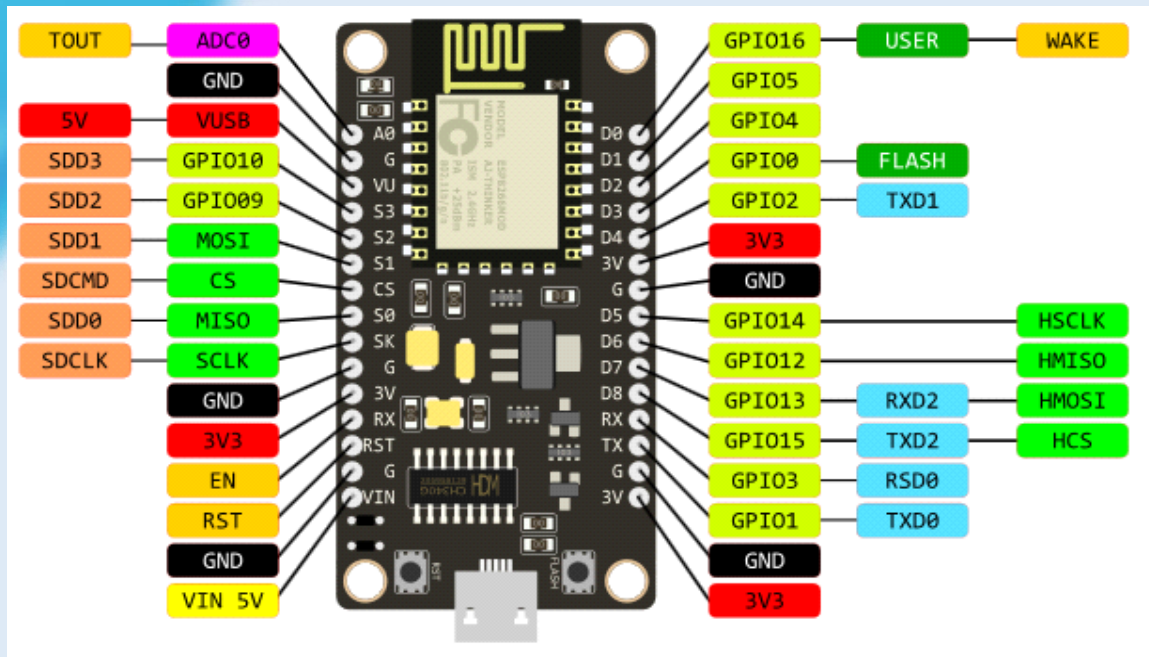
Important parts of ESP8266 wifi module

3. Hardware Components

3.1 Interfacing of USB serial with arduino UNO

- Open Arduino Serial USB example and change auth Taken

- Run the blynk-ser script, located in scripts folder:

Windows: MyDocuments\Arduino\libraries\Blynk\scripts

Mac: ~/Documents/Arduino/libraries/Blynk/scripts

Linux: ~/Arduino/libraries/Blynk/scripts.

The script is simply redirecting traffic to Blynk Cloud.You can specify port, baud rate, and server endpoint like this

/blynk-ser.sh -c <serial port> -b <baud rate> -s <server address> -p <server port>

For instance:

./blynk-ser.sh -c /dev/ttyACM0 -b 9600 -s blynk-cloud.com -p 8442

Run blynk-ser.sh -h for more information. Be sure to select the right serial port (there may be multiple). Arduino IDEmay complain with "programmer is not responding". You need to terminate script before uploading new sketch.

3.2 Hardware design

Interfacing of esp8266 with Arduino UNO: In order to make the ESP8266-01 Wifi Module connect to the blynk server and enable the Arduino Uno to transmit and receive data the wifi module must be flashed.

Step 1: Do connection with your Arduino Uno board

ESP8266:-------------- >Arduino:

GND ------------------------- GND

GP2 ------------------------ Not connected (open)

GP0 ------------------------- GND

RXD ------------------------- RX

TXD ------------------------- TX

CHPD ----------------------- 3.3V

RST ------------------------- Not connected (open)

VCC ------------------------- 3.3V

Step 2: Download the firmware and ESP8266 flasher. Connect your Arduino board with your PC/laptop then go to control panel and check for COM port. Choose your COM port carefully.

Step 3: Browse for your firmware.bin file which you downloaded from the link. Click on the download button. It will stop at 99% then remove the cable from the PC/laptop and you are done.
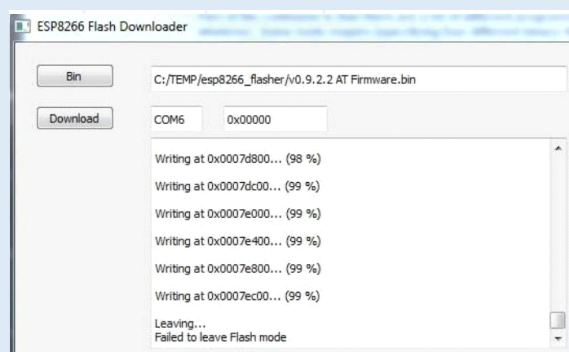
3.3 Interfacing of LDR and PIR with arduino-uno:

The LDR sensor is connected to the Arduino UNO with the help of jumper cables. One terminal of the LDR is connected to the 5V source of the Arduino using jumper cables and the other is connected to a resistance of 100kΩ. The other terminal of the resistance is connected to the GND port of the Arduino board.
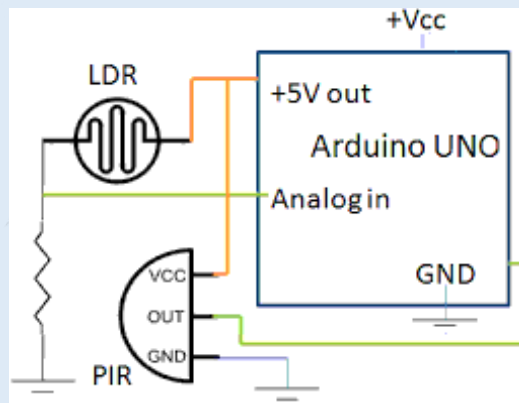
4. Software

Arduino IDE (Integrated Development Environment is an application available for Windows, mac-OS and Linux platforms. It is originally written in Java. It is used to write programs for various arduino compatible boards. The source code for the IDE is released under the GNU General Public License, version 2. It supports C and C++ with the help of special provision of code structuring. The Arduino IDE has a range of libraries available in it. The Arduino IDE supplies a software library from the Wiring project, which provides various of input and output options. User-written code only requires two basic functions, for starting the sketch and the main program loop those are compiled and linked with a program stub main() into an executable cyclic executive program. The Arduino IDE converts the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

BLYNK: Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet via Blynk Server. It's a digital dashboard where buildingof a graphic user interface is possible by just dragging and dropping widgets. Using this app we can control development boards like Arduino, Raspberry Pi via internet over Wi-Fi, Ethernet, USB or using the ESP8266 chip. Since Blynk also works with USB we can use the app by connecting the board that we are using to your laptop or desktop.
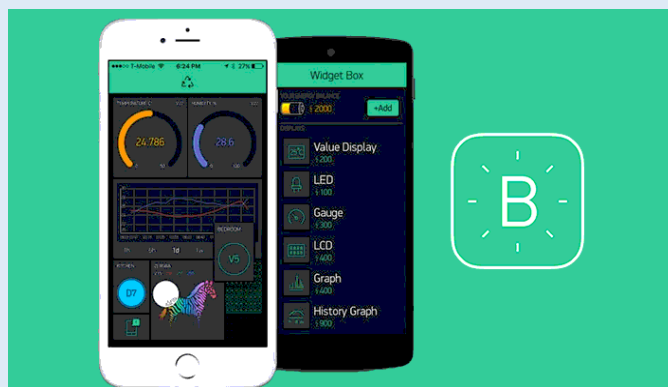
```
void loop()
{
  Blynk.run();
}

// This function will be called when the widget
// in Blynk app writes values to the Virtual Pin 0.
BLYNK_WRITE(V0)
{
  // Getting the value from pin V0.
  int pinValue = param.asInt();

  // Set the LED state.
  digitalWrite(1, !pinValue);
  digitalWrite(3, !pinValue);
  digitalWrite(2, !pinValue);
}
```

5. Results

The control/display unit is for a prototype of a homeautomation system which is supposed to automate ,control certain household devices and also measure certainparameters. Listed below are the results we have achieved.

5.1 Automatic light control using LDR

Whenever the ambient brightness is low i.e. LDR value is less than 750 lux(lumens/sq.meters), it signals the microcontroller to turn on the led. This could be used for automatically switching on or switching off lights, depending on the ambient brightness. Instead of a led, the light must be connected to a bulb via a relay (SRD-05VDC-SL-C relay).

Light intensity control using pwm: Connect the led/light to the PWM (pulse width modulation) pin of microcontroller and using the slider application from the app, change the intensity of the light to a desired setting.

In PWM technique pulses of different on times are fed in from the microcontroller to the light/led. Different pulse width results in different intensities. Higher the on-time, more the intensity and vice versa. In the Blynk UI(Fig.8):Blynk UI Showing Slider Widget) the user simply increases the intensity by moving the slider from left to right and moves it from right to left to decrease it.

5.2 Intruder alert using PIR sensor

Everyone cannot afford to keep a security guard to protect their homes from intruders. In fact, in the age of IOT, they don't need to. All they need is a PIR sensor which track movement (by tracking heat) connected to a microcontroller which can send data over the internet. Whenever any intruder tries to break in or for that matter any movement is detected in the home, in absence of its owner, a notification pops up/alarm rings in the owner's phone, alerting him/her that there is unwanted presence in the home.

5.3 Over the air (OTA) switch

Sometimes it is really inconvenient to enter a room without any light and look for the switch in the darkness. IoT has a simple solution for this. The user can simply switch on and off the light from anywhere as per as his/her need. This OTA switch could even be helpful even if someone forgets to switch off the light before leaving the room/home.

5.4 Measurement of light intensity

The gauge widget displays the brightness in lux(lumens/sq.meters). This information can be helpful if someone wants to change the brightness of the room to a desired value. In the Blynk UI, we can use the Blynk UI Slider to change the brightness level in lux.

6. Conclusion

The home automation system has worked satisfactorily by connecting electrical appliances to it and those were successfully controlled from a wireless mobile device by using ARDUINO-UNO (microcontroller). The Wi-Fi has been successfully tested on different mobile phones from different manufacturers, thus proving its portability and wide compatibility. We also examined about the security concerns like intruder alert/burglar alarm system including the online notification based on IOT technology. Thus a low-cost home automation & security system is successfully designed, implemented and tested.

NISAR Mission

Name:- Soumyajit Roy

Roll No.-EE2017/018(4th year)
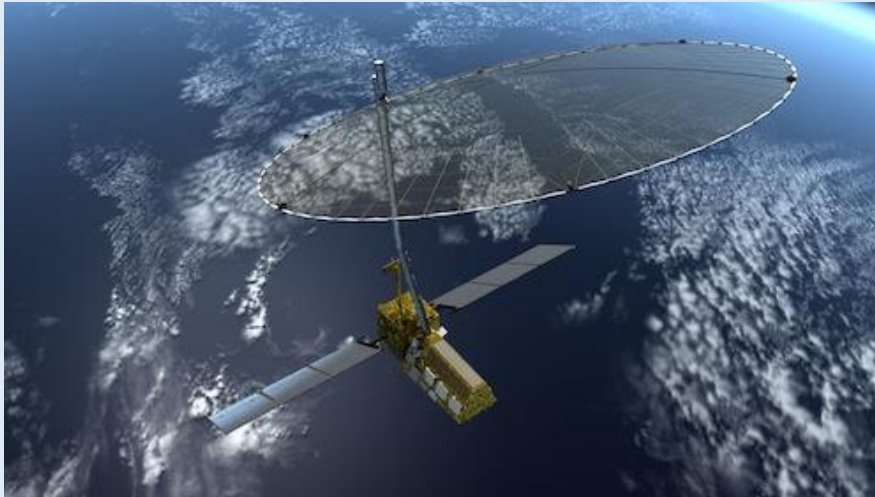
The NASA-ISRO Synthetic Aperture Radar (SAR), or NISAR, Mission would make global integrated measurements of the causes

NASA AND ISRO ARE COLLABORATING ON DEVELOPING AN SUV-SIZED SATELLITE CALLED NISAR, WHICH WILL DETECT MOVEMENTS OF THE PLANET'S SURFACE AS SMALL AS 0.4 INCHES OVER AREAS ABOUT HALF THE SIZE OF A TENNIS COURT.

- **The Name 'NISAR':** The name **NISAR** is short for **NASA-ISRO-SAR.**
  - **SAR** here refers to the **Synthetic Aperture Radar** that NASA will use to measure changes in the surface of the Earth.
  - It refers to a technique for producing **high-resolution images.** Because of the precision, the radar can penetrate clouds and darkness, which means that it can **collect data day and night in any weather.**
- **Function:** It will scan the globe **every 12 days** over the course of its **three-year mission** of imaging the **Earth's land, ice sheets** and **sea ice** to give an unprecedented view of the planet.
- **Role of NASA:**
  - National Aeronautics and Space Administration (**NASA** - space agency of the USA) will provide one of the radars for the satellite, a high-rate communication subsystem for science data, GPS receivers and a payload data subsystem.
  - **NISAR** will be equipped with the **largest reflector antenna** ever launched by **NASA.**
- **Role of ISRO:**
  - Indian Space and Research Organisation (**ISRO**) will provide the spacecraft bus, the second type of radar (called the **S-band radar**), the launch vehicle and associated launch services.
- **Primary Goals:**

- o   Tracking subtle changes in the Earth's surface,
- o   Spotting warning signs of imminent volcanic eruptions,
- o   Helping to monitor groundwater supplies, and
- o   Tracking the rate at which ice sheets are melting.
- ▪   **Expected Benefits:**
  - o   NISAR's data can help people worldwide **better manage natural resources and hazards,** as well as providing information for scientists to better understand the **effects and pace of climate change.**
    - •   The images will be detailed enough **to show local changes** and broad enough to **measure regional trends.**
  - o   As the mission continues for years, the data will allow for better understanding of the causes and consequences of **land surface changes.**
  - o   It will also add to our **understanding of our planet's hard outer layer, called its crust.**

S-Band Radar

- ▪   **S band radars** operate on a wavelength of 8-15 cm and a frequency of 2-4 GHz.
- ▪   Because of the wavelength and frequency, S-band radars are not easily attenuated. This makes them useful for near and far range weather observation.
- ▪   The **drawback** to this band of radar is that it requires a **large antenna dish** and a **large motor** to power it. It is not uncommon for a S-band dish to exceed 25 feet in size.

Major Mission and Instrument Characteristics of NISAR

	S-band	**L-band**
Orbit	747 km with 98° inclination	
Repeat Cycle	12 days	
Time of Nodal Crossing	6 AM / 6 PM	
Frequency	3.2 GHz ± 37.5 MHz	1.257 GHz ± 40 MHz
Available Polarimetric Modes	Single Pol (SP): HH or VV Dual Pol (DP): HH/HV or VV/VH Compact Pol (CP): RH/RV Quasi-Quad Pol (QQP): HH/HV and VH/VV	SP: HH or VV DP: HH/HV or VV/VH CP: RH/RV Quad Pol (QP): HH/HV/VH/VV
Available Range Bandwidths	10 MHz, 25 MHz, 37.5 MHz, 75 MHz	5 MHz, 20 MHz, 40 MHz, 80 MHz (Additional 5 MHz iono band for 20 & 40 MHz modes at other end of pass-band)
Swath Width	> 240 Km	>240 Km

Spatial Resolution	6.4m (Az); 2m-6m (Sl-Ra)	6.9m (Az); 1.9m-30m (Sl-Ra)
Incidence Angle Range	33 - 47 deg	33 - 47 deg
Noise Equivalent σ°	-20 dB swath average (baseline) -17 dB(Threshold)	-20 dB swath average
Ambiguities	< -20dB for all modes except QQP	< -23dB swath average in SP or DP modes < -17dB swath average in QP mode

More About The Mission:

Artist's Concept

PLANNED LAUNCH DATE: 2022

The NASA-ISRO SAR (NISAR) Mission will measure Earth's changing ecosystems, dynamic surfaces, and ice masses providing information about biomass, natural hazards, sea level rise, and groundwater, and will support a host of other applications.

NISAR will observe Earth's land and ice-covered surfaces globally with 12-day regularity on ascending and descending passes, sampling Earth on average every 6 days for a baseline 3-year mission.

Center frequency	1.2575 GHz (L-band)
Wavelength	23.8 cm
Orbit height	747 km
Incidence angle	33.88º-47.2º
Pulse width	(20+5) μs
Chirp bandwidth	(20+5) MHz
PRF (Pulse Repetition Frequency)	1650 Hz

Processed Doppler Bandwidth	1100 Hz
Backscatter model	Ulaby, L-band, shrubs
Processing window	Hamming (alpha=o.85)

Table : System and processing parameters for nominal dual-pol operation of NISAR
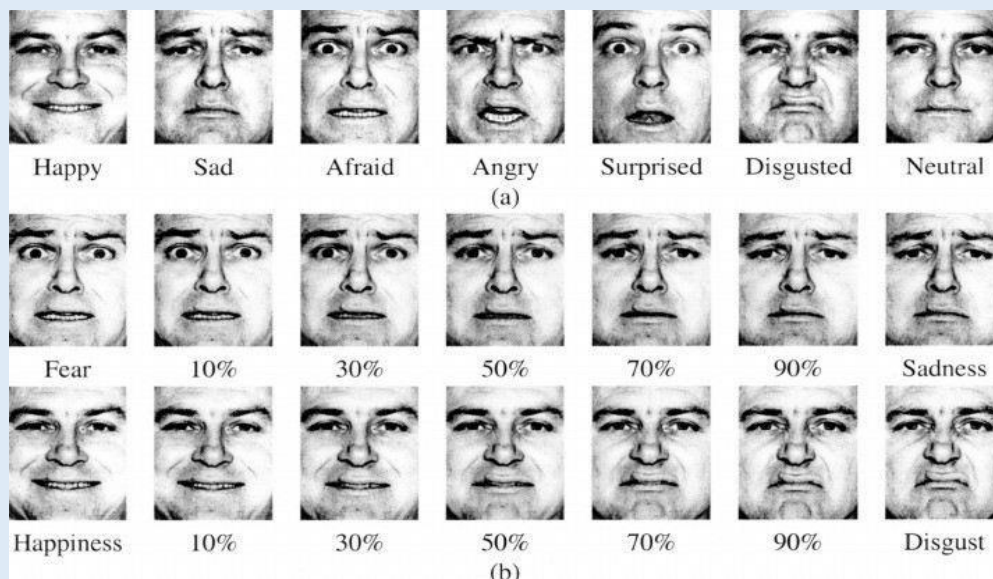
Sentiment Analysis

Name:- Anish Koley

Roll No.-EE2019/035 (2nd year)

Lets start this with an great example, hope everyone uses texting apps to communicate each other remotely.

Let us consider a moment when someone texts you with a sarcastic comment (without emojis) can you tell if it's sarcastic? If they're actually happy, angry or neutral?

That's what makes sentiment analysis such an expansive and interesting field. Sentiment analysis–also called opinion mining–is the process of defining and categorizing opinions in a given piece of text as positive, negative, or neutral. As mentioned above, sarcasm is a form of irony that sentiment analysis just can't detect. Heck, it's hard enough to do if your human and trying to read someone's online post.

Sentiment analysis in our Everyday life:

With the increasing capabilities of sentiment analysis, it's becoming a more utilized tool for businesses. Social media monitoring tools use it to give their users insights about how the public feels in regard to their business, products, or topics of interest.

It's widely used by email services to keep spam out of your inbox and by review websites to recommend new content like films or Web series, Songs, Video etc.

However, it has been used in cloudy circumstances. Twitter, for example, came under fire when it was discovered they were using sentiment analysis to see if they could manipulate people's emotion by altering their algorithms to inject negative or positive tweets more frequently into their users' news feeds.

By using this process of "emotional contagion," they found that they could decisively influence their users' emotional output by flooding their news feeds with positive or negative posts. The big problem

is that Twitter never informed its users that they were part of an experiment and may have caused emotional distress to them in some cases.

Clearly we can see how this use of sentiment analysis can be problematically unethical.

How is sentiment analysis implemented:

There are three machine learning classification algorithms that are predominantly used for sentiment analysis in social media listening:

- Support Vector Machines (SVMs) Naive-bayes
- Decision Trees

Each has it's own advantages and drawbacks; however, a few different studies have concluded that the Naive-Bayes classifier is the more accurete of three. However, today we'll go into one of the more widely used machine learning algorithms which is the Naive-Bayes algorithm.

So what is a Naive-Bayes classifier? It's a machine learning classification algorithm that asserts an independent value for each feature or datum within a dataset. In other words, each element is valued individually to determine a probability that the sum of these values will constitute a pre-defined label or outcome.
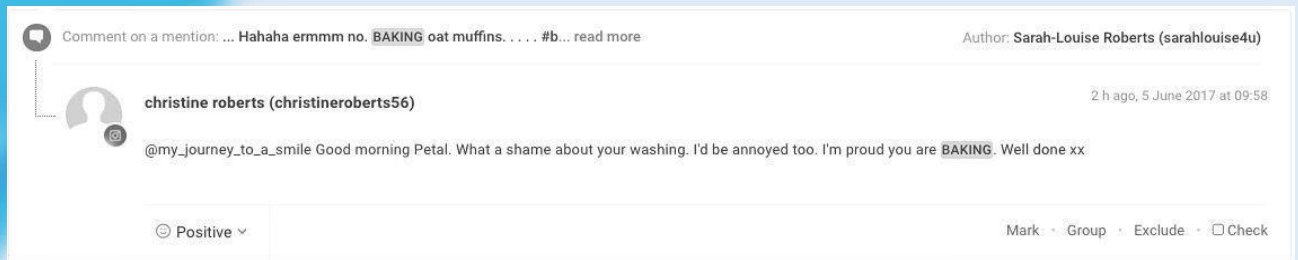
Let us take one good example:

A fruit may be considered to be a guava if it is green, round, and about 4 inches in diameter. Even if these features depend on each other or upon the existence of the other features, all of these properties independently contribute to the probability that this fruit is an guava and that is why it is known as 'Naive'.

There's a ton of math involved in quantifying just how the outcomes are processed. I'll try to provide you with a quick summation of how it's done. In terms of sentiment analysis for social media monitoring, we'll use a Naive-Bayes classifier to determine if a mention is positive, negative, or neutral in sentiment.

With Naive-Bayes you first have to have a dataset. With textual sentiment analysis, this usually comes in the form of a training set bag-of-words already sorted into positive or negative categories.

A positive word may have a +1 scoring while a negative word will have a -1 scoring. You can also assign higher values to certain words that may be more negative in degree. Regardless, if the final score of a mention is positive, then the mention is positive and vice versa for negatives.

Let's take a look at a mention and see how a computer would score it if we pre-assigned sentiment to our bag-of-words.

Comment on a mention: ... Hahaha ermmm no. BAKING oat muffins. . . . . #b... read more
Author: Sarah-Louise Roberts (sarahlouise4u)

christine roberts (christineroberts56)
2 h ago, 5 June 2017 at 09:58

@my_journey_to_a_smile Good morning Petal. What a shame about your washing. I'd be annoyed too. I'm proud you are BAKING. Well done xx

☺ Positive ⌄   Mark · Group · Exclude · ☐ Check

Let's pretend we've already assigned sentiment to a group of words within our mixed-bag as they appear below.

Word/Phrase	Positive	Negative
Good morning	✓	
Shame		✓
Annoyed		✓
Proud	✓	
Well done	✓	

Each word only appears once so for time's sake we don't need a frequency table. If we ascribe each positive and negative value a "1", then we can simply divide the positive and negative words by the amount of words (19) in the entire mention.

Positive words: 3/19 = 0.16
Negative words: 2/19 = 0.11
(P)0.16 – (N)0.11 = +0.05

Since the total of our mention comes out as positive, we can say the sentiment of the mention above is positive and that's how sentiment analysis manipulate peoples emotions and sentiments.
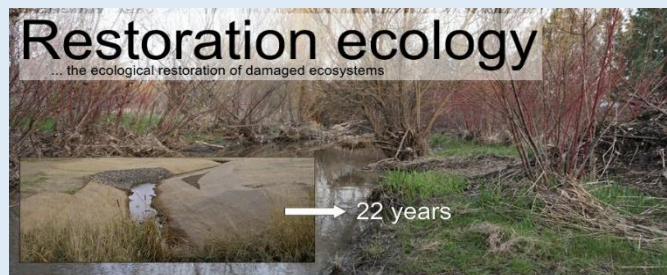
Restoration of Ecosystems

Name:- Sandip Sen

Roll No.-EE2020/L01(2nd year)

Ecosystem restoration is redefined as a process of reversing the degradation of ecosystem, such as landscapes, lakes and oceans to regain their ecological functionality. In our words, to improve the productivity and capacity of ecosystems to meet the needs of society.

The emergence of COVID-19 has reminded us just how disastrous the consequences of ecosystem loss can be: The destruction of animals' natural habitats creates ideal conditions for pathogens such as coronaviruses to spread.

So, it is timely for this year's World Environment Day to coincide with the launch of the UN Decade on Ecosystem Restoration, a global mission running through 2030 to protect and revive billions of hectares of valuable and much needed natural capital, from forests and farmland to the oceans.

1. Why ecosystem Restorations theme being choosen this year ?

There are good reasons for ecosystem restoration. Aside from the intrinsic value of biodiverse, functioning ecosystems, they underpin a lot of our activities, as we have noted in this recent blog article. Our long-term prosperity relies on rebalancing our use of ecosystem services such as pollination, flood protection and CO_2 sequestration, and nature's capacity to supply them.

Half the world's GDP depends – at least moderately – on a form of ecosystem service. The degradation of these services creates significant risk for business: from lower returns and the risk of defaults to rising insurance liabilities. Put simply, ecosystem collapse will result in economic collapse.

2. About United nation decade on ecosystem restoration.

There has never been a more urgent need to restore damaged ecosystems than now. Restoration of ecosystem is fundamental to achieving the Sustainable Development Goals, mainly those on climate change, poverty eradication, food security, water and biodiversity conservation. The UN Decade on Ecosystem Restoration (hereafter the Decade) is a global effort aimed at restoring the planet and ensuring One Health for people and nature.The Decade unites the world behind a common goal: preventing, halting and reversing the degradation of ecosystems worldwide. Forests, grasslands, croplands, wetlands, savannahs, and other terrestrial to inland water ecosystems, marine and coastal ecosystems and urban environments—all of them are in dire need of some level of protection and restoration.

This incredible challenge can only be met if everyone—including Member States, local governments, partners from the private sector, academia and civil society—come together to find viable, lasting solutions. Restoring damaged ecosystems is an efficient and cost-effective way people can work with

nature to address the most pressing challenges humanity is facing today, i.e. the Coronavirus disease 2019 (COVID-19) global pandemic, especially in the context of the Build Back Better approach.

3. How ecosystem degraded, damaged and destroyed ?

Our environment has been greatly damaged due to pollution and over exploitation of natural resources by human beings. All the natural ecosystems have been damaged to a great extent. Restoration of these damages is becoming a priority and of environmental interest. Science and technology of restoration ecology is rapidly evolving. Restoration requires a holistic approach. Restoration technology is now available to redirect the damaged ecosystems to their near natural integrity. In this context, this book is the first of its kind in reviewing the different approaches undertaken to restore various damaged ecosystems. Scientists currently working in this field have contributed their work in the form of reviews, site-specific case studies, technology for bioremediation and biodegradation. The book will provide first hand information in this currently expanding field and will be helpful to biologists, environmental scientists, engineers, wastewater treatment experts, microbiologists and all those interested in the conservation and management of the environment.

4. How to restore different ecosystem ?

Recovered ecosystems depend on three important factors: biodiversity, function and connectivity. Let's take a closer look at each of these. It's important to remember that each species in an ecosystem plays a specific role, so without the interactions of the different species, an ecosystem hasn't fully repaired itself. That's why biodiversity can help measure the overall recovery of a natural area. Scientists look for specific keystone species that play vital roles in ecosystems. For instance, tidal pools depend heavily on starfish. Sometimes scientists help restoration along by reintroducing these species. Next, scientists also look at the functioning of ecosystems: how different generations of trees and species disperse over time, providing nutrient flows that lead to regeneration in nature. Scientists can help these functions by mimicking natural disruptions with controlled burns in forests. These closely monitored and controlled activities help nature by scattering seeds and improving the nutrients in the soil. Finally, connectivity to the broader environment is important for nature.

5. Benefit of restoration of ecosystem ?

Healthy coastal habitats produce as much food per acre as farmland because of the fertile mix of nutrients from land and sea. Beyond providing food for our consumption, coastal habitats are the home of thousands of species of fish, birds, plants, and animals that depend on healthy habitat for their survival. Outbreaks of toxic microbes—causing massive fish kills—have harmed human health in those exposed to the toxic microbe, causing skin lesions and even memory loss. That's one possible result when estuaries and coastal and upland habitats are allowed to decline. But when they are restored, they produce healthy fish and wildlife that contribute to human health and enjoyment. The coastal and marine environment is a major source of biodiversity. Restoring a variety of coastal and marine habitats provides for healthy communities of plants and animals, including endangered and threatened species, to maintain ecological balance within natural

systems.Healthy estuaries and coastal resources support unique, centuries-old cultures, traditions and ways of life dependent upon the marine environment's diversity for everything from livelihoods to storytelling.

6. **Interesting facts of each ecosystem and more things.**

1. Forests cover one-third of the world's land area and host more than half of the world's land-based plant and animal species.

2. A quarter of all modern medicines come from tropical forest plants, including two-thirds of all cancer-fighting drugs.

3. Forests have an abundant supply of nutritious foods, such as nuts, fruits, seeds and even insects which are rich in protein and important minerals such as calcium and iron. These natural products help forest communities and millions of other people to remain healthy.
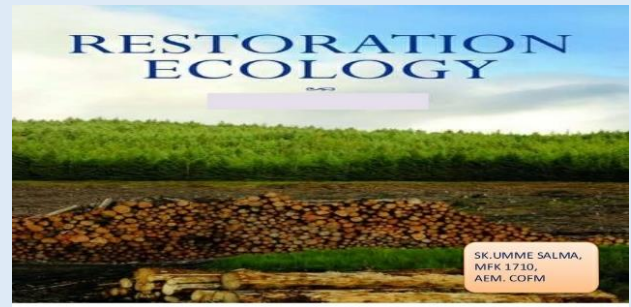
STORY BEHIND THE "POWER STORY"

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DEBAYAN CHAKRABORTY

SUBRATA GHOSH

DEBLEENA DAS

RAJDEEP BASAK

TUHINA DEY

Imagination is more important than knowledge.
---Albert Einstein

Journey Begins...