E-VIDYUT

ELECTRICAL AND ELECTRONICS ENGINEERING

VOLUME 14

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INDEX

MESSAGE FROM PRINCIPAL

It gives me immense pleasure to pen a few words as prologue to the in-house magazine of the EEE department, E-VIDYUT 2019. The issue is designed to present the events that have occurred as well as technical write-ups which makes the issue resourceful and informative. I congratulate all the contributors and also editorial board for bringing out such a nice issue. Happy Reading.

Dr. S. Krishna Mohan Rao

MESSAGE FROM HEAD OF THE DEPARTMENT

It is my pleasure to pen my views for release of this semester issue of E-VIDYUT 2019. I am extremely delighted to acknowledge that the editorial team has done a stupendous job of subsuming all the key events which have taken place over the course of last few months. To Top it off, this Magazine includes major events witnessed by our department as well as Engineering Advances in the Electrical Field. The essential objective of the Technical Magazine is to inform, engage, inspire and entertain a diverse readership " including students, faculty, parents and alumni- with a timely and honest portrait of our department activities.

This issue has made an earnest attempt in this direction and all the credit for its success falls upon faculty and students who have worked with dedication and enthusiasm to bring the issue forward. I convey my regards to all the readers.

Prof, Ganesh Prasad Khuntia

EDITORIAL BOARD.....

Welcome to the volume-14 edition of the E-Vidyut. We are really proud and exuberant to acclaim that we are prepared with all new hopes and hues to bring out this edition which is going to unfold the unraveled world of the most precious and proud moments of the EEE Department. The magazine is to be viewed as a lunch pad for the student's creative urges blossom naturally. As the saying goes, mind like parachute works best when opened.

This humble initiative is to set the budding minds free and allowing them to roam free in the realm of imagination and experience to create a world beauty in words. The enthusiastic Write ups of our young editors are undoubtedly sufficient to hold the interest and admiration of the readers. This magazine is indeed a pious attempt to make our young talents to give shape to their creativity and learn the art of being aware because I believe that success depends upon our power to perceive, observe and the power to explore. We are sure that the positive attitude, hard work, sustained efforts and innovative ideas exhibited by our young buddies will surely stir the minds of the readers and take them to the surreal world of unalloyed joy and pleasure.

FACULTY MEMBERS

Prof. Sudhansu Bhusan pati

Dr. Srikant kumar Das

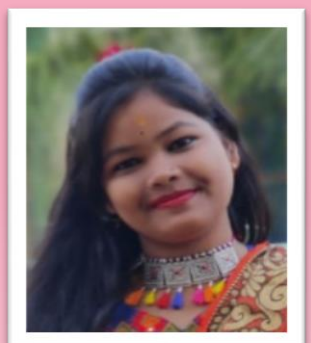
Prof. Sweekruti Panda

Prof. Subrat Kumar Panda

Dr. Sujit Kumar Panda

STUDENT MEMBERS

Ashutosh Mishra (4th yr)



Truptimayee Nayak(4th yr)

Prasad Maharana(3rd yr)

Swetasingdha Panda(3rd yr)

ABOUT DEPARTMENT

The Department of Electrical and Electronics Engineering was established in the year 2007. It aims at producing qualified engineers in the areas of electrical machine, power electronics, control system, power system, and instrumentation. The field of Electrical and electronics is advancing at a very rapid pace. Power electronics has taken the center stage in every area be it power systems, control systems, power quality, etc. The department is well equipped with a group of highly qualified and dynamic teachers. It boasts of laboratory facility to be one of the best in the state. The students are encouraged and motivated to take up challenging projects. Summer training, industrial visit and projects are carefully planned for the students to remain updated with the technology trend. Seminars and short courses are regularly organized to update the students with the latest in the education and industry trends.

VISION AND MISSION OF THE DEARTMENT

VISION

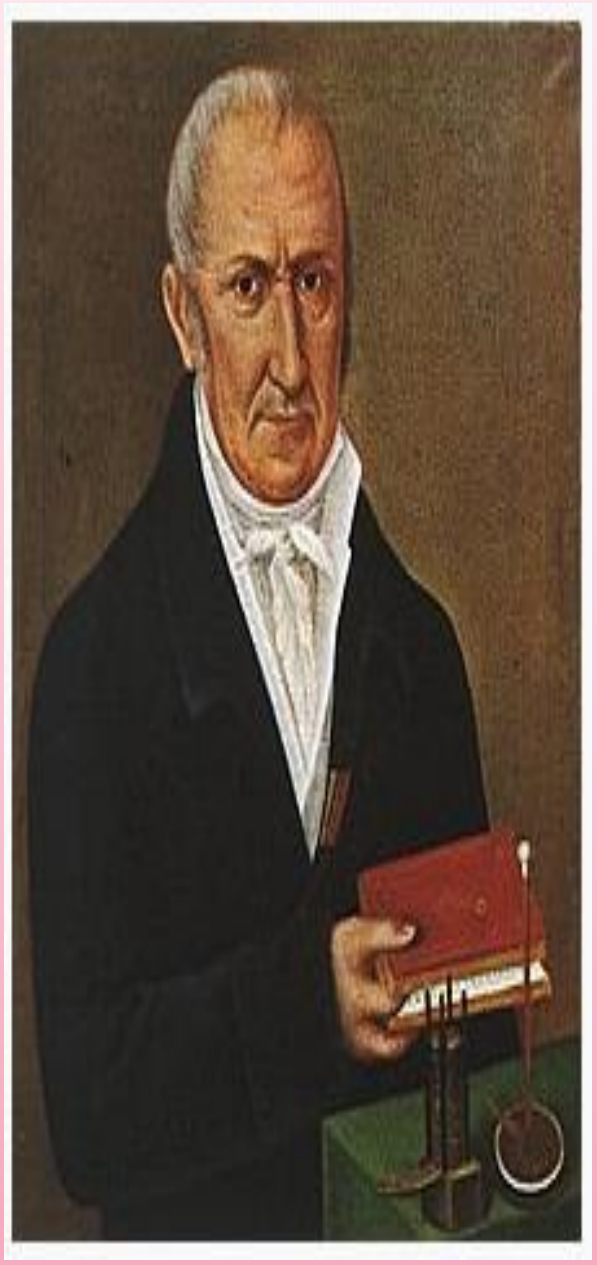
To create a distinctive culture, that could enable students and faculty members collaboratively approach to advance their knowledge about recent advancements in the core domains of electrical and electronic engineering such as power electronic, smart grids, renewable energy etc., and develop effective, implementable and environment friendly solutions towards solving the energy vs. sustainability crisis for present and future society.

MISSION

- To create a culture of research and Innovation through necessary collaboration with the premier institutions to purse career in research.
- To develop a distinctive environment where student, teacher can learn and acquire necessary knowledge and skills through effective collaborations and holistic interactions.
- To create a conducive ambience where students and faculty members can engage themselves for developing effective solutions for recent as well as prominent future challenges in the area of energy generation, transmission and distribution.
- To Generate a Pool of eco-pruners and entrepreneurs with the ability to address the industry and social problems and should be able to provide weight age towards Society and sustainable energy issues

SCIENTIST OF THE QUARTER

Alessandro Volta



Alessandro Giuseppe Antonio Anastasio Volta (Italian: [ales sandro vɔlta]; 18 February 1745 – 5 March 1827) was an Italian physicist, chemist, and pioneer of electricity and power who is credited as the inventor of the electric battery and the discoverer of methane. He invented the Voltaic pile in 1799, and reported the results of his experiments in 1800 in a two-part letter to the President of the Royal Society. With this invention Volta proved that electricity could be generated chemically and debunked the prevalent theory that electricity was generated solely by living beings. Volta's invention sparked a great amount of scientific excitement and led others to conduct similar experiments which eventually led to the development of the field of electrochemistry.

Volta also drew admiration from Napoleon Bonaparte for his invention, and was invited to the Institute of France to demonstrate his invention to the members of the Institute. Volta enjoyed a certain amount of closeness with the emperor throughout his life and he was conferred numerous honors by him. Volta held the chair of experimental physics at the University of Pavia for nearly 40 years and was widely idolized by his students.

Despite his professional success, Volta tended to be a person inclined towards domestic life and this was more apparent in his later years. At this time he tended to live secluded from public life and more for the sake of his family until his eventual death in 1827 from a series of illnesses which began in 1823. The SI unit of electric potential is named in his honor as the volt

Flexible AC Transmission System Controllers

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The electricity supply industry is undergoing a profound transformation worldwide. Market forces, scarcer natural resources, and an ever-increasing demand for electricity are some of the drivers responsible for such unprecedented change. Against this background of rapid evolution, the expansion programs of many utilities are being thwarted by a variety of well-founded, environment, land-use, and regulatory pressures that prevent the licensing and building of new transmission lines and electricity generating plants.

The ability of the transmission system to transmit power becomes impaired by one or more of the following steady state and dynamic limitations:

- **Angular stability,**
- **Voltage magnitude,**
- **Thermal limits,**
- **Transient stability,**
- **Dynamic stability.**

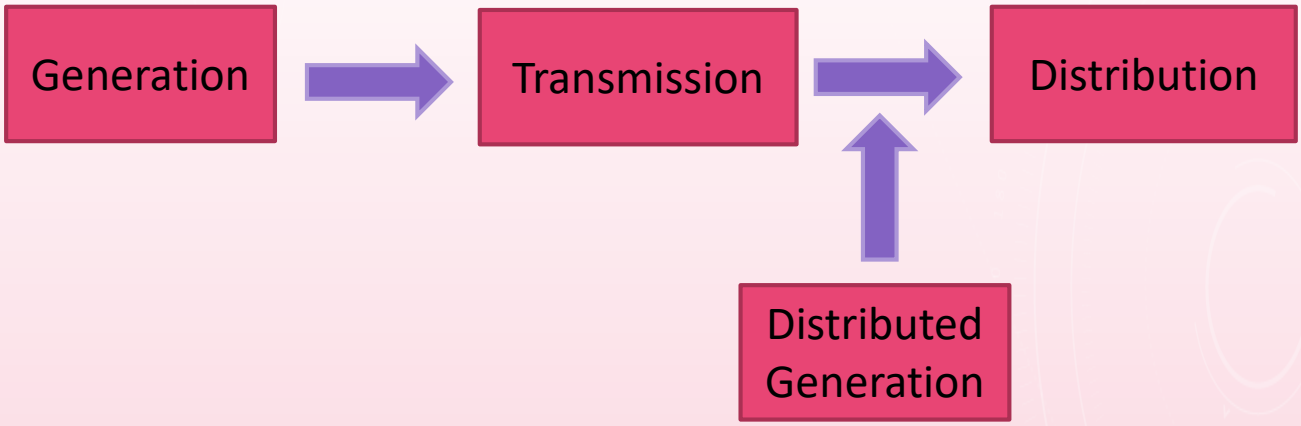
se limits define the maximum electrical power to be transmitted without causing damage to transmission lines and electrical equipment.

POWER SYSTEM CONTROL:

Generation, Transmission, Distribution

Power system consisting of generation, transmission, distribution and consumption of electrical energy can be detached into zones as shown in Figure:

1. Generation
2. Transmission
3. Distribution
4. Distributed Generation



(Block diagram of Generation, Transmission & Distribution)

Power System Constraints

There are many power system constraints and they put a limit over power transfer among areas.

The typical constraints are:

1. Thermal
2. Dynamic Voltage and voltage stability
3. Power System Oscillation Damping
4. Short Circuit Current and Other limitations

Some of the above constraints also influence the transmission system; hence there is a requirement for a solution to use with the transmission lines with highest possible efficiency.

Power system controllability

To improve the performance of a power system there are three key variables that must be controlled. The three main variables are: Voltage, angle and impedance

AC network controllers used to improve the performance of a power system can be classified in two categories, conventional network controller and FACTS controller.

FACTS Controllers Flexible AC Transmission System (FACTS) is defined by as "Alternating current transmission systems incorporating power electronic-based and other static Controllers to enhance controllability and increase power transfer capability." The significance of the power electronics and other static Controllers is that they have high-speed response and there is no limit to the number of operations. Like a transistor leads to a wide variety of processors, power devices such as Thyristor, GTO, and IGBT lead to a variety of FACTS Controllers as well as HVDC converters. These Controllers can dynamically line voltage, active and reactive power flow, and control line impedance. They can absorb or supply reactive power and with storage they can supply and absorb active power as well. Figure below show that there are three types of FACTS Controllers. (a) as injection of voltage in series with the line; (b) as injection of current in shunt and the (c) a combination of voltage injection in series and current injection in shunt. These Controllers have constraint according to the specific type of Controller, its characteristics and rating

Objectives of FACTS controllers

The main objectives of FACTS controllers are the following:

- Regulation of power flows in prescribed transmission routes.
- Secure loading of transmission lines nearer to their thermal limits.
- Prevention of cascading outages by contributing to emergency control.
- Damping of oscillations that can threaten security or limit the usable line capacity

The implementation of the above objectives requires the development of high power compensators and controllers. The technology needed for this is high power electronics with real time operating control. The realization of such an overall system optimization control can be considered as an additional objective of FACTS controllers. FACTS offer solutions to overcome constraints on useable transmission capacity. These constraints may be due to Dynamic conditions like

- Sub synchronous Oscillations
- Dynamic over Voltages and Under Voltages
- Voltage Collapse

Steady State conditions of:

- Undesirable Power Flow
- Excess Reactive Power Flows
- Thermal Limits

Types of FACTS controllers –

(a) Static Synchronous Compensator (STATCOM)

STATCOM is a static synchronous generator operated as a shunt-connected Static VAR Compensator whose capacitive or inductive output current can be controlled independent of the ac system voltage.

(b) Static Var Compensator (SVC)

SVC is a shunt-connected Static VAR Generator or absorber whose output is adjusted to exchange capacitive or inductive current so as to maintain or control specific parameters of the electrical power system (typically bus voltage). SVC is an important FACTS controller already widely in operation. Ratings range from 60 to 600 MVAR

(c) Thyristor Controlled Breaking Reactor (TCR)

`TCBR is a shunt-connected thyristor-switched resistor, which is controlled to aid stabilization of a power system or to minimize power acceleration of a generating unit during a disturbance.

(d) Thyristor Controlled Series Capacitor (TCSC)

TCSC is a capacitive reactance compensator, which consists of a series capacitor bank shunted by a thyristor-controlled reactor in order to provide a smoothly variable series capacitive reactance.

(e) Static Synchronous Series Compensator (SSSC)

SSSC is a static synchronous generator operated without an external electric energy source as a series compensator whose output voltage is in quadrature with, and controllable independently of, the line current for the purpose of increasing or decreasing the overall reactive voltage drop across the line and thereby controlling the transmitted electric power . The SSSC may include transiently rated energy storage or energy absorbing devices to enhance the dynamic behaviour of the power system.

(f) Interline Power Flow Controller (IPFC)

IPFC is a combination of two or more SSSCs that are coupled via a common dc link to facilitate bidirectional flow of real power between the ac terminals of the SSSCs and are controlled to provide independent reactive compensation for the adjustment of real power flow in each line and maintain the desired distribution of reactive power flow among the lines. The IPFC structure may also include a STATCOM, coupled to the IPFC common dc link, to provide shunt reactive compensation and supply or absorb the overall real power deficit of the combined SSSCs.

(g) Thyristor Switched Series Reactor (TSSR)

TSSR is an inductive reactance compensator, which consists of a series reactor shunted by a thyristor controlled reactor to provide a stepwise control of series inductive reactance

(h) Unified Power Flow Controller (UPFC)

UPFC is a combination of STATCOM and a SSSC which are coupled via a common dc link to allow bidirectional flow of real power between the series output terminals of the SSSC and the shunt output terminals of the STATCOM and are controlled to provide concurrent real and reactive series line compensation without an external electric energy source. The UPFC, by means of angularly unconstrained series voltage injection, is able to control the transmission line voltage, impedance, and angle or, alternatively, the real and reactive power flow in the line.

(i) Generalized Unified Power Flow Controller (GUPFC)

GUPFC can effectively control the power system parameters such as bus voltage, and real and reactive power flows in the lines. A simple GUPFC consists of three converters, one connected in shunt and two connected in series with two transmission lines terminating at a common bus in a sub-station . It can control five quantities, i.e., a bus voltage and independent active and reactive power flows in the two lines.

(j) Inter-phase power controller (IPC)

IPC is a series-connected controller of active and reactive power consisting, in each phase, of inductive and capacitive branches subjected to separately phase shifted voltages. The active and reactive power can be set independently by adjusting the phase shifts and/or the branch impedances, using mechanical or electronic switches.

Benefits of FACTS controllers

FACTS controllers enable the transmission owners to obtain one or more of the following benefits:

1. Cost: Due to high capital cost of transmission plant, cost considerations frequently overweigh all other considerations. Compared to alternative methods of solving transmission loading problems, FACTS technology is often the most economic alternative.
2. Control of power flow to follow a contract, meet the utilities own needs, ensure optimum power flow, minimize the emergency conditions, or a combination thereof.
3. Contribute to optimal system operation by reducing power losses and improving voltage profile.
4. Increase the loading capability of the lines to their thermal capabilities, including short term and seasonal.
5. Provide greater flexibility in sitting new generation.
6. Reduce reactive power flows, thus allowing the lines to carry more active power.

So FACT controllers can be utilized to increase the transmission capacity, improve the stability and dynamic behaviour or ensure better quality in modern power systems. Their main capabilities are reactive power compensation, voltage control and power flow control.

Super Conducting Generators

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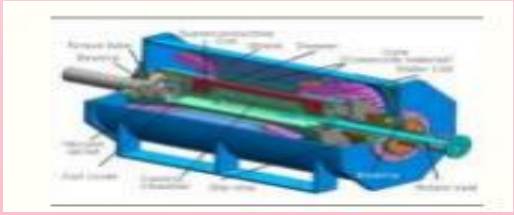
Introduction:-

Superconducting elements are the most important part of electromechanical systems because of their functioning and these systems form the superconducting electric machines. Lack of DC resistance in super conductors contributes much to its greater efficiency. In a super conducting machine very high magnetic field is produced otherwise impossible in a conventional machine and is the main characteristic of super conductors. High magnetic field results in lesser motor volume and ultimately more power density. Cryogenics are highly used in super conductors to maintain a specific temperature which is less than the room temperature up to hundred degrees, super conducting transition temperature (Tc), at which the superconductors reach the zero resistance.



Superconducting AC synchronous electric machines which include alternators and synchronous motors have become more common nowadays than before. The rotor or the rotating member of the machines has an electromagnetic field winding on itself for direct current which employs superconductors. The stationary member or stator of the machines however utilizes the same old conductors constituting of copper conductors which undergo normal conduction. An attempt to reduce the resistive loss of the stator conductors they are cooled but the loss is not permanently removed.

Principle

The working principle previously used in old electric generators which included synchronous permanent magnet generators or motors and the induction machines is also being used nowadays in the superconducting generators. The only difference between the two is the windings of the superconducting generator. These windings are able to support a more powerful magnetic field as compared to that of conventional generators. Using this coil in other various rotating machines will also improve their efficiency; make them more compact and eco-friendly. The superconducting generators have a coil cover for the coil to support it when under centrifugal force and a damper for protection against high frequency magnetic field.

A cooling chamber to maintain ultra-low temperature is also present along with a rotary seal which is a rotary room to provide the cryogenic coolant from. The core is made of non-magnetic stator core plus a stator coil made of copper. The current is applied to the super conducting coil, made of superconducting material, through the slip ring.

Three insulations are also present, first is the shield to protect the release of magnetic field to the surrounding, second is the vacuum jacket which forms the vacuum insulation layer and last is the torque tube which is the insulating structure.

Industrial Revolution in Energy

Superconductivity technology is not without benefits and its scope and ability is now much understood. The magnetic resonance imaging techs in medicine and super-colliders or particle physics analysis done in research are a few beneficial outcomes of this technology which clearly are upgrading different areas of our society. The size, cost and efficiency of the production and usage of electricity will also be greatly affected by super conductors.

Comparison between super conductor and conventional tech generators

Cost comparison is done between the generators working on super conducting technology and those working on conventional tech and is shown in the "Superconducting Generator Cost Comparison" chart. The results obtained from the comparison show that the conventional technology costs cheaper when dealing with low power levels. This is so because the cost of copper cable used in the conventional machines is much less than that of the superconducting cable. The cost of superconducting generators also increases because of the use of cryogenics to cool the machine up to a specific temperature while the cooling cost of old generators is much less.

The case is reverse when talking about high power levels. Super conductors become more cost effective at this point because the power per unit of increase becomes more favorable. The break-even point for both generators comes out to be between the ranges of 4-6 MW. It is expected in future that further research and improvement in superconductor production tech and the cooling method through cryogenics will decrease the cost a great deal. The cost utilized for superconducting power generation will also decrease. The break-even point mentioned earlier will also reduce. If it decreases up to 2 MW, competition for superconducting generators will also decrease.

Positive and negative points of superconducting electric machines

First a few of its positive points as compared to conventional tech are being highlighted. The rotor electromagnet is subject to less resistive loss. The size and weight per power capacity is also decreased regardless of the cooling equipment. Some negative points of this machine are as follows: The cooling system has greater cost, size, weight and also complications. Once the superconductors exit their superconductive state the generator at once stops working. Chances for instability of the rotor speed are also greater. Lack of the characteristic damping usually found in conventional generators may cause the synchronous speed of the superconductor generator to fluctuate. Either the motor bearings should be separate from the cold rotor or it should be able to tolerate the decreased temperature. To operate a synchronous machine such as the superconductor generator practically, it is important to have access to electronic control. This electronic control leads to harmonic loss in the super cooled rotor of the generator to great extent. The coils used in the superconducting generators or motors have electric resistance to a zero unlike that of the copper coil used in old generators leading to less loss of electrical resistance and so greater efficiency. As the electrical resistance loss is decreased so the heat produced by the machine is also less. This reduces the size and the quantity of the material used for production. Advanced heat and electric insulation along with cryogenic refrigeration technology is required by the superconducting generators plus motors to maintain the low temperature requirement and the functionality of the superconducting coil.

Leading future market is expected from superconducting generators and motors because of its characteristic high energy efficiency and better resource Utilization ability. It has much resemblance to today's demand of high efficiency and eco-friendly plant.

Eye Tracking

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Introduction:-

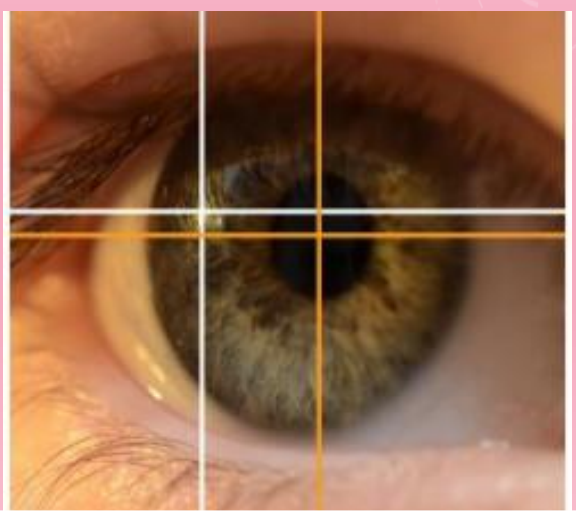
At present human computer interaction has become very important in our daily lives. Smartphone uses fingers as an input source. Eye movements are most frequent of all human movements. Eye movement is fundamental to the operation of visual system therefore the movement of user's eye can provide a convenient and natural source of input.

Eye tracking is the measurement of eye activity. Where do we look? What do we ignore? When do we blink? How does the pupil react to different stimuli?

This involves a process of using sensors to locate features of eyes and estimate where someone is looking.

The process of eye tracking data is collected using either a remote or head-mounted 'eye tracker' connected to a computer. While there are many different types of non-intrusive eye trackers, they generally include two common components: a light source and a camera. The light source (usually infrared) is directed toward the eye. The camera tracks the reflection of the light source along with visible ocular features such as the pupil. This data is used to extrapolate the rotation of the eye and ultimately the direction of gaze. Additional information such as blink frequency and changes in pupil diameter are also detected by the eye tracker. The aggregated data is written to a file that is compatible with eye-tracking analysis software such as Eye Works

Most modern eye trackers utilize near-infrared technology along with a high-resolution camera (or other optical sensor) to track gaze direction. The underlying concept, commonly referred to as Pupil Center Corneal Reflection (PCCR), is actually rather simple. It essentially involves the camera tracking the pupil center, and where light reflects from the cornea. An image of how this looks like is on the right.



The accuracy of eye movement measurement heavily relies on a clear demarcation of the pupil and detection of corneal reflection.

The visible spectrum is likely to generate uncontrolled specular reflection, while illuminating the eye with infrared light - which is not perceivable by the human eye - renders the demarcation of the pupil and the iris an easy task – while the light directly enters the pupil, it just reflects from the iris. This means that a clear reflection is generated (with little noise) and can therefore be followed with ease.

Pupil Centre Corneal Reflection (PCCR). The light reflecting from the cornea and the Centre of the pupil are used to inform the eye tracker about the movement and direction of the eye. Near-infrared light is directed toward the center of the eyes (the pupils) causing visible reflections in the cornea (the outer-most optical element of the eye), which are tracked by a camera.

Here are 8 applications of Eye Tracking that are being used today:

1. Website Usability Testing- Computers have become a primary source of information; therefore, it is critical that users be able to easily locate and comprehend information on a user interface. Eye tracking is often used by Web designers and Usability Specialists to identify which elements of websites function as intended and which need to be revised.
2. Advertising and Marketing Research- Another growing application for eye tracking is in the marketing industry. Advertisers are evaluating the effectiveness of their campaigns, using eye tracking to determine if customers are noticing the key elements in a product placement, commercial, or print ad.
3. Assistive Technology- both wearable and monitor mounted eye trackers are being used by disabled individuals for communication and computer control. With most of these products, eye tracking permits eye movement to replace the traditional keyboard and handheld mouse.
4. Digital and Operational Training Scenarios- Eye tracking is used in different types of simulators, including driving, flight, and even operating room, to track the eye movements of trainees as they perform tasks. Military and law enforcement agencies have also used eye tracking in the field.
5. Human Behavior- One of the most common applications of eye tracking in research is studying patterns of eye movements and their correlation with different behaviors. There is much to be discovered about how visual behavior relates to cognition and decision-making.
6. Developmental Psychology- Infants communicate and take in information about their world through their eyes before they can speak. Eye tracking can get an up close look at how babies perceive their surroundings and how visual behavior impacts their development.
7. Human Factors Research- Eye tracking is often used to monitor and research how people interact with their environment, particularly with respect to equipment and machinery. Human factors research seeks to improve efficiency, operational performance, and safety, as humans engage with their technical and environmental surroundings.

8. Neuroscience and Diagnostics- It has been discovered that certain oculometrics, only traceable with eye tracking, could be potential indicators of neurological conditions. Research is being conducted to determine if eye tracking may be an accurate tool for identifying signs of Traumatic Brain Injury, autism, and ADD.

Eye tracking is no longer a niche technology used by specialized research laboratories or a few select user groups but actively exploited in a wide variety of disciplines and application areas. It is becoming an increasingly interesting option even in traditional computing. Major technology companies and the gaming industry are starting to show growing interest in embedding eye tracking in their future products, such as laptops and tablets.

Eye Tracking Devices:- There are two types of eye tracker:

(I). Screen-based (also called remote or desktop)

(II). Glasses (also called mobile).

Screen-based (also called remote or desktop)

- Record eye movements at a distance (nothing to attach to the respondent)
- Mounted below or placed close to a computer or screen
- Respondent is seated in front of the eye tracker.
- Recommended for observations of any screen based stimulus material in lab settings such as pictures, videos, websites, offline stimuli (magazines, physical products etc.), and other small settings (small shelf studies etc.)

Glasses (also called mobile).

- Records eye activity from a close range.
- Mounted onto lightweight eyeglass frames.
- Respondent is able to walk around freely. Recommended for observations of objects and task performance in any real-life or virtual environments (usability studies, product testing etc.)

Limitations Of Eye Tracking:-

motion is tightly linked to visual attention. As a matter of fact, you just can‘t move your eyes without moving attention. You can however certainly shift attention without moving your eyes. While eye tracking can tell us what people look at and what they see, it can’t tell us what people perceive.

Eye tracking gives incredible insights into where we direct our eye movements at a certain time and how those movements are modulated by visual attention and stimulus features (size, brightness, color, and location).

Robotic Motors or Special Motors

The huge majority of **robots** uses electric **motors**. Repeatedly brushless and brushed DC **motors** are used in portable **robots** and AC **motors** are used in industrial **robots**. These **motors** are preferred in systems with lighter loads, and where the predominant form of motion is rotational

Motor selection is the least understood concept for robotics hobbyists which require strategizing and serious analysis. It involves in determining robot speed, acceleration, torque requirements based on robot weight, wheel size and application where it is to be implemented. There are many types of motors are available in today's market, but mostly Tiny pager motors, servo motors, linear motors, stepper motors and DC geared motors are used in industrial robots according to their application area.

Improper selection of motor end up with a handicapped robot so what type of motor is best and suited to make industrial robots real, accurate and sufficient to meet all industrial process needs while keeping all realistic specifications in mind? Here we gathered some insights of these motor from industrial professionals for choosing corresponding motor to be selected for industrial applications.

We encourage you to follow the opinions of experts which aim to provide best motors for industrial robotics with available DC, stepper, brushless and servo motors for precise, cost effective and reliable movements of robot.

ABHISEK PATTANAIK
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Paper battery

A **paper battery** is engineered to use a spacer formed largely of cellulose (the major constituent of paper). It incorporates [nanoscopic scale] structures to act as high surface-area electrodes to improve conductivity.

In addition to being unusually thin, paper batteries are flexible and environmentally-friendly, allowing integration into a wide range of products. Their functioning is similar to conventional chemical batteries with the important difference that they are non-corrosive and do not require extensive housing.

Electrochemical batteries can be modified to integrate the use of paper. An electrochemical battery typically uses two metals, separated into two chambers and connected by a bridge or a membrane which permits the exchange of electrons between the two metals, thereby producing energy. Paper can be integrated into electrochemical batteries by depositing the electrode onto the paper and by using paper to contain the fluid used to activate the battery. Paper that has been patterned can also be used in electrochemical batteries. This is done to make the battery more compatible with paper electronics. These batteries tend to produce low voltage and operate for short periods of time, but they can be connected in series to increase their output and capacity. Paper batteries of this type can be activated with bodily fluids which makes them very useful in the healthcare field such as single-use medical devices or tests for specific diseases.[3] A battery of this type has been developed with a longer life to power point of care devices for the healthcare industry. The device used a paper battery made using a magnesium foil anode and a silver cathode has been used to detect diseases in patients such as kidney cancer, liver cancer, and osteoplastic bone cancer. The paper was patterned using wax printing and is able to be easily disposed of. Furthermore, this battery was developed at a low cost and has other practical application.

ANKITA KUMARI SAHU
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Smart Note Taker

The Smart Note Taker is such a helpful product that satisfies the needs of the people in today's technologic and fast life. This product can be used in many ways. The Smart Note Taker provides taking fast and easy notes to people who are busy one's self with something. With the help of Smart Note Taker, people will be able to write notes on the air, while being busy with their work. The written note will be stored on the memory chip of the pen, and will be able to read in digital medium after the job has done. This will save time and facilitate life.

The Smart Note Taker is good and helpful for blinds that think and write freely. Another place, where our product can play an important role, is where two people talks on the phone. The subscribers are apart from each other while their talk and they may want to use figures or texts to understand themselves better. It's also useful especially for instructors in resonations. The instructors may not want to present the lecture in front of the board. The drawn figure can be processed and directly sent to the server computer in the room.

The server computer then can broadcast the drawn shape through network to all of the computers which are present in the room. By this way, the lectures are aimed to be more efficient and fun. This product will be simple but powerful. The product will be able to sense 3D shapes and motions that user tries to draw. The sensed information will be processed and transferred to the memory chip and then will be monitored on the display device. The drawn shape then can be broadcasted to the network or sent to a mobile device. There will be an additional feature of the product which will monitor the notes, which were taken before, on the application program used in the computer.

This application program can be a word document or an image file. Then, the sensed figures that were drawn onto the air will be recognized and by the help of the software program we will write, the desired character will be printed in the word document. If the application program is a paint related program, then the most similar shape will be chosen by the program and then will be printed on the screen.

ADARSH MOHANTY
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Mobile train radio Communication

Each mobile uses a separate, **temporary radio channel** to talk to the cell site. The cell site talks to many mobiles at once, using one channel per mobile. **Channels use a pair of frequencies** for communication. One for transmitting from the cell site, **the forward link**, and one frequency for the cell site to receive calls from the users, **the reverse link.** Communication between mobile units can be either **half-duplex** or **full-duplex.** In case of **half-duplex**, transmit and receive communications between the mobile units are not at the same time, i.e. talking and listening can not be done at the same time. In case of full-duplex communication, transmit and receive communication is at the same time, i.e. one can talk and listen at the same time. When communications between mobile units are **within a cell**, and if the same is **half-duplex**, then it shall require only **one pair of frequency.** If the same is **full-duplex**, then requirement of **frequency pair shall be two**. When a mobile unit is communicating with a mobile unit **outside the cell,** then the requirement of frequency pair shall be **one per cell** for both **half-duplex** and **full-duplex** communication. Hence the system resources are utilized more if the mobile units communicate with each other in full-duplex mode.

SUPRIYA DAS
1701298061

Smart antennas

Smart antennas (also known as adaptive array antennas, digital antenna arrays, multiple antennas and, recently, MIMO) are antenna arrays with smart signal processing algorithms used to identify spatial signal signatures such as the direction of arrival (DOA) of the signal, and use them to calculate beamforming vectors which are used to track and locate the antenna beam on the mobile/target. Smart antennas should not be confused with reconfigurable antennas, which have similar capabilities but are single element antennas and not antenna arrays.

Smart antenna techniques are used notably in acoustic signal processing, track and scan radar, radio astronomy and radio telescopes, and mostly in cellular systems like W-CDMA, UMTS, and LTE.

Smart antennas have many functions: DOA estimation, beamforming, interference nulling, and constant modulus preservation..

SOUMIN KUMAR PATEL
1701298368

Advancements in Inverter Technology

An inverter is simply an electronic device that converts low voltage DC battery power 230 volts AC electrical power. They are used in applications ranging from microwaves, laptops to satellite systems X-ray machines etc. Most industrial applications require high frequency high voltage power supply. These increased power requirements have lead to significant development in inverted technology. An inverter is an electrical device that converts direct current to alternating current; the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching control circuits. The inverter performs the opposite function of a rectifier.

From the late nineteenth century through the middle of the twentieth century, DC to AC power conversion was accomplished using rotary converters or motor-generator sets. In the early twentieth century, vacuum tubes and gas filled tubes began to be used as switches in inverter circuits. The most widely used type of tube was the thyratron. The origins of electromechanical inverters explain the source of the term inverter. Early AC to DC converters used an induction or synchronous AC motor directly connected to a generator so that the generator's commutator reversed its connections at exactly the right moments to produce DC. Inverters can be used in a number of applications. The use can vary from small applications in a personal computer to large industrial complexes which require bulk power. An inverter is basically a logic gate that converts input into output and both of them are in opposite state. It implies that if input is false then output is true and vice versa.

SUSIL KUMAR BEHERA
1701298135

surveillance-camera

Surveillance cameras are video cameras used for the purpose of observing an area. They are often connected to a recording device or IP network, and may be watched by a security guard or law enforcement officer. Cameras and recording equipment used to be relatively expensive and required human personnel to monitor camera footage, but analysis of footage has been made easier by automated software that organizes digital video footage into a searchable database, and by video analysis software (such as VIRAT and Human ID). The amount of footage is also drastically reduced by motion sensors which only record when motion is detected. With cheaper production techniques, surveillance cameras are simple and inexpensive enough to be used in home security systems, and for everyday surveillance.

As of 2016, there are about 350 million surveillance cameras worldwide. About 65% of these cameras are installed in Asia. The growth of CCTV has been slowing in recent years. In 2018, China was reported to have a huge surveillance network of over 170 million CCTV cameras with 400 million new cameras expected to be installed in the next three years, many of which use facial recognition technology.

SUBHRAJIT SUBUDHI
1701298336

Biometric Voting Machine

It has always been an arduous task for the election commission to conduct free and fair polls in our country, the largest democracy in the world. Cores of rupees have been spent on this to make sure that the elections are riot free. But, now- a -days it has become common for some forces to indulge in rigging which may eventually lead to a result contrary to the actual verdict given by the people. This paper aims to present a new voting system employing biometrics in order to avoid rigging and to enhance the accuracy and speed of the process. The system uses thumb impression for voter identification as we know that the thumb impression of every human being has a unique pattern. Thus it would have an edge over the present day voting systems.

As a pre-poll procedure, a database consisting of the thumb impressions of all the eligible voters in a constituency is created. During elections, the thumb impression of a voter is entered as input to the system. This is then compared with the available records in the database. If the particular pattern matches with any one in the available record, access to cast a vote is granted. But in case the pattern doesn't match with the records of the database or in case of repetition, access to cast a vote is denied or the vote gets rejected. Also the police station nearby to the election poll booth is informed about the identity of the imposter. All the voting machines are connected in a network, through which data transfer takes place to the main host. The result is instantaneous and counting is done finally at the main host itself. The overall cost for conducting elections gets reduced and so does the maintenance cost of the systems.

Biometrics is the term given to the use of biological traits or behavioral characteristics to identify an individual. The traits may be fingerprints, hand geometry, facial geometry, retina patterns, voice recognition, and handwriting recognition. In this paper we have used thumb impression for the purpose of voter identification or authentication. As the thumb impression of every individual is unique, it helps in maximizing the accuracy. A database is created containing the thumb impressions of all the voters in the constituency. Illegal votes and repetition of votes is checked for in this system. Hence if this system is employed the elections would be fair and free from rigging. Thanks to this system that conducting elections would no longer be a tedious and expensive job.

SANKET PADHI
1701298010

Sensor technology.

a **sensor** is a device, module, machine, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. With advances in micro machinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement, for example into MARG sensors. Moreover, analog sensors such as potentiometers and force-sensing resistors are still widely used. Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life. There are a wide range of other sensors, measuring chemical & physical properties of materials. A few examples include optical sensors for Refractive index measurement, vibrational sensors for fluid viscosity measurement and electro-chemical sensor for monitoring pH of fluids.

A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C (it is basically the slope dy/dx assuming a linear characteristic). Some sensors can also affect what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors are usually designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages.

ABINASH SENAPATI
1801298014

Solar power

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaics (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect.

Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale photovoltaic power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun. The current largest photovoltaic power station in the world is the Pavagada Solar Park, Karnataka, India with a generation capacity of 2050 MW.

The International Energy Agency projected in 2014 that under its "high renewables" scenario, by 2050, solar photovoltaics and concentrated solar power would contribute about 16 and 11 percent, respectively, of the worldwide electricity consumption, and solar would be the world's largest source of electricity. Most solar installations would be in China and India. In 2017, solar power provided 1.7% of total worldwide electricity production, growing 35% from the previous year. As of 2018, the unsubsidized levelised cost of electricity for utility-scale solar power is around $43/MWh

ABHISEK DHAL
1801298008

SEMINAR & WORKSHOPS ORGANISED BY EEE

(SEMINAR ON "ENERGY MANAGEMENT")

(WORKSHOP ON "POWERSYSTEM")

MESSAGE FROM STUDENT

Working for the college magazine as an in -charge was a wonderful experience as it allowed me to expose some awesome hidden talent of the students . It was overwhelming to see how creative the minds of these medicos can be and to see that despite of being so occupied in their lives, they have kept their inner artists ,photographers. I would like to thank Dr. Srikanta Kumar Dash sir for supporting us and guiding us throughout the process of making our college magazine ''E-Vidyut'' . I would also like to thank Prof. Sudhansu Bhusana Pati sir for being such an important part of this magazine . And thanks to my batch mates and all those who made this magazine special by sending us their articles and making it a successful.

Remember that you are responsible for the talent that has been entrusted to you. I feel really blessed to be able to present some boorish talent out through this magazine

Kisan Mahapatro

STUDENT ACHIEVEMENT

Sl.No.	Name of the Student	Year of Study	Date/Place of Event	Event	Achievement
01	Shreehari Sahoo	2018-2022	GIFT,BBSR	Annual Day Event-Lelihan 2019	2ND PRIZE IN Mano Action
02	Dular Gope	2016-2020	GIFT,BBSR	Annual Day Event-Lelihan 2019	1st Prize in Quiz
03	Sushil Kumar	2016-2020	GIFT,BBSR	Annual Day Event-Lelihan 2019	2nd Prize in Quiz
04	Sujan Mandal	2016-2020	GIFT,BBSR	Annual Day Event-Lelihan 2019	1st Prize in Guitar
05	Tanmay Kumar Mallick	2018-2022	GIFT,BBSR	Annual Day Event-Lelihan 2019	3rd prize in Painting
06	Chinmaya Kumar Nayak	2018-2022	GIFT,BBSR	Annual Day Event-Lelihan 2019	2nd prize in painting
07	Ritik Roshan Das	2017-2021	GIFT,BBSR	Annual Day Event-Lelihan 2019	2nd Prize in Duet Song
08	Ritesh Borah	2016-2020	GIFT,BBSR	Annual Day Event-Lelihan 2019	1st Prize in Duet Song
09	Prasad maharana	2017-2021	16.03.2018, IIT kharagpur	IOT`	Consolation prize
10	Kisan Mahapatro	2017-2021	16.03.2018, IIT kharagpur	IOT`	Consolation prize
11	Subhrajit Subudhi	2017-2021	16.03.2018, IIT kharagpur	IOT`	Consolation prize
12	Prasad Maharana	2017-2021	19.10.2019 IIT, BOMBAY	IOT	Consolation prize
13	Kisan Mahapatro	2017-2021	19.10.2019 IIT, BOMBAY	IOT	Consolation prize

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