ASANSOL INSTITUTE OF ENGINEERING AND MANAGEMENT - POLYTECHNIC

ANNUAL TECHNICAL MAGAZINE

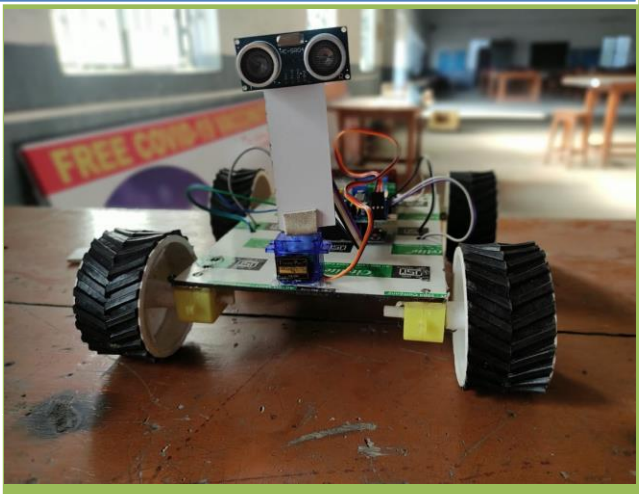
SPARKLE' 2022

APPROVED BY AICTE **** AFFILIATED TO WBSCT & VE & SD

2022-23

Asansol Institute of Engineering and Management-Polytechnic

Technical Magazine “Sparkle 2022”



Vision

AIEMP is driven to provide excellent educational opportunities that are responsive to the needs of our students, and empower them to meet and exceed challenges as active participants in shaping the future of our world and also to meet the growing technological & socioeconomic needs of our nation.

Mission

- Improvement of fundamental skills in Maths, Science, English and basic engineering for the students.
- Provide our faculty necessary opportunity to attend FDP.
- To arrange training for the students in industry to develop their industry orientation and make them industry ready and also provide them necessary in house orientation for higher studies.
- Imbibing values, ethics, character, courage and patriotism in the teaching learning to help students blossom as future national leaders.

Message from Director

I am gratified to know that the **Asansol Institute of Engineering & Management-Polytechnic, Asansol** is bringing out the First issue of their **Technical Magazine** namely **"Sparkle'2022"** of this academic year (2022-2023). This is a very productive technical material and subsidiary skill developing tool for the students. I wish AIEM-P very big successes in all their ventures.I also applaud the coordination and efforts behind the team to bring out this issue. I wish them all success.

With Best Wishes

H.N Misra
Director
Eastern India Educational Trust

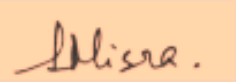
Message from the Principal

"Success is not an accident. It is a hard work, perseverance, learning, studying, sacrifice and most of all, love of what you are doing or learning to do". Pele

It is a matter of great pride and satisfaction for **Asansol Institute of Engineering & Management-Polytechnic, Asansol** to bring out the **Technical Magazine** "SPARKLE-2022", released from the Department of Mechanical Engg, Electrical Engg, Mining Engg, Civil Engg, Computer Science & Technology and Basic Science & Humanities. The College has made tremendous progress in all areas academic, non-academics, capacity building relevant to staff and students. The College is planning to achieve the NBA milestone latest by July'2023.

I am confident that Technical magazine namely "Sparkle'2022 "will send a positive signal to the staff, students and the persons who are interested in the Technical education and Technology based activities. A Technical Magazine is like a mirror which reflects the clear picture of all sorts of activities undertaken by Departments and develops writing skills among students in particular and teaching faculty in general. I congratulate the Editorial Board of this Technical Magazine who have played wonderful role in accomplishing the task in Record time. I express my deep sense of gratitude to Dean Academic, HODs and HOD In-charge under whose guidance this technical work has been undertaken and completed within the stipulated time. Also my heartfelt congratulation to all the academic staff members and students for their fruitful effort.

With Best Wishes



Dr.Lisha Misra
Principal
Asansol Institute of Engineering & Management-Polytechnic

Message from the Dean Academic

"Where there is a will there's a way?"

by George Herbert

Providing ample opportunities in Diploma engineering education is one of the most fundamental obligations we owe to our students because in Asansol Institute of Engineering & Management-Polytechnic (AIEM-P) we are driven by the belief that every student deserves a high quality education.

Sparkle'2022 provides an intersection of great challenge and great opportunity for the students to review their efforts and to analyze their achievements in research and development. Technology is evolving at a dizzying rate and our classrooms may not be designed to keep pace with it. There may be a lot wrong in the style of education but the pages of "SPARKLE'2022" tell the tale of all that have been a part of what is right about the education they get in AIEM-P.

I congratulate the team of students and the faculty for their tireless efforts that have come to fruition in the form of this Technical Magazine-"SPARKLE'2022". I wish it all success and hope that this tradition that has been set by the current students will be carried through by the following generation of students to come. I have no doubts in near future AIEM-P will be termed as one of the leading technical institution in our state.

Tanmoy Singha
Dean Academic
Asansol Institute of Engineering & Management-Polytechnic

Message from the HOD (Computer Science & Technology)

A College Technical magazine “SPARKLE’2022” is an eloquent expression of the progress and outstanding that a college has to its credit. It’s a manual that highlights the quality of education and extra-curriculum that a college undertakes to develops all round personality of the students. I am sure that the students of AIEM-P will be benefitted to a large extent by the content of the Technical Magazine “SPARKLE’2022”.

I heartily congratulate all those who have taken pain to bring out this technical magazine adding glorifying and colorful petals to a wonderful flower called AIEM-P.

Rana Chakraborty
Administrative Officer
Asansol Institute of Engineering & Management-Polytechnic

Message from the HOD (Mining Engg.)

"Our future Success is directly proportional to our ability to understand, adopt and integrate new Technology into our work"

by Sukant Ratnakar

It's my heartfelt good wishes to all associated with the publication of the first ever technical magazine "SPARKLE'2022".Technical magazine is the mirror of technical activity of an institutes to the world. The article in the magazine highlights the emerging trends in Science and Technology. This is very knowledgeable and informative. I am sure that the students will be immensely benefited. Hope this trend will continue in coming years.

Thanks to Mr.Tanmoy Singha, Dean Academic, for his untiring effort to bring out this technical magazine.

My special thanks to our Hon'ble Director Sir and Principal Madam for their continuous inspiration which yielded this beautiful magazine.

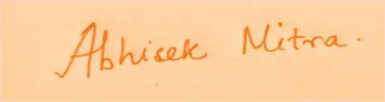
Lastly blessings and thanks to the student for their wonderful articles which really sparked the Sparkle 2022.

Sankha Sarkhel

Dr. Sankha Sarkhel
HOD (Mining Engineering)
Asansol Institute of Engineering and Management-Polytechnic

Message from the HOD In-Charge (Mechanical Engg.)

On behalf of Mechanical engineering department, Asansol Institute of Engineering and Management- Polytechnic, I am pleased to announce the launching of the 1st Volume of Technical Magazine "SPARKLE'2022". This Technical Magazine aims to disseminate information focusing on application of existing technology, practical explanations and developments in latest trends and techniques which will thrive our student's mind-set towards recent technology.

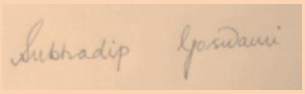


Abhisek Mitra
HOD In-charge (Mechanical Engineering)
Asansol Institute of Engineering and Management- Polytechnic

Message from the HOD In-Charge (Electrical Engg.)

It gives me immense pleasure to be a part of such a good and appreciable technical magazine. A magazine is a reflection of the institute. This is the first time that a technical magazine is getting published and will continue at regular intervals as time surpasses.

The students have extremely worked hard for composing the articles in a jubilant and vibrant manner. Let's hope that this will bring a new light in their future for paving the way towards a better career and it is quite obvious that their works will soon result in flying colours...



Subhadip Goswami
HOD In-Charge (EE)
Asansol Institute of Engineering and Management- Polytechnic

Message from the HOD In-Charge (Civil Engg.)

It gives me immense pleasure to express my views on the release of Technical Magazine- "SPARKLE'2022".I feel extremely happy through this Technical Magazine that our students will be definitely encouraged the students towards the recent trend and new technology. Besides, our budding talents have expressed their thoughts, ideas, hopes, feelings, aspirations and convictions in a creative way.

The student's articles contributed for the Technical Magazine has shown their intellectual insight and their excellent command on language. Once again, my message is: "Aim always High", as high as the sky to be good citizens and leaders of our beloved country.

Munmun Roy

HOD In-Charge (Civil Engineering)

Asansol Institute Of Engineering and Management-Polytechnic

Message from the HOD In-Charge (Basic Sci. & Hum)

It gives me great pleasure to know that "SPARKLE'2022", AIEM-P Technical Magazine 2022-2023 is ready for publication. True to its name, this magazine gives an insight into the range and scope of the imagination and creativity of our students and faculty members.

I applaud the editorial team for the hard work and dedication they have invested in realizing this goal, and wish my dear students success in all future endeavors.

Debashis Banerjee
HOD In-Charge (Basic Science & Humanities)
Asansol Institute of Engineering & Management-Polytechnic

Editorial Board Members

Standing (From Left) - Mr. Abhijeet Chatterjee (Lecturer, Mining Engg.), Mr. Manoj Karmakar (Lecturer, BSH), Mr. Arjak Majumder (Lecturer, CST), Mr. Jayanta Das (Lecturer, CE), Mr. Pranabesh Mukhopadhyay.

Sitting (From Left) – Mr. Debasish Banerjee (HOD In-charge, BSH), Dr. Sankha Sarkhel (HOD, Mining Engg.), Mr. Tanmoy Singha (Dean Academic), Dr. Lisha Misra (Principal), Mr. Rana Chakraborty(HOD,CST), Mr. Abhisek Mitra (HOD In-charge ,ME), Mrs. Mummun Roy(HOD In-charge, Civil Engg.).

Chapter-1

Technical Magazine

"SPARKLE-2022"

Mechanical Engineering Department

Name of the Editors:

1. Mr. Abhisek Mitra (HOD in-Charge-ME)

2. Mr. Sourav Bhattacharyya (Lecturer-ME)

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Anti-Lock Braking System (ABS)

Author: Rupam Kumar Das
6th Semester

Stopping a car in a hurry on a slippery road can be very challenging. Anti-lock braking systems (ABS) take a lot of the challenge out of this sometimes-nerve-wracking event. In fact, on slippery surfaces, even professional drivers can't stop as quickly without ABS as an average driver can with ABS.

THE TECHNOLOGY BEHIND IT

Wheel sensors detect when your car's tires begin locking up. Then, they rapidly apply and release (pulse) the brakes to automatically keep your tires from skidding.

THERE ARE FOUR MAIN COMPONENTS TO AN ABS SYSTEM:

- Speed sensor
- Brake caliper's
- Pump
- Valves
- Controller

ADVANTAGES

- With the use of ABS stops the car at a shorter distance than the conventional brakes.
- Prevents the wheels from locking up hence avoids uneven tyre wear.
- Increases control.
- Enables the possibility of a traction control system.

DISADVANTAGES

- Inconsistent stopping distances on various surfaces under variable conditions.
- Under generally poor road conditions, ABS braking increases stopping distance.E
- Experienced drivers can often brake better manually than with ABS brakes.
- More expensive to repair and maintain.

Automated Drain & Gutter Cleaner Project

Author: Ranit Dutta, Manish Ranjan, Sufiyan Faizi
3rd Semester

Introduction

Cleaning of drains/gutters has always been a problem. Labors cleaning gutters & drain seems unethical and also leads to a high risk of them catching infections or poisoning due to large amounts of waste/chemicals in them. Also throwing of bottles/plastics and other such objects into the gutters lead to narrowing and eventually blockage in gutter flow. This leads to overflow in many cases. So here we provide a fully automated drain gutter cleaning mechanism to tackle these modern day gutter jamming issues. Our system uses an automated gutter/drain cleaning system that lets fluids flow through it but catches large solid waste like bottles & plastic and accumulates it. So gutter cleaners need to just clean these gutter cleaning systems installed at points instead of cleaning entire gutter floors. Our system consists of metal teeth based jaws that wait at the bottom of the mechanism. It is mounted in a frame to hold the system upright in the gutter. The vertical frame bed is used to let liquid flow but catch all solid waste. The mechanism consists of a filter basket on top of it. After particular time intervals the jaw lifts up using a motorized shaft which is connected using a chain to the jaws. It then reaches the top and turns upside down to dump the solid waste. Now after dumping the waste, the motor rotates again to bring the jaw again to the bottom position to collect more waste. The system is a very efficient way to cleaning gutters & drains and also requires very low power since it will only rotate once or twice a day to dump the solid waste.

Parts:-

1. DC Motor	2. Collector Jaw	3. Frame Bed
4. Mounts	5. Chain	6. Sprockets
7. Couplings	8. Shaft	9.Collector Bin
10. Joints & Mounts	11. Screws & Bolts	

Advantages:-

1. Automated Cleaning 2. Automatic Waste Collection 3. Low Power Consumption.

Bio-Bioethanol Production from Renewable raw Materials

Author: Gourab Dutta, Apurba Kar, Arindam Mondal, Ashraf Rahman

3rd Semester

Production of bio-fuels from renewable feedstocks has captured considerable scientific attention since they could be used to supply energy and alternative fuels. Bioethanol is one of the most interesting bio-fuels due to its positive impact on the environment. Currently, it is mostly produced from sugar- and starch-containing raw materials. However, various available types of lignocellulosic biomass such as agricultural and forestry residues and herbaceous energy crops could serve as feedstocks for the production of bio-ethanol, energy, heat and value-added chemicals. Lignocellulose is a complex mixture of carbohydrates that needs an efficient pretreatment to make accessible pathways to enzymes for the production of fermentable sugars, which after hydrolysis are fermented into ethanol. Despite technical and economic difficulties, renewable lignocellulosic raw materials represent low-cost feedstock's that do not compete with the food and feed chain, thereby stimulating the sustainability. Different bioprocess operational modes were developed for bio-ethanol production from renewable raw materials. Furthermore, alternative bio-ethanol separation and purification processes have also been intensively developed. This paper deals with recent trends in the bio-ethanol production as a fuel from different renewable raw materials as well as with its separation and purification processes.

Sugar cane is less expensive than other raw materials used for bio-ethanol production due to easier processing and higher productivity.

Molasses, a main byproduct of the sugar industry, Total residual sugars in molasses can amount to 50–60% (m/V), of which about 60% is sucrose, which makes this substrate suitable for large-scale bio-ethanol production.

Industry 4.0

Author: Amit Prasad, Ronit Goswami, Rohan Kumar Shaw
3rd Semester

Industry 4.0 also known as "Fourth Industrial Revolution" is the digital transformation of manufacturing/production and related industries and value creation processes.

Industry 4.0 has been defined as "a name for the current trend of automation and data exchange in manufacturing technologies, including cyber-physical systems, the Internet of things, cloud computing and cognitive computing and creating the smart factory". The goal is to enable autonomous decision-making processes, monitor assets and processes in real-time, and enables equally real-time connected value creation networks through early involvement of stakeholders, and vertical and horizontal integration.

Key themes

Four themes are presented that summarize an Industry 4.0:

- Interconnection — the ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of things, or the internet of people (IoP)
- Information transparency — the transparency afforded by Industry 4.0 technology provides operators with comprehensive information to make decisions. Inter-connectivity allows operators to collect immense amounts of data and information from all points in the manufacturing process.
- Technical assistance — the technological facility of systems to assist humans in decision-making and problem-solving, and the ability to help humans with difficult or unsafe tasks
- Decentralized decisions — the ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomously as possible. Only in the case of exceptions, interference, or conflicting goals, is tasks delegated to a higher level.

The application of the Fourth Industrial Revolution operates through:

- Mobile devices
- Internet of things (IoT) platforms
- Location detection technologies (electronic identification)
- Advanced human-machine interfaces, smart sensors
- Augmented reality/ wearables.

Chapter-2

Technical Magazine

"SPARKLE-2022"

Electrical Engineering Department

Name of the Editors:

1. Mr. Subhadip Goswami (HOD in-Charge- EE)

2. Mr. Pranabesh Mukhopadhyay (Lecturer-EE)

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Renewable Energy

Author: Parthasarathi Dutta
6thSem

Renewable energy is derived from natural resources that are renewed on a regular basis. The sun, wind, water, earth's heat, and vegetation are all examples of natural phenomena. Renewable energy technologies convert these fuels into usable forms of energy, such as electricity, heat, and chemicals.

Today, fossil fuels are mostly used to heat and power our houses, as well as to fuel our automobiles. Coal, oil, and natural gas are convenient for providing our energy demands, but there is a finite quantity of these fuels on the planet. We are utilising them at a far faster rate than they are being produced, and they will soon run out. By 2020, the United States will have used much of its nuclear capacity due to safety concerns and waste disposal issues. Renewable energy has the potential to fill the void left by fossil fuels. Renewable energy is better for the environment even if we had a limitless supply of fossil resources. Renewable energy is sometimes referred to as "clean" and "green" since it produces minimal pollutants. However, burning fossil fuels releases greenhouse gases into the atmosphere, which trap heat from the sun and contribute to global warming. Climate experts believe that the earth's surface temperature has increased during the last century. If this trend continues, sea levels will rise, and floods, heat waves, draughts, and other extreme weather events will become more common, according to experts. When fossil fuels are burnt, other contaminants are emitted into the air, land, and water. Pollution in the air contributes to ailments such as asthma. Plants and fish are harmed by acid rain caused by sulphur dioxide (SO_2) and nitrogen dioxide (NO_2). Smog is also caused by nitrogen oxides. Renewable energy is abundant, and technology is always improving. Renewable energy may be used in a variety of ways. A few of these are mentioned farther down.

Hydropower is our most established and largest renewable energy or power source. About 12% to 15% of our country's power is generated here. Hydropower capacity now stands at over 46000 megawatts. The energy in flowing water is converted into electricity in hydropower facilities. Hydropower facilities do not emit any pollutants into the atmosphere, but they do have an impact on water quality. The "Koyna Hydroelectric Project" in Maharashtra state is India's largest hydroelectric power plant or project. It has a total capacity of between 1920 and 1960 megawatts.

Solar technologies tap directly into the sun's unlimited power and utilise it to generate heat, light, and electricity. Photovoltaic technology, sometimes known as solar power, turns sunlight directly into electricity. Solar energy has long been a popular source of power for spacecraft. For decades, it has been used to power tiny devices as well as rural and agricultural uses. Although there are many different types of solar electric systems available today, they all have three fundamental components. First, there's the solar module or solar panel, which transforms

sunlight into electricity or energy. Second, an inverter circuit transforms direct current to alternating current, which may be utilised by most domestic applications, as well as batteries to store surplus power generated by the system. The remaining components of the system include wire, circuit breakers, and support structures. By 2021, India will have a solar power capacity of 40085 megawatts. According to a data provided by the ministry of new renewable energy, Rajasthan has the most solar energy capacity in India, with 7737.95 megawatt (MNRE). The "Bhadla Solar Park" is the world's largest solar power facility or park. It has a 2245 megawatts capacity.

Wireless Electricity

Author: Parthasarathi Dutta
6thSem

The transfer of electrical energy without the need of a cable or physical connection is known as wireless electricity. The creation of a fully operating wireless power transmission system has been pushed by the introduction of wireless charging electric vehicles and the need for greater sustainability. Given the large transmission and distribution losses, it's a fantastic alternative. It would also aid with the transmission of power to remote locations such as highland regions and tribal settlements.

During the late 1800s, famous inventor Nikola Tesla came up with the concept of wireless power. He created the renowned Tesla coil in 1891. It functioned on the theory of electrical resonance and could send electricity across small distances. Tesla kept working on developing an energy station that could conduct high-voltage wireless power transmission as part of his quest to achieve sustainable wireless power transmission. Tesla built a wireless transmission station in Long Island, New York, for this purpose. However, due to a lack of funds, he was forced to abandon the project.

After over a century of trials and investigations, it appears that tesla was on the correct track in his concept of employing Earth resonance instead of cables as a medium for electrical transmission.

Magnetic induction technology is used to transmit electricity wirelessly. With alternating current, two coils are employed, one transmitter coil and one reception coil. A magnetic field is created by the alternating current in the transmitter coil, which generates voltage in the reception coil.

Two types of inductive coupling procedures can be employed for wireless electricity transmission based on the idea of magnetic induction:

1. Standard inductive coupling
2. Inductive coupling with a resonant frequency

For short-distance transmission of electricity, conventional inductive coupling is commonly utilised. The majority of the magnetic flux is not coupled between the coils, resulting in rapid decay and increased power loss.

Some common applications of wireless power transfer include:

1. Solar satellite transmission
2. Microwave power transmission
3. Wireless charging of electric cars

4. LASER transmission
5. Medical applications

Wireless energy has the potential to bring in a new era of IoT, AI, and 5G. It will not only improve our everyday lives, but it will also ensure that everyone has access to power, regardless of where they live. It would also secure the security of electrical energy for small and developing countries. The field of research in this area must continue to progress in order to reach the intended benefits of wireless power.

The Rise of AC Active Rectification

Author: Prince Kumar Singh
6thSem

The AC full bridge rectifier is conventionally used as it is very simple, easy and mass produced. Another important reason to utilise complete bridge rectifiers is that they are accessible in all voltage ranges. The primary issue with the full bridge rectifier is that it generates a lot of heat, which causes power loss, poor power factor, and harmonics in the system. All of the power loss in the system causes it to create heat, and in order to reduce the heat, we employ a fan or radiator in the system, which reduces the overall system efficiency. A major part of the power is used to reduce the heat of the full bridge rectifier only which makes the full bridge rectifier inefficient mainly for the larger system.

The answer is a Full Bridge Active Rectifier. The complete bridge rectifier's diodes are replaced by active silicon switches such as MOSFETs, IGBTs, and so on. When compared to a complete bridge rectifier, the heat dissipation in this arrangement is quite low. In comparison to active silicon switches, diodes have a large internal resistance. When a diode conducts, the voltage drop is greater; however, when diodes are replaced with MOSFETs (or any other active silicon switch), the system provides a low resistance channel when it is activated and a high resistance path when it is not, resulting in a very efficient system. To turn the switches on and off, it requires active control signals. An active control IC can supply the active control signal. The system's efficiency may be increased to 96 percent by using Active Bridge rectification. The efficiency of a complete bridge rectifier is just 87 percent. Another advantage of this AC active rectification is that it can also be used as an inverter. If the control signal's algorithm is changed, the rectification is converted to inversion. It's a crucial piece of equipment for an HVDC converter station.

Crossover Distortion

Author: Simran Verma
3rdSem

Crossover distortion is a form of distortion that occurs when a load is switched across devices. It is most typically used in complementary, or "push-pull," Class-B amplifier stages, although it can also be found in other circuit types. The phrase "crossover" refers to the signal "crossing over" across devices, in this example from the upper to the lower transistor and vice versa. The word has nothing to do with the audio loudspeaker crossover filter, which separates an audio signal into frequency bands in order to drive different drivers in multiway speakers. A typical class-B emitter-follower complementary output stage is shown in the image. The output is exactly halfway between the supplies when there is no signal (i.e., at 0 V). When this happens, both transistors' base-emitter biases are zero, and they are in the cut-off zone, where they are not conducting. Consider the following example of a positive-going swing: The higher NPN transistor will remain off or conduct very little as long as the input is less than the needed forward VBE drop (0.65 V). In terms of the base circuit, this is the same as a diode operation, and the output voltage does not follow the input voltage (the lower PNP transistor is still off because its base-emitter diode is being reverse-biased by the positive-going input). The lower transistor is the same, but with a negative-going input. As a result, between 0.65 V and 0 V, the output voltage is not a true reproduction or magnified version of the input, and this may be seen as a "kink" in the output waveform (or where one transistor stops conducting and the other starts). When the output voltage swing is minimised, this kink is the most prominent kind of crossover distortion, and it becomes more visible and obtrusive. In this circuit, less prominent kinds of distortion can also be seen. The voltage gain of an emitter-follower is little under one. The voltage gains of the NPN emitter-follower and the PNP emitter-follower in the circuit depicted will be very slightly different, resulting in somewhat different gains above and below ground. Other, more subtle types of crossover distortion arise as a result of minor variations between the PNP and NPN devices. Another technique to decrease crossover distortion is to employ feedback, which may be used to lessen most types of distortion. We can greatly minimize distortion by comparing the output to the desired output and modifying the input to account for any errors. This may be done using a discrete circuit or an operational amplifier, as demonstrated below. A push-pull pair's distortion is reduced using an operational amplifier. Op-amps are high-gain differential voltage amplifiers (sometimes modelled as infinite gain). In an ideal model, the op amp's output is remained constant such that both of its inputs are at the same voltage. Because the inverting input is linked directly to the output in this scenario, the voltage at the non-inverting input is always equal to the voltage at the output and inverting input, resulting in no distortion. Distortion is minimised by a factor equal to the gain of the op amp when using a more exact model of an operational amplifier (with non-infinite gain).

Evolution of Traction Systems

Author: Arka Chatterjee
6thSem

For urban and suburban services, electric traction was initially used in Britain in 1890 at 600 V dc utilising third rail. The line rail system using 1,200 V dc was trialled on the Manchester-Bury line to see if it could be used to long-distance main-line operation. Due to inherent flaws in this system of supply, such as insufficient protection offered by the wooden planks and snow blocking up grooves during the winter season, an overhead contact system utilising 1,500 V dc was eventually implemented. Many countries, including our own, still utilise this technique for suburban and main lines. In India, suburban electric traction was initially implemented in Bombay in 1925 and Madras in 1931. Later, it was expanded to include Poona and Igatpuri. The voltage used was 1,500 V dc. Traction motors were previously powered by rotary converter substations at1,500 V dc. Two 750 V rotary converters, each with a capacity of 2,500 kW, were used in sequence for the1,500 V supply. After around 20 years, 3,000 V dc electric traction was implemented on the Howrah—Burdwan and Sheoraphuli-Tarakeshwar branch lines, as there was a general trend towards using3,000 V dc for electric traction at the time. Swiss mountain railroads were the first to use the three-phasesystem, while mainline trains (running at 3,000 V) were the first to use it in 1902. The 3-system has sincebeen developed exclusively for mainline electrification, with the majority of applications in Northern Italy. InSwitzerland, Germany, Austria, and Scandinavia, the single-phase ac system running at low frequency (Hz)has been widely used for suburban and main-line services. In the United States, around 800 kilometres (on thePennsylvania and New Haven lines) are electrified using a single-phase system with a frequency of 25 Hz anda voltage of 1,100 V. In the Belgian Congo, the electrification of the Katanga lines was similarly done using asingle phase 50 Hz system. Hungary created the Kando system (single phase-three phase system) in 1932.According to information acquired from the French National Railways on the relative benefits and demerits of ac and dc systems, the ac system with a commercial frequency of 50 Hz was financially and operationally favourable. For all future plans, the Railway Board agreed in 1957 to use a 25 kV, 50 Hz single phase method of electrification. This approach reduces the cost of overhead equipment, substations, and locomotives significantly. Because of the use of high voltage, the size of the overhead system is decreased, resulting in cost savings for supporting structures and their foundations. Because of the high voltage, traction substations maybe placed further apart.

Homopolar Generator

Author: Raju Kumar
6thSem

A homopolar generator is a DC electrical generator that consists of an electrically conductive disc or cylinder revolving in a plane parallel to a uniform static magnetic field. With an electrical polarity that relies on the direction of rotation and the orientation of the field, a potential difference is formed between the centre of the disc and the rim (or ends of the cylinder). It's also known as a Faraday disc, a unipolar generator, an acyclic generator, or a disc dynamo. The voltage is normally modest, on the order of a few volts in small demonstration models, but big research generators may produce hundreds of volts, and some systems have numerous generators connected in series to achieve much higher voltages. They're unique in that they can generate massive amounts of electric current, up to a million amperes, thanks to the homopolar generator's low internal resistance. In addition, no other rotating electric machine can create DC without the need of rectifiers or commutators, as the homopolar generator can. Michael Faraday created the first homopolar generator during his research in 1831. In his honour, it's known as the Faraday disc or Faraday wheel. It was the birth of modern dynamos, or electrical generators that use a magnetic field to work. It was inefficient and not employed as a practical power source, but it demonstrated the ability to generate electric power using magnetism and paved the way for commutated direct current dynamos and eventually alternating current alternators. Due to current counter flows, the Faraday disc was mostly inefficient. While current flow was produced directly beneath the magnet, current flowed backwards in areas outside of the magnetic field's effect. The power output to the pickup wires is limited by this counter flow, which causes waste heating of the copper disc. Later homopolar generators solved this problem by utilizing an array of magnets positioned around the circle of the disc to maintain a constant field and remove regions where counter flow may occur. Long after the original Faraday disc was abandoned as a viable generator, a modified version was produced that combined the magnet and disc into a single spinning portion. This arrangement is also referred to as a homopolar generator. One of the earliest patents on the general type of homopolar generators was attained by A. F. Delafield, U.S. Patent 278,516. Other early patents for homopolar generators were awarded to S. Z. De Ferranti and C. Batchelor separately. Nikola Tesla was interested in the Faraday disc and conducted work with homopolar generators, and eventually patented an improved version of the device in U.S. Patent 406,968. Tesla's "Dynamo Electric Machine" patent describes an arrangement of two parallel discs with separate, parallel shafts, joined like pulleys by a metallic belt. In the 1950s, homopolar generators saw resurgence as a source of pulsed power storage. Heavy discs were utilized as a flywheel to store mechanical energy that could be swiftly unloaded into experimental equipment in these systems. Sir Mark Oliphant of the Australian National University's Research School of Physical Sciences and Engineering created an early version of this type of apparatus. From 1962 to 1986, it was employed as an exceptionally high-current source for synchrotron testing, storing up to 500 mega joules of energy. The structure built by Oliphant could deliver currents of up to 2 mega amperes (MA).

Phasor Measuring Unit

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A Phasor Measuring Unit (PMU) is a device that uses a common time source for synchronisation to estimate the magnitude and phase angle of an electrical phasor quantity (such as voltage or current) in the electricity grid. GPS or the IEEE 1588 Precision Time Protocol, which provides synchronised real-time measurements at numerous distant places on the grid, generally offers time synchronisation. PMUs can quickly capture samples from a waveform and rebuild the phasor quantity, which is comprised of an angle measurement and a magnitude measurement. A synchrophasor is the measurement that results from it. These time-synchronized data are critical because frequency mismatches can generate grid stress, which can lead to power outages if the system's supply and demand are not exactly balanced. PMUs can also be used to monitor the power grid's frequency. A typical commercial PMU may report data with up to 120 measurements per second temporal resolution. This allows engineers to analyse dynamic grid events, which is impossible to do with typical SCADA data, which produce one measurement every 2 or 4 seconds. PMUs are one of the most essential measuring devices in the future of power systems because they provide utilities with better monitoring and control capabilities. A PMU might be a standalone device, or it can be included into a protective relay or other device. Charles Proteus Steinmetz submitted a paper in 1893 on a simpler mathematical explanation of alternating current electrical waveforms. Steinmetz referred to his model as a phasor. Dr. Arun G. Phadke and Dr. James S. Thorp of Virginia Tech invented phasor measurement units (PMU) in 1988, and Steinmetz's phasor calculation technique evolved into the calculation of real-time phasor measurements that are synchronised to an absolute time reference provided by the Global Positioning System. Synchrophasors are the name given to synchronised phasor measurements. The PMU was originally prototyped at Virginia Tech, and the first PMU (model 1690) was constructed by Macrodyne in 1992. They are now commercially accessible. More observability and control technologies will be required to correctly monitor power flow as the number of distributed energy resources on the power grid grows. Electricity has always been distributed to clients in a unidirectional form through passive components, but now that customers may create their own power using technologies like solar PV, the distribution system is becoming bidirectional. With this shift, modern sensor technologies, such as ––PMUs and uPMUs, must be used to continually monitor transmission and distribution networks. In simple words, a power company's public electric grid was built to collect power from a single source: the operating company's generators and power plants, and feed it into the grid, where it is consumed by consumers.

Resonant Inductive Coupling

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The phenomenon of resonant inductive coupling, also known as magnetic phase synchronous coupling, occurs when the "secondary" (load-bearing) side of a weakly coupled coil resonates, causing the coupling to become stronger. This sort of resonant transformer is frequently used as a band pass filter in analogue circuits. Wireless power systems for portable computers, phones, and automobiles also employ resonant inductive coupling. Several resonant coupling technologies are in use or being developed for short-range (up to 2 metres) wireless energy systems to power laptops, tablets, smart phones, robot vacuums, implanted medical devices, and vehicles such as electric automobiles, Maglev trains, and autonomous guided vehicles. Passive RFID tags (for example, in a passport) and contactless smart cards are examples of data transfer. A CCFL inverter's resonant transformer powers a cold-cathode fluorescent bulb. Connect the stages of a super heterodyne receiver, with tuned transformers in the intermediate-frequency amplifiers providing the reception's selectivity. Why? X-ray sources with a high voltage (one million volts). The Tesla coil is a resonant transformer circuit that generates extremely high voltages and may deliver far more current than high-voltage electrostatic generators like the Van de Graaff generator. However, unlike contemporary wireless power systems, which lose very little energy, this sort of technology radiates the majority of its energy into empty space. In radio circuits, resonant transformers are commonly employed as band pass filters and in switching power supply. This happens in a resonant transformer, which is an electrical component made up of a high Q coil wound on the same core as a capacitor linked across a coil to produce a coupled LC circuit. One driving coil on the main side and one resonance circuit on the secondary side make up the most basic resonant inductive coupling. When the secondary side's resonant state is perceived from the primary side, two resonances are observed as a pair. The anti-resonant frequency is one of them, while the resonant frequency is the other. The secondary coil's short-circuit inductance and resonant capacitor are coupled to form a resonant circuit. The phases of the magnetic fields of the primary coil and the secondary coil are synchronised when the primary coil is powered with a resonant frequency of the secondary side. As a result of the increased mutual flux, the maximum voltage is created on the secondary coil, and the copper loss of the main coil is minimised, heat production is reduced, and efficiency is enhanced. The near-field wireless transmission of electrical energy between magnetically linked coils that are part of a resonant circuit adjusted to resonate at the same frequency as the driving frequency is known as resonant inductive coupling.

Scott Connection

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A Scott-T transformer (also known as a Scott connection) is a type of circuit that converts three-phase electric power (3φ, 120-degree phase rotation) into two-phase electric power (2φ, 90-degree phase rotation). The Scott connection distributes a balanced load equally between the source's phases. In the late 1890s, Westinghouse engineer Charles F. Scott designed the Scott three-phase transformer to bypass Thomas Edison's more expensive rotary converter and allow two-phase generating plants to drive three-phase motors. Because two-phase motors, like three-phase motors, consume continuous power, a balanced two-phase load is transformed to a balanced three-phase load. If a two-phase load is unbalanced (more power consumed from one phase than the other), no transformer configuration (including the Scott-T transformers) will be able to restore balance: On the two-phase side, unbalanced current creates unbalanced current on the three-phase side. The current in the two phases was assumed to be intrinsically equal throughout the Scott-T development since the usual two-phase load was a motor. People have attempted to resurrect the Scott connection in recent times as a means of powering single-phase electric railroads from three-phase utility sources. On the three-phase of being equal, this will not result in balanced current. The immediate difference in loading on the two sections will be viewed as a three-phase supply imbalance; transformers will not be able to smooth it out. The Scott-T transformer connection may also be used in a back-to-back T-to-T arrangement for a three-phase to three-phase connection. This is a cost-saving in the lower-power transformers due to the two-coil T connected to a secondary two-coil T instead of the traditional three-coil primary to three-coil secondary transformer. In this arrangement the X0 neutral tap is part way up on the secondary teaser transformer. The voltage stability of this T-to-T arrangement is questioned when compared to a traditional three-coil primary to three-coil secondary transformer, because the "per unit" impedance of the two windings (primary and secondary, respectively) in a T-to-T configuration is not the same, whereas the three windings (primary and secondary, respectively) are the same in a three-transformer configuration if the three transformers are identical. Distribution transformers that convert three-phase to three-phase (also known as "T-connected") are becoming more popular. The primary must be delta-connected (), while the secondary can be delta or "wye"-connected (Y), depending on the customer's preference, with X0 acting as the neutral in the "wye" instance. In most cases, taps are given for both cases. The maximum capacity of a distribution transformer of this type is typically 333 kVA (a third of a megawatt). Two-phase motor loads existed at the time of the invention, and the Scott connection allowed them to be connected to contemporary three-phase supplies with equal currents on all three phases.

Toroidal Inductors and Transformers

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Toroidal inductors and transformers are inductors and transformers having toroidal (ring or donut) magnetic cores. They're passive electrical components that have a circular ring or donut-shaped magnetic core made of ferromagnetic material like laminated iron, iron powder, or ferrite, around which wire is coiled. Although square-shaped cores were commonly employed in closed-core inductors and transformers in the past, toroidal-shaped cores are now widely used due to their higher electrical performance. Because of its symmetry, the quantity of magnetic flux that escapes beyond the core (leakage flux) is minimal, making the toroidal form more efficient and radiating less electromagnetic pollution (EMI). Toroidal inductors and transformers are found in a wide range of electronic circuits, including power supplies, inverters, and amplifiers, which are found in the vast majority of electrical devices, including televisions, radios, computers, and audio systems. Because they are built of fewer materials and incorporate a centering washer, nuts, and bolts, toroidal inductors/transformers are more compact than alternative shaped cores, resulting in a design that is up to 50% lighter. This is especially true for high-capacity devices. Because the toroid has a closed-loop core, it has a greater magnetic field and consequently a larger inductance and Q factor than a straight-core inductor of the same mass (solenoid coils). Because the majority of the magnetic field is confined within the core, this is the case. In contrast, the magnetic field coming from one end of a straight core travels a great distance through air to reach the other end of the inductor. A toroidal transformer will also have reduced secondary impedance since the windings are relatively small and wrapped in a closed magnetic field, which will improve efficiency, electrical performance, and minimise distortion and fringing effects. Little magnetic flux escapes from the core of a toroid due to its symmetry (leakage flux). As a result, a toroidal inductor/transformer emits less electromagnetic interference (EMI) to nearby circuits, making it an excellent choice for highly concentrated situations. To comply with increasingly severe international rules regulating the amount of electromagnetic field consumer devices may emit, manufacturers have introduced toroidal coils in recent years. Because quasi-static circumstances are assumed, each field's phase is the same everywhere. The transformer, its windings, and everything else are symmetrically distributed along the axis of symmetry. There is no circumferential current because of the windings.

Chapter-3

Technical Magazine

"SPARKLE-2022"

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Name of the Editors:

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Responsible Mining

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INTRODUCTION

Responsible mining is commonly defined as mining that involves and respects all stakeholder, minimizes and takes account of its environmental impact and prioritizes a fair division of economic and involving governments and the affected communities. The underlying principles are based on existing international agreements , such as the Rio declaration and sustainable development goals (SDGS) involving polluter responsibility, equity participatory decision making and accountability and transparency.

PROBLEM CAUSED BY RESPONSIBLE MINING:

IT can occur at local regional, and global scales through direct and indirect mining practices. The effects can results in erosion , sinkholes, loss of biodiversity , or the contamination of soil , groundwater , and surface water by the chemicals emitted from mining processes. These processes also effect the atmosphere from the emissions of carbon which have effect on the quality of human health and biodiversity . some mining methods may have such significant environmental and public health effect that mining companies in some countries in some countries are required to follow strict environmental and public health effect that mining companies in some countries are required to follow strict environmental and rehabilitation codes to ensure that the mined area returns to its original state mining can lead to soil pollution.

SOLUTIONS TAKEN FOR RESPONSIBLE MINING

1. LOWER IMPACT MINING TECHNIQUES:-Traditional mining techniques can have a severe impact on the environment and some popular methods- like open pit and underground mining – present some of the most significant environmental risks.

2. REUSING MINING WASTE:-Mining naturally produces significant amounts of waste – such as tailings, rocks and wastewater, in many cases, businesses leave waste behind when mining operation cease.

3.ECO-FRIENDLY EQUIPMENT:-Mining companies wanting to reduce their environmental impact can switch to more eco-friendly equipment.

4.REHABILITATING MINING SITES :- Many modern mining techniques cause significant disruption to the environment like stripping the top soil layer necessary for plant growth and raising soil and water acidity.

5.SHUTTING DOWN ILLEGAL MINING:- Illegal mining remains a significant issue for the industry – for example, experts estimates that around 14,000 people are currently involved in illegal mining in south Africa.

CONCLUSION:

Improving mining and despite recent strides and new technology, the mining remains unsustainable in many areas. Fortunately , there are a variety of technologies and techniques – both in use and in development that the sector can use to reduce its environmental impact.

Advance land rehabilitation techniques, coupled with low- impact mining methods and reuse of mine waste , can cut back on the impact that mining operations have on their immediate environment companies can also use new equipment powered by electric engines to reduces their carbon footprint and becomes more eco-friendly.

Coal Bed Methane - CBM Extraction Methods

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Coal bed methane (CBM), an important unconventional gas occurring naturally in coal beds, is increasingly being used for industrial and utility purposes.

Learn what coal bed methane is, its unique gas composition, physical properties, and uses and explore the most prominent coal bed methane extraction processes.

What Is Coal Bed Methane?

Coal bed methane (CBM) is a form of natural gas which can be recovered from coal deposits or coal seams (a coal deposit is a geographical location containing mineable accumulations of coal while a coal seam is entrapment of coal in underlying rock).

The gas is formed during the natural conversion of plant material into coal, known as coalification. When coalification occurs, the coal becomes saturated with water and methane gas is trapped within it. CBM can be recovered from coal deposits and seams through drilling and extraction (the exact recovery process will be discussed in a subsequent section of this article).

CBM Gas Composition

The composition of CBM in a sample of coal varies widely across several locations in the country. Generally, it consists predominantly of methane gas (CH_4) although it can contain trace amounts of ethane (C_2H_6), carbon dioxide (CO_2) and water (H_2O).

Citing figures from a report published on the United States Geological Survey (USGS) website, CBM in Virginia consists of about 96.6% methane gas with a calorific value of about 990 Btu/cf. Similarly, the figures from coal deposits and seams in Pennsylvania were around 94% methane gas with a calorific value of 979 Btu/cf.

The total CBM content in a core sample is calculated as the sum of three components – desorbed gas, lost gas, and residual gas.

1. Desorbed gas refers to CBM that has been released from the coal surface via the coal matrix.
2. Lost gas is CBM lost during the extraction process due to leakages, subsurface temperature or pressure variance, venting and other factors.
3. Free gas is CBM freely available or saturated with water present in the coal bed.

What Is Coal Bed Methane Used for?

According to the American Geosciences Institute (AGI), the U.S. produced 1 trillion cubic feet of CBM in the year 2017. Coal bed methane and its by-products are suitable for a host of industrial applications, notably:

Power Generation

In the last few decades, CBM has become increasingly used as a source of energy in North America. For example, it can be used in place of natural gas in gas turbines for power generation.

Manufacturing

CBM can also be used as a feedstock for manufacturing fertilizers and plastics.

Transportation

Coal bed methane can be converted into other types of hydrocarbons like diesel and gasoline commonly used as fuel for automobiles.

Controversy Surrounding Coal Bed Methane Gas Production

The controversy surrounding coal bed methane extraction has to do with the use of water during the process and its impact on global climate change. Coal bed methane exploration involves pumping large volumes of water out of coal seams to reduce the hydrostatic pressure and liberate the gas.

The produced water from coal bed methane wells has a fairly high salinity (due to dissolved sodium bicarbonate ions or chlorides) making it unsuitable for certain agricultural activities due to adverse and long-term chemical or physical effects on soil structure.

The EPA states that it is not actively developing effluent controls for the CBM industry as current technologies for analyzing coal bed methane produced water are not economically viable. However, it mandates CBM operators to have an NPDES permit for the disposal of wastewater.

Also, CBM is a fossil fuel which releases CO2, a known greenhouse gas during combustion. Moreover, its main component, methane, offers up to 72 times more global warming potential (GWP) per unit mass than CO2.

CBM Production Techniques

To carry out CBM production, a steel-cased hole is drilled into the coal seam and the underground (produced) water is pumped out through tubing. Removal of produced water helps reduce the hydrostatic pressure within the coal bed, causing the gas to be desorbed from its surface.

As production occurs, the change in pressure alters the porosity and permeability of the coal bed. The recovered gas is sent into a natural gas pipeline or air compressor system.

How to Handle Coal Bed Methane Produced Water?

CBM produced water can be handled in several ways to minimize its impact on the environment. The produced water can be sent to a wastewater treatment plant for purification before it is disposed or reused, re-injected into another section of the formation, or sent to an evaporation pond for desalination.

The Gas Separation Technology in coal bed methane production supports the optimal recovery of coal bed methane gas to meet the most challenging energy needs.

Drone Technology in Mining Operation

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Introduction

The Mining industry has opened its arms to Drone technology for multiple Mining applications such as Inspection, Surveying, Mapping, preserving safety, improving security, etc. The rising need for Unmanned Aerial Vehicles (UAVs) for Mining operations stems from its capacity to collect precise data swiftly and cost-efficiently. Drones in mining have shown tremendous growth and have also added significant value to all mining projects. With better coordination, in-depth analysis, diminished expenses, and heightened workers' safety, the mining industry has found its savior!

The vital and transformative application of Drones in mining has made it widespread among numerous organizations. UAVs have revitalized the mining industry through Artificial Intelligence coupled with Drone Technology. Offering users excellent efficiency of large mine sites, complete quarry management, and reliable site condition information, mining corporations can now make quick decisions without second-guessing their choices. Drone usage for Surveying, Inspections, Mine Mapping, and many other mining operations have facilitated more trustworthy coordination with crew members, both on-site and off-site, for all the projects' vigorous insights.

One of the fundamental reasons that Drones have become so widespread in the mining industry is because the data procured via UAVs diminishes the need for on-site workers to adopt traditional survey techniques that require them to visit hazardous or hard-to-reach mine sites. Not just this, drone surveying can be done for almost a fraction of the cost of robust traditional methods and can pocket more accurate data due to advanced technology!

The Trends Influencing Mining

Monitoring and Inspection - Mining is said to be one of the most hazardous industries for workers. Mining Operations stimulate numerous dangers such as rock falls, high humidity, gas-leaks, dust explosions, floods, and other unfortunate events affecting worker's safety. The mining industry has employed UAVs and Drone Technology for real monitoring and inspection of deep shafts. Inspection of mining equipment, which previously required a

highly experienced workforce, can now be carried out in a comparatively inexpensive and time-efficient method. Depending upon Geographic Information Systems (GIS) and high-grade quality RGB sensors for obtaining data, the Drone Aerial images collected are more precise and reliable than any traditional monitoring and inspection method.

Surveying and Mapping - Aerial surveying and mapping are one of the most excruciating and time-consuming activities that need regular implementation by the mining industry. With the assistance of high-quality drones and a proficient drone pilot on-site, the cost for detailed Aerial photography is 90% lesser than that of a traditional piloted plane. The GIS data captured can be transformed into 3D models and reliable ortho-images with significant volumetric measurements.

Stockpile - Managing stockpiles in any industry for that matter is a cumbersome task, but essential for safety. A challenge faced continuously by the mining industry is the ever-changing heights and areas concealed by stockpiles at the job-site. The irregularity of such inventories makes it challenging to determine their volume with accuracy with conventional techniques like GNSS surveying. The traditional methodology for such operations prevents regular surveying and can even become a danger to the surveyor. With the help of drones, mining companies can yield vital information regularly and efficiently. Photogrammetry software, 3D models, Digital Terrain Models (DTMs), Digital Elevation Models (DEMs) and even highly detailed contour maps are produced for comprehensive analysis of the stockpile.

Haulage Road Optimization - Haul road networks hold an essential place in the efficiency and productivity of mining operations. For dependable and consistent transportation, roadway statuses and conditions must frequently be observed. By employing UAVs to capture Aerial data, regular visual evaluations of haul roads can take place. Obtaining relevant information such as length, slopes, and turning angles of the haul roads support engineers and constructors for meticulous preparation, designing, development and upkeep. Drones also accommodate areas more extensively and precisely to guarantee that the roads are constructed following legal standards.

Mining Exploration - Mining exploration is easily one of the most life-threatening operations that were traditionally carried out by workers of the respective company. With Drone Technology redefining several aspects of the mining industry, the mining exploration has redesigned itself through the implementation of high-quality drones. With

UAV data, mining companies can transform survey information into high-resolution orthoimages, DSM maps, RBG maps, etc. via secure photogrammetry software. Mining exploration projects are uncovered at only a portion of traditional survey expenses, and are done efficiently, saving lots of time for the company! Photogrammetry software transforms data for more comprehensive and straightforward knowledge.

Tailing Dam Monitoring - Employing drones for the surveying and inspection of tailing dams eradicates any danger to workers who indulged in traditional manual surveying techniques. Aerial imagery assists operators and planners to observe mine-site components like slopes on tailings dams frequently. With Drones, regular monitoring and preservation of dams can be done with no manual requirement close to the subject being managed. Thorough data analysis maintains the goodwill of the asset and avoids any failure.

Water and Sediment - Drones in the mining industry can also prevent any interruptions in mining operations due to undesired or uncontrolled water and sediment flow. Accurate Drone imagery of flow and tailings operations are remodeled as Digital Elevation Maps (DEMs) for thorough perception and preparation by operators. Consistent visual records of the mine-site can be advanced for monitoring progress, guide planned activities, and regularly update financial audits.

Green Mining

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Introduction

The environmental impact of mining activities is a key issue concerning the industry. The Surface Mining Control and Reclamation Act, enacted in 1977, provides many regulations to ensure mine sites are operated, and any environmental damage is remediated, in a responsible way. Read Mining and the Environment: What Happens When A Mine Closes? to learn about other U.S. regulations governing the mining industry and some of the issues they address. Remediation is just one part of reducing the environmental impact of mining; here we present a summary of some projects underway to initiate more responsible mining technologies, or "green mining." In the Mining-technology.com article, Eco-friendly Mining Trends for 2014, Joshua Kirksey, Communications Advisor for Natural Resources Canada (NRC), defines green mining as "technologies, best practices and mine processes that are implemented as a means to reduce the environmental impacts associated with the extraction and processing of metals and minerals.

Problem Faced by Green Mining

Many methods are used to extract the ores causing huge threat to environment. Mining practices lead to un sustainability and the problems created by it were not yet controlled. So, adoption of green mining technologies helps to attain sustainable development and control the problems to maximum extent. The main objective of green mining is to start mining process and send it to ensure that adopting green mining practices lead to sustainability. Green mining also reduces greenhouse gases prone to affect conserve minerals, using energy more efficiently etc. According to Mission 2016 plan many green mining techniques were adopted and increased focus on research and became more popular so every industry focusing on environmentally friendly technologies. Some of the major mining nations like Canada, Australia, South Africa etc adopted sustainable development viewed on not only environment but also other dimensions like local stake holder engagement, socio economic development in mining project areas and transparency in communication with stake holders.

Solution Taken for Green Mining

- Shutting down illegal and unregulated mines.
- Choosing environmentally friendly general mining processes. In situ mining, for example, can be more environmentally friendly than underground mining and is cheaper than many mining methods.
- Implementing recently discovered green mining technologies. These include mining from tailings, dust suppression techniques, liquid membrane emulsion technology, sulphuric acid leaching extraction process, impermeable tailings storage, and improved energy efficiency by using better ventilation systems and diesel engines.
- Cleaning up the sites of shut-down mines using R2 technology to recover metals while improving the condition of the land.
- Revaluating cut-off grades to reduce waste and increase efficiency.

Conclusion

These practices include measures such as reducing water and energy consumption, minimizing land disturbance and waste production, preventing soil, water, and air pollution at mine sites, and conducting successful mine closure and reclamation activities.

Mineral Processing

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Introduction

Mineral processing, art of treating crude ores and mineral products in order to separate the valuable minerals from the waste rock, or gangue. It is the first process that most ores undergo after mining in order to provide a more concentrated material for the procedures of extractive metallurgy. The primary operations are comminution and concentration, but there are other important operations in a modern mineral processing plant, including sampling and analysis and dewatering.

Problem Faced by Mineral Processing

Certain minerals directly cause environmental hazards ranging from air and water pollution to contamination within residential communities. Mineral contamination effects include causing disease in humans and wildlife, befouling wilderness and streams, and contributing to global warming. Although some mineral contamination is the result of natural processes, human activity is responsible for most environmental hazards.

Acid Mine Drainage

Acid mine drainage forms when the mineral pyrite reacts with air and water to form sulfuric acid. This acidic flow dissolves heavy metals, including mercury, copper, and lead, which allows them to seep into surface or ground water. Ninety-five percent of America's acid mine drainage problem is concentrated in the mid-Atlantic states, affecting more than 4,500 miles of streams, and is primarily produced in abandoned coal mines.

Arsenic Groundwater Contamination

Arsenic can contaminate groundwater when arsenic-laden minerals dissolve over time, releasing their arsenic into groundwater, but arsenic contamination is more often caused by industrial runoff waste containing arsenic. Arsenic is tasteless and odourless, making it undetectable unless ground and well water is specifically tested for arsenic.

Asbestos Contamination

Asbestos fibres occur naturally in certain rock formations, and these fibers can easily be inhaled, causing health problems that include lung cancer, mesothelioma, and asbestosis, a condition that scars lung tissue, making it difficult for oxygen to enter the bloodstream. The

U.S. Consumer Product Safety Commission's regulations in the mid-1970s began phasing asbestos out of most building materials and consumer products, but the mineral still remains in older buildings and some job sites.

Coal Burning

The Union of Concerned Scientists reports that in one year a typical coal-burning power plant generates 500 tons of particulate matter that can exacerbate asthma and cause bronchitis, 720 tons of carbon monoxide, and 3.7 million tons of carbon dioxide, the greenhouse gas primarily responsible for global warming. Coal-burning plants also contribute to environmental hazards, including smog and acid rain.

Solution taken for Mineral Processing

With cutting-edge processing technologies, Wastes solutions can render the by-products of mineral extraction wastewater inert. The by-products are then reliably contained and made safe for the environment. The processes we employ are effective at keeping groundwater, surface waters, wildlife, and communities protected from tailings dam leaks and levy failures.

Innovations in wastewater solutions focus on iron ore concentration, coal preparation, and sand aggregate. Our package plants for water and wastewater treatment are also available for remote locations and mine sites.

Conclusion

The committee concludes that all minerals and mineral products could be or could become critical to some degree, depending on their importance and availability—in the sense that the chemical and physical properties they provide are essential to a specific product or use or more broadly, that specific minerals are an essential input for a national priority (for example, national defenses) or for an industry, or may be important (or have the potential to become important) to a region or the nation as a whole. Materials derived from minerals are essential to the performance of nearly all products and services we take for granted—cellular telephones, automobiles, home appliances, computers and other electronic products, and aircraft, for example. The degree of a mineral’s importance can vary considerably over time as technologies and the economy evolve and change.

Mine Gases and its Physiological Effects

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6th Semester

Carbon Dioxide (CO_2):-

Carbon Dioxide is a natural component of air at approximately 0.03%.It is also known as 'Black damp' in u/g mines. It is also a key component of Black Damp, caused by biological oxidation such as rotting mine timbers. Increased concentrations of carbon dioxide replace the oxygen content of the mine air thus producing a toxic atmosphere.

1. Specific Gravity: - 1.529%

2. Properties:-

(a) Colour: Colourless.
(b) Smell: Odorless
(c) Heavier than air.
(d) Acidic taste at high concentrations.
(e) Health Effects: - At 5%, stimulated respiration and at 7% to 10%, unconsciousness after a few minutes of exposure.
(f) Taste: Medley.
(g) Solubility in water: High
(h) Do not support combustion.
(i) Critical temperature: 32°C.

3. Sources of CO2 in underground mines:-

(a) Exhalation of men.
(b) Burning of lights.
(c) Oxidation of coal, timber.
(d) Blasting of explosives.
(e) Outburst of gas.

4**. Physiological effect of Carbon Dioxide (CO2):-**

[A person affected by CO2 recovers with artificial respiration]
1. 2% - Depth of breathing increased by 50%.
2. 3% - Depth of breathing doubled.
3. 5% - Death of breathing tripled.
4. 6% - Heavy panting [To breathe hard and quickly].
5. 10% - Headache or loss of sense.
6. 15% - Unconsciousness.
7. 20-25% - Unconsciousness and death.

Carbon Monoxide (CO):-

Carbon monoxide results from incomplete combustion of organic carbon-based materials.It are also known as white damp in u/g mines. It is also an after-product of detonated explosives and diesel engines. Carbon monoxide is highly toxic to the body. When inhaled,

CO quickly bonds with the body's haemoglobin, thus reducing the blood's ability to carry oxygen throughout the body.

1. Specific Gravity of CO: 0.967

2. Properties of CO:

(a) Co is flammable in u/g mines.
(b) Colour: Colourless.
(c) Taste: Tasteless.
(d) Smell: Odorless.
(e) Lighter than air.
(f) Non-irritating
(g) Deadly poisonous
(h) Combustible but not support combustion.

3. Sources of CO in Mine Air:

[Maximum permissible concentration of CO in mine air is 0.05% of 50 PPM]
(a) Incomplete combustion of coal and other carbonaceous material.
(b) Explosive when blasted.
(c) Spontaneous combustion.
(d) Firedamp explosion.

4. Limits:

(a) TLV – 50 PPM
(b) Ceiling – 200 PPM
(c) IDLH – 1500 PPM
(d) Explosive Range:
(e) 12.5% to 74%

5. Physiological effect of carbon monoxide (CO):

[Carbon monoxide is produced by carbonaceous matters,when burns with insufficient of oxygen].
(a) 0.002% :- Headache discomfort (after 45 minutes).
(b) 0.12% :- Palpilation after 10 minutes worker.
(c) 0.2% :- After 10 minute or 30 minute unconsciousness.
(d) 0.5% :- Death of 10 minute-15 minute of work.

Hydrogen Sulphide or Sulphurated Hydrogen (H2S):

Hydrogen sulfide is an extremely toxic gas. It is known as stink gas in u/g mines. It blocks the use of oxygen by the body's cells. It is produced when sulfur compounds decompose. It is commonly associated with acid mine water. This gas is released whenever a mine pool is agitated. It can be produced in mine fires should sulfide ores be present.

1. Specific Gravity: 1.175.

2. Properties of hydrogen sulphide:

(a) Colour: Colorless
(b) Smell: Odor similar to rotten eggs at very low.
(c) Taste: Sweetish.

(d) Heavy poisonous then CO(carbon monoxide).
(e) Solubility of water very very high.
(f) Percentage in mines 0.001%.
(g) Combustible and highly explosive in nature.

3. Sources of hydrogen sulphide in mines air:

(a) Generally not found in coal mines.
(b) Sometimes in after damps.
(c)Methane blowers and out brush (Gradual exudation) sometime produced H2S.
(d)Generally found in metal mines:

$FeS_2 + 2H_2O = Fe(OH)_2 + H_2S$

4. Sources of physiological effect of Hydrogen Sulphide (H2S):

(a) 0.005-0.01% (half hour) irritation and inflammation of eyes and respiration.
(b) 0.02-0.03% (half hour) symptoms increase.
(c) 0.05-0.07% (half hour) serious poisoning.
(d) 0.01-0.3% (half hour) paralysis of respiratory track and death.

Oxygen (O_2):

Oxygen is essential to support life. Although oxygen is not an explosive gas, it does support and accelerate combustion. Normal air contains 20.94% oxygen by volume. Atmospheres containing less than this amount are known as oxygen deficient.

1. Specific Gravity: 1.105(slightly heavier than air).

2. Properties:

(a) Colour: Colorless.
(b) Smell: Odorless.
(c)Taste : Tasteless.
(d) Non-Explosive.
(e) Supports Combustion and life.
(f) Easily displaced by other gases introduced into the atmosphere.
(g)Work Pass: not less than 19%.
[In Coal Mine Regulation (CMR) 1957 regulation no. 120 (2) (ii) And In 2017 regulation no. 153 (2) (6)].
(h) Molecular Mass- 32.

3. Physiological effect of (O_2) :

19% - heavy breathing palpitation.
17.5% - (below up to) No serious effect.
17% - Breathing, faster and deeper.
15% - Dizziness/buzzing of ears, rapid heart rate.
12% - feeling and consciousness(12-13%).
10% - unconsciousness(with half an hour).
7% - heavy panting, palpitation, face turns blue.
0% - unconsciousness with 40 sec and death in air without O2 because of anoxia.

Methane (CH_4):

Methane gas is found naturally in most coal seams. It is known as hot gas in u/g mines. It includes many volatile organic compounds including methane, ethane, butane, propane, and contaminants. It is the most common dangerous gas found in underground coal mines.

1. Specific Gravity: 0.559

2. Properties:

(a) Colour : Colourless.

(b) Smell : Odourless.

(c) Taste : Tasteless.

(d) Slightly soluble in water.

(e) Comfortable burn with blue flame :

[CH4 + (2O2 + 4N2) = CO2 + 2H2O + 8N2]

(f) Violent explosion of CH4 happens in u/g mines occur in 9% (complete combustion occur)

(g) Flame safety lamp will extinguishes in 17.5% (O2)

CH4 > 25% - O2 < 15%

(h) Methane is dangerous (5.4-14.8)% in u/g mines.

If 25% of CH4 is there in mine then oxygen reduce to 15%.

3. Sources of CH4 in mine air :

(a) $(C^6H^{10}O^5)^2 = 5CH^4 + 5CO^2 + 2C$.

(b) Decomposition of plant and vegetable under the surface without the presence of oxygen.

(c) Methane will be more in depth mines because in high-depth temperature,pressure and heat are more in high depth.

4. Why it is dangerous?

(a) Methane may act as a fuse to fire damp explosion.

(b) Fire dam explosion will led to a coal dust explosion.

5. Methane is generally found in :

(a) Mine Roadways.

(b) Long Wall Intake and return.

(c) Stone drift.

6. How to detect Methane?

(a) Flame safety lamp.

(b) Methanometer.

(c) Air sample from the roof of mines.

Nitrogen (N_2) :

Nitrogen composes 78.09% of the atmosphere. It is a non-flammable gas.

1. Specific Gravity: 0.967(Lighter than air).

2. Properties :

(a) Colour : Colourless

(b) Smell : Odourless

(c) Taste : Tasteless

3. Sources of nitrogen in mine air :
(a) Decomposition of organic substances.
(b) Blasting of explosives.
(c) Emissions of strata.

Sulphur Dioxide (SO_2):

Sulfur dioxide is produced when iron pyrite burns in gob fires or by blasting sulfide ores. It is also found in diesel exhaust. Sulfur dioxide has the same effect on the body as nitrogen dioxide, except that sulfuric acid is created in the lungs. It is a non-flammable gas.

1.Specific Gravity : 2.264

2 Properties :
(a) Colour : Colourless.
(b) Odour : Heavy sulphurodour.
(c) Soluble in water - High.
(d) Very much poisonous (0.0005%).

3. Sources of Sulfur Dioxide (SO2) :
(a) After damp (sometimes in small quantity).
(b) Highly concentrated sulfide ore mines.
(c) Blasting in rich sulfide or mines.

4. Physiological effect of Sulfur Dioxide:
(a) 0.0005% max allowance of concentration.
(b) It can be easily detected by its odour.

Controlled Blasting Technique in Opencast Mines

Author: Swarup Sadhu
6th Semester

Abstract

Controlled blasting methods are used to control blast induced effects such as, over-break, fractures within remaining rock walls and ground vibrations etc. In both the mining and construction industries, blasting is the predominant method for fragmentation of consolidated mineral deposits. Adopting various techniques of controlled blasting such as line drilling, trim (cushion) blasting, smooth (contour or perimeter) blasting, pre-splitting etc,; selecting and employing various parameters of blast design; using modern technology such as precise timing delays, varied density of explosives product by using bulk explosives; muffle blasting at a very critical and congested areas are some of the points discussed in this paper for mitigation of adverse impact of blasting. By adopting these precautions not only the ground vibration is restricted to ease the public relation problem, but the mines'/constriction's techno-economics, preservation of host rock strength and safety standard are improved to a considerable level

Introduction

Controlled blasting means controlling of ground vibration, fly rock and air overpressure (noise) within safe limit. On the other hand, controlled blasting means minimization of over-break and under-break beyond the boundary of the excavation area. It is generally applied when blasting operation is to be conducted near residential structures/buildings or another sensitive environment or applied both in surface as well as underground to obtain smooth and stable final excavation wall. Proper selection of blast design parameters and systematic blasting operation is crucial for controlled blasting operations.

Importance of Controlled blasting techniques

Blasting operation in ecologically fragile hilly areas requires special attention to their effects on the surrounding environment. A sudden change in the geometry of the rock mass along with blast induced ground vibration may lead to slope stability problems. Fly rock and throw of blasted materials downwards the valley sides may endanger nearby habitant located at the foothill and close by areas. Air blast (noise) and ground vibration generated from blasting operation could scare the fauna of the area causing birds and wildlife to

migrate to other areas. All these problems can be tackled by controlled blasting technique, if the blast design is made meticulously, explosive is chosen properly, and safety-concerns are dealt with proper care and guidance of experts working either at the same mine or from outside agency.

Controlled blasting techniques

1. Line Drilling

• Line drilling is carried out in a single row of closely spaced, unloaded, small diameter holes that are drilled along the excavation line.

• This provides a plane of weakness to which the primary blast can break and, to some extent, reflects the shock waves created by the explosion, reducing the shattering and stressing in the finished wall.

• Line drilling is best suited for homogenous formations where bedding planes, joints, and seams are at a minimum.

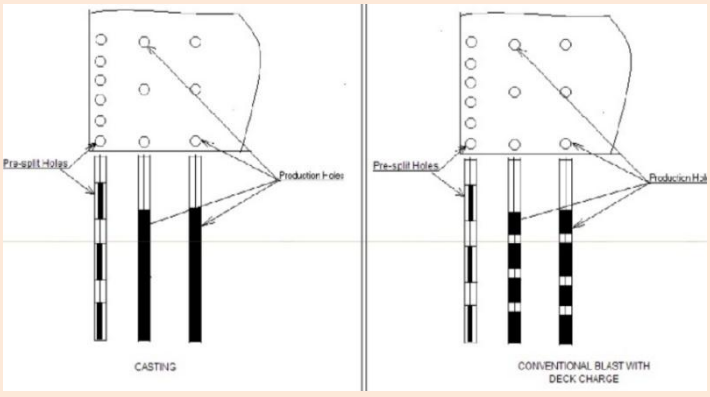
• The only place where it is applicable is in areas where even the light explosive loads associated with other controlled blasting techniques may cause damage beyond the excavation limit.

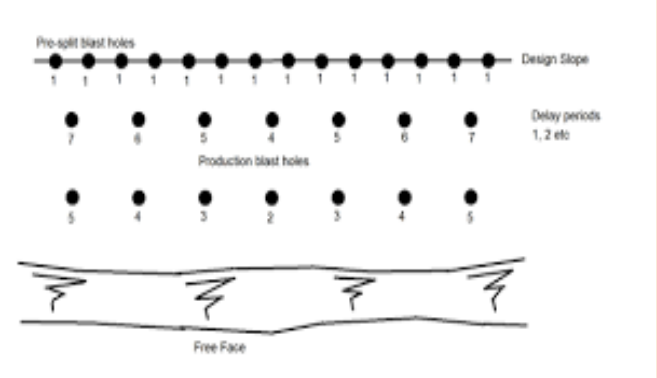
2. Pre-Splitting

• The pre-splitting blasting involves a single row of holes drilled along the excavation line.

• Pre-split in the rock forms a discontinuous zone that minimizes or eliminates over break from the subsequent primary blast and produces a smooth-finish rock wall.

• Pre-splitting is also used to reduce ground vibration in some critical cases.





3. Smooth Blasting

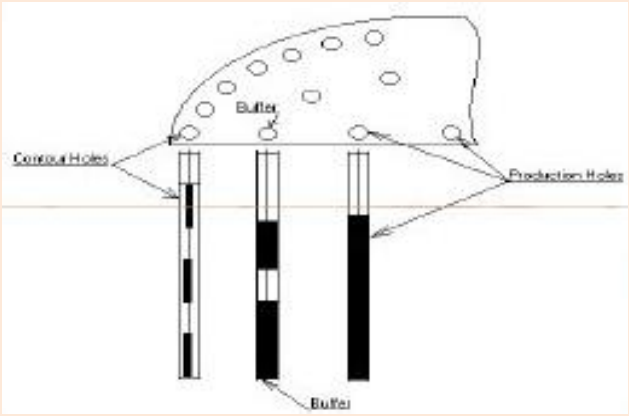
• This method is widely accepted for controlling over break in canal, slopes etc.

• In smooth blasting, the holes are drilled along the excavation limits, lightly loaded with well-distributed charges, and fired at the end of the round.

• The holes for smooth blasting should be fired instantaneously or with minimum delay to achieve a shearing action and smooth walls with minimum over break.

• Smooth blasting and pre-splitting techniques differ mainly from the line drilling principle in that some or all of the holes are loaded with relatively light, well-distributed charges of explosives.

• The smooth blasting is also referred to as contour blasting or perimeter blasting.



4. Cushion Blasting

• It is first introduce in Canada

• Cushion blasting consists of a single row of holes is drilled along the excavation line, loaded with light, well-distributed charges, and fired after the main excavation is removed.

• In cushion blasting, the charged holes are further decoupled by reducing the diameter or using stemming material of crushed stone or sand to provide a crushing effect.

• This “cushions” the shock from the finished wall as the holes are detonated and minimizes the stresses and fractures in the finished wall.

• This technique is rarely used today because the reduction in decoupling could be achieved by the use of small diameter explosive cartridges, which serves the same purpose.

• The holes are blasted using the last delay number in the same blasting round, preferably with a jumping delay of 50 ms.

The suitable parameters for controlled blasting are established through trial blasts. Usually, it needs to establish the optimum hole spacing and the charge per hole

Chapter-4

Technical Magazine

Sparkle'2022

Civil Engineering Department

Name of the Editors:
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A Critical Review of Behavior of Vertical Piles against Lateral Loads

Author: Vishal Gupta(6th Sem)

Nowadays Housing in the urban sectors of our country is a big problem. In an attempt to cater to the huge influx of population from rural areas to the urban sectors, urban housing posses a huge challenge to the Civil Engineering Community.

The outskirts of the city and downtown are the prime locations for construction of multistoried building projects. As a matter of fact for reclaimed land and filled up soil sites or sites which are susceptible to seismic force generated liquefaction. Generally Geotechnical experts recommend adoption of deep foundation.

Generally deep foundation in this country consists of Bored Cast in-situ- Reinforced Concrete pile foundation. It is a customary practice of the structural Engineers to design pile for vertical loads coming on them.

The load carrying capacity of piles may be determined analytically by various static formulae both for cohesive and non- cohesive soils. Multistoried buildings are however subjected to lateral forces such as wind or earthquake. Thus foundations of multistoried buildings are thus subjected to wind and seismic effect induced lateral loads. Lateral loads are however induced due to other aspects such as berthing of ships at jetties, wharf or quay. Water currents, earthquake and effects of moving vehicles as on bridges. Thus it is essential for above mentioned type of structures that proper provision for design against lateral loads such as wind and Earthquake should be adopted of the foundation soil is of inadequate bearing capacity, the piles provided should also be checked for lateral load capacity. Lateral load capacity of pile should however be assumed on the basis of pile load test at the site condition.

Advanced Construction Materials

Author: Yogesh Mondal(6th Sem)

The population is increasing at a very high pace nowadays so different types of structures are to be built and constructed. The material used in the construction is naturally occurring and are extracted from the nature.

Advanced construction materials like artificial sand, translucent wood, bricks made up of cigarette butts, geo-synthetics, noise reducing asphalt, new admixtures- Masterglenium, Self healing concrete, etc. The wood which we get from the trees are not transparent, they contain lignin which absorbs 80-95% of light.

The different categories of geo-synthetics are geotextiles, geomembranes, geogrids, geopipes, etc. There are several types of silent road surfaces like Thin surface asphalt layers, Stone mastic asphalt and Double layered porous asphalt. Admixtures are those materials which are used to modify the properties of concrete.

Researchers are continuing their researches to invent new and more advanced construction material in the field of Civil engineering.

Biodiesel Instead of Petrol

Author: Santimoy Ruidas (6th Sem)

The Resources of Petrol will be depleted very soon and the use of too much petrol will increase the environmental pollution. So we can use biodiesel in this way. Biodiesel is a fuel which is produce from organic matters, vegetable oils, animal fats .It is renewable and can be manufactured domestically. The resources of petrol are limited and it produces hazardous substances which causes environmental pollution.

The most well-known bio-fuels are biodiesel and ethanol. These fuels come from renewable resources and provide numerous benefits to the public, the economy, and the planet.

IT'S been reported that about 1.6 million people die in 2019 in India due to air pollution. Gasoline engines release nitrogen oxide and acetaldehyde into the air. These molecules react with sunlight to form smog, which results in air pollution, which causes lung disease, cancer, and more.

The use of bio-fuels is clearly one way to improve our health, economy, and planet. That is why so many people are accepting that renewable energy is the future. We understand that fossil fuels are finite, and we will run out one day. By making the transition to sustainable alternatives like bio-methane or biodiesel, we can create an overall better environment for ourselves and future societies. This is the right time for the Indian Government to increase the production of bio-fuel.

Green Concrete: Eco Friendly Construction Materials

Author: Astha Kumari Nonia (3rd Sem**)**

Concrete which is made from concrete wastes that are eco-friendly are called as "Green concrete". "Green concrete" is a revolutionary topic in the history of concrete industry. This was first invented in Denmark in the year 1998 by Dr. WG. Concrete wastes like slag, power plant wastes, recycled concrete, mining and quarrying wastes, waste glass, incinerator residue, red mud, burnt clay, sawdust, combustor ash and foundry sand. The production of such concrete requires minimum amount of energy. Now a day's green concrete widely used in the construction of bridges, building construction, construction of columns and also used in the road construction.

Green concrete reduce the dead weight of a structure from 5 tons to about 3.5 tons. Green concrete are good thermal and fire resistance. Green concrete reduce CO2 emission of a concrete industry by 30% and increased the use of waste product in a industry by 20%. Maintenance cost of green concrete is very less.

Green concrete is a revolutionary topic in the history of concrete industry. As green concrete is made with concrete wastes it does not take more time to come in India because industries having problem to dispose wastes and environmental pollution rate is also high in India. So if we used Green Concrete in India it reduced environmental pollution rate with reduction in CO2 emission.

So definitely use of Concrete product like green concrete in future will not only reduce the emission of CO2 in environment and environmental impact but also economical to produce.

Chapter-5

Technical Magazine

Sparkle'2022

Computer Science & Technology Department

Name of the Editors:

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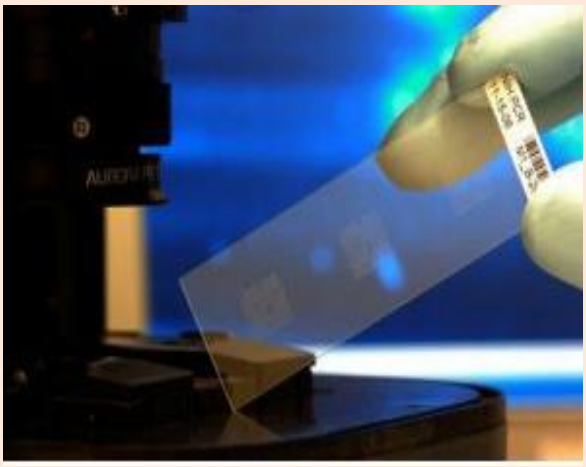
Biochip

Author: Dhrubajit Gope(6th Sem)

Biochip: The first biochip was invented by an American company namely Affymetrix, and the product of this company is Gene Chip (DNA microarrays). These products comprise the number of individual DNA sensors used for sensing defects. Biochip plays an essential role in the field of biology research like systems biology as well as disease biology while the number of clinical applications is rising. It is a set of microarrays which are placed on a strong surface of a substrate to allow thousands of reactions to be performed in less time. The development of biochip mainly includes the combination of molecular biology, biochemistry, and genetics. Biochips are used for analyzing organic molecules connected with a live organism. This article discusses what is Biochip, types, biochips and their uses, disadvantages, and its applications.

A biochip is a set of diminished microarrays that are placed on a strong substrate that allows many experiments to be executed at the same time to obtain a high throughput in less time. This device contains millions of sensor elements or biosensors. Not like microchips, these are not electronic devices. Each and every biochip can be considered as a microreactor that can detect a particular analyte like an enzyme, protein, DNA, biological molecule or antibody. The main function of this chip is to perform hundreds of biological reactions in a few seconds like decoding genes (a sequence of DNA).



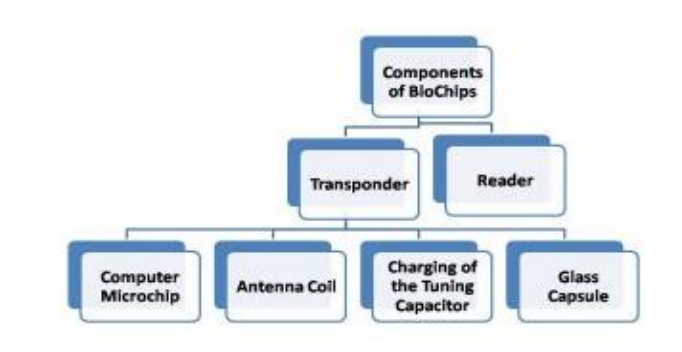
Working Principle of a Biochip:

The working of Biochip mainly includes the following steps.

1. Step1: The operator generates a low-power electromagnetic field through radio signals
2. Step2: The fixed biochip gets turn on
3. Step3: The activated chip transmits the identification code reverse to the operator through radio signals
4. Step4: Reader strengthens the received code to change it into digital form and finally exhibits it on LCD.

Components of Bio Chips

The Biochip comprises two components namely the transponder as well as reader.



1) Transponder

Transponders are two types' namely active transponder and passive transponder. This is a passive transponder which means that it doesn't contain any of its own energy or battery whereas in passive, it is not active until the operator activates it by giving it a low electrical charge. This transponder consists of four parts such as antenna coil, computer microchip, glass capsule, and a tuning capacitor.

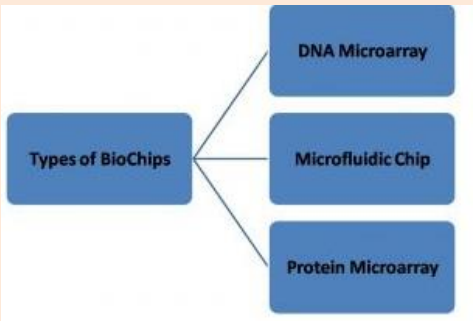
- The computer microchip stores a unique identification (UID) number that ranges from 10 digits to 15 digits long.
- The antenna coil is very small, primitive and this type of antenna is used to send and receive the signals from the scanner or reader.
- The charging of the tuning capacitor can be done with the small signal i.e, 1/1000 of a watt which is sent by the operator.
- The glass capsule holds the antenna coil, capacitor, and microchip, and it is made with a biocompatible material namely soda lime glass.

2) Reader

The reader comprises of a coil namely "exciter" and it forms an electromagnetic field through radio signals. It offers the required energy (<1/1000 of a watt) to activate the biochip. The reader carries a receiving coil for receiving the ID number or transmitted code sent back from the excited implanted biochip.

Types of BioChips

There are three types of Biochips available namely DNA microarray, microfluidic chip, and protein microarray.



Types of BioChips:

1) DNA Microarray

A DNA microarray or DNA biochip is a set of tiny DNA spots fixed to a strong surface. A researcher utilizes to calculate the expression levels for a large number of genes. Every DNA mark comprises picomoles of particular genes which are termed as probes. These can be a short segment of a genetic material under high rigidity situations. Usually, probe-target hybridization is noticed and counted by recognition of fluorophore or chemiluminescence labeled targets to decide the relative quantity of nucleic acid series in the target. Innovative arrays of nucleic acid were macro arrays about 9 cm X 12 cm and the initially automated icon based analysis was published in the year 1981.

2) Microfluidic Chip

Microfluidic biochips or lab-on-a-chip are a choice to usual biochemical laboratories and are transforming several applications like DNA analysis, molecular biology procedures, proteomics which is known as the study of proteins and diagnostic of diseases (clinical pathology). These chips are becoming more complex by using 1000's of components, but those components are designed physically called as bottom-up full-custom plan, which is a very large workforce.

3) Protein Microarray

A protein microarray or protein chip method is used to follow the actions as well as connections of proteins, and to find out their function on a large scale. The main advantage of protein microarray is that we can track a large number of proteins in parallel. This protein chip comprises of a surface for supporting like microtitre plate or bead, nitrocellulose membrane, the glass slide. These are automated, rapid, economical, very sensitive, consumes less quantity of samples. The first methodology of protein chips was introduced in antibody microarrays of scientific publication in the year 1983. The technology behind this chip was quite easy to develop for DNA microarrays, which have turned into the most generally used microarrays.

Biochips Advantages and Disadvantages

- The advantages of biochip include the following.
- The biochip is used to rescue the sick
- Very small in size, powerful and faster.
- Biochips are useful in finding the lost people
- Biochips can be used to identify the persons individually
- Biochips perform thousands of biological reactions in a few seconds.
- The disadvantages of biochip include the following.
- Biochips are expensive
- Biochip raises dangerous problems of individual privacy.
- Biochip marks the end of human being liberty and self-respect.
- There will be a chance of turning every person into a controlled person
- Biochips can be fixed into the human's body without their interference.

Biochips Applications

The applications of biochip include the following.

- By using this chip we can trace a person or animal anywhere in the world.

- This chip is used to store and update the information of a person like medical financial and demographics.
- A biochip leads to safe E-commerce systems
- These chips are effective in restoring the records of medical, cash, passport, etc.
- The biochip can be applicable in the medical field as a BP sensor, glucose detector, and oxygen sensor.

Paper Battery

Author: Kishor Kumar(6th Sem)

Paper Battery

Electronic devices and gadgets require a power supply (either AC or DC), this power supply can be taken directly from the mains power supply or from the electrical batteries. The battery can be defined as an electronic device comprised of (one or more) electrochemical cells. The chemical energy of the electrochemical cells can be converted into electrical energy. Based on different criteria batteries are classified into various types such that based on rechargeable condition they are classified as rechargeable batteries and non-rechargeable batteries. The advancement in technology developed environmentally friendly and more flexible batteries such as paper batteries. In this article, let us discuss about paper battery construction and working. But, primarily, we must know what a paper battery is.

The flexible and thin energy storage device which can be used as a battery is called as paper battery. This paper battery can also be used as a capacitor. This battery can be produced by merging the nanotubes (made using carbon) and nano-composite paper (made using cellulose). The paper battery consists of property of a battery – high-energy storage capacity and property of super capacitor – high-energy density and thus, produces extreme power.

Paper Battery Construction

The major components used for the construction of paper battery include:

- Carbon Nanotube (CNT) used for cathode terminal
- Lithium metal (Li+) used for anode terminal
- Different types of electrolytes that include blood, urine, and sweat (which are termed as bio-electrolytes)
- Paper (Cellulose-Separator)

7-Simple Steps for the Construction of Paper Battery

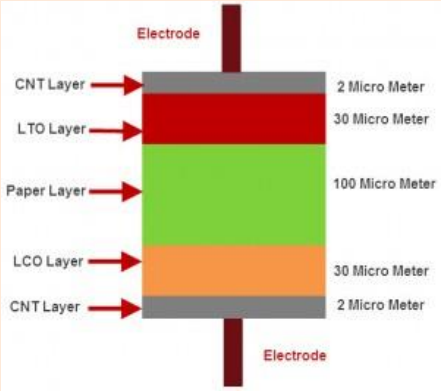
Step 1: Take a cellulose-based paper and apply black carbon ink on it

Step2: Spread this ink applied on the paper

Step3: After spreading ink, laminate a thin film over the cellulose surface

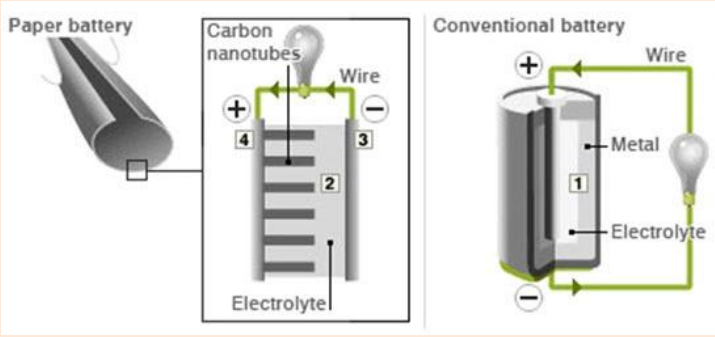
Step4: Heat the cellulose paper for 5min at 80 degrees C

Step5: Then, peel off the film from the substrate
Step6: The electrodes of paper battery are formed by film. The electrolytes LTO and LCO are connected to different films
Step7: The functioning of paper battery can be checked by connecting battery terminals to the LED.

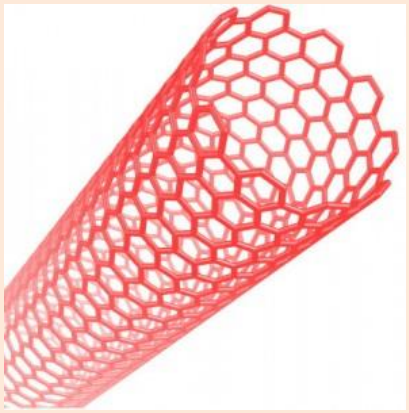


Paper Battery Working

The conventional rechargeable batteries which we use in our day-to-day life consist of various separating components which are used for producing electrons with the chemical reaction of a metal and electrolyte. If once the paper of the battery is dipped in ion-based liquid, then the battery starts working i.e., electricity is generated by the movement of electrons from cathode terminal to anode terminal. This is due to the chemical reaction between the electrodes of paper battery and liquid. Due to the quick flow of the ions within a few seconds (10sec) energy will be stored in the paper-electrode during the recharging. By stacking various paper-batteries up on each other, the output of the paper battery can be increased.



As the paper batteries are connected each other very closely for increasing their output, there is chance of occurring short between the anode terminal and cathode terminal. If once the anode terminal contacts with cathode terminal, then there will be no flow of current in the external circuit. Thus, to avoid the short circuit between anode and cathode a barrier or separator is needed, which can be fulfilled by the paper separator.



Nanotubes used for Paper Battery

Paper Battery= Paper (Cellulose) + Carbon Nanotubes

The paper battery can be used for various applications as it facilitates advantages such as folding, twisting, molding, crumpling, shaping, and cutting without affecting on its efficiency. As the paper batteries are the combination of cellulose paper and carbon nanotubes, which facilitates advantages of long term usage, steady power, and bursts of energy. These types of paper batteries are estimated to use for powering the next generation vehicles and medical devices.

Paper Battery Properties

The properties of paper battery can be recognized from the properties of cellulose such as excellent porosity, biodegradability, non-toxic, recyclability, high-tensile strength, good absorption capacity, and low-shear strength and also from the properties of carbon nanotubes such as low mass density, flexibility, high packing density, lightness, better electrical conductivity than silicon, thin (around 0.5 to 0.7mm), and low resistance.

Advantages of Paper Battery

- Unlike the conventional batteries, paper battery can be used by folding, cutting, and rolling.
- Paper battery functions as a battery as well as a capacitor.
- Paper battery is a modern storage device with ultra-thin in size.
- It has special properties such as more economical, biodegradable, and bio-compatible.
- Paper battery can generate electrical energy of 1.5V.
- The output voltage of paper battery can be customized based on requirement.

Fuzzy Logic- A Way to Achieve Control Based on Imprecise Inputs

Author : Subhadip Sinha (3rd Sem)

In this era of digital control, almost every appliance is controlled using the digital control level using 1 and 0. But just think, isn't it quite unpractical to think every output of the daily processes you come across, depends only on two states of the input. No, Definitely. Just imagine your mother cooking some tasty food and you can't stop yourself from praising her. So how the food does become so tasty? With the addition of ingredients in proper quantity and proportion, of course. So how does she manage that? With perfect numerical knowledge of the quantities? Not always. She does that with a known idea, which comes with experience. This is where comes the idea of a control logic that uses the degrees of input state rather than the inputs itself; a logic that doesn't requires some perfect inputs but rather works with only a typical estimation of the inputs. This is fuzzy logic.

Fuzzy logic is a basic control system that relies on the degrees of state of the input and the output depends on the state of the input and rate of change of this state. In other words, a fuzzy logic system works on the principle of assigning a particular output depending on the probability of the state of the input.

Fuzzy Logic was developed in 1965 by Lotfi Zadeh at the University of California, Berkley as a way to perform computer processes based on natural values rather than binary values. It was initially used as a way to process data and later began to be used as a control strategy.

Fuzzy logic works on the concept of deciding the output based on assumptions. It works based on sets. Each set represents some linguistic variables defining the possible state of the output. Each possible state of the input and the degrees of change of the state are a part of the set, depending upon which the output is predicted. It works on the principle of If-else-the, i.e. If A AND B Then Z.

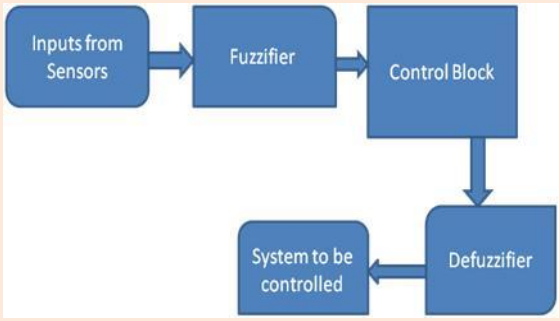
Suppose we want to control a system where the output can be anywhere in the set X, with a generic value x, such that x belongs to X. Consider a particular set A which is a subset of X such that all members of A belong to the interval 0 and 1. The set A is known as a fuzzy set and the value of fA(x) at x denotes the degree of membership of x in that set. The output is decided based on the degree of membership of x in the set. This assigning of membership depends on the assumption of the outputs depending on the inputs and the rate of change of the inputs.

These fuzzy sets are represented graphically using membership functions and the output is decided based on the degree of membership in each part of the function. The membership of the sets is decided by the IF-Else logic.

Generally, the variables of the set are the state of the inputs and the degrees of changes of the input and the membership of the output depends on the logic of AND operation of the state of the input and the rate of change of the input. For a multi-input system, the variables can also be the different inputs and the output can be the possible result of the AND operation between the variables.

Fuzzy Control System

A fuzzy control system consists of the following components:



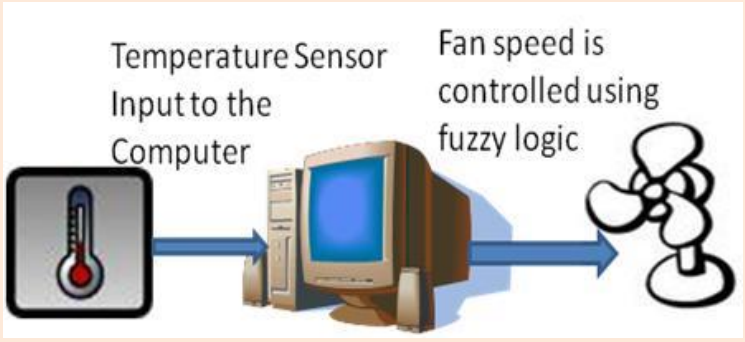
A Fuzzy Logic Control System

A Fuzzifier which transforms the measured or the input variables in numerical forms into linguistic variables.

A Controller performs the fuzzy logic operation of assigning the outputs based on the linguistic information. It performs approximate reasoning based on the human way of interpretation to achieve control logic. The controller consists of the knowledge base and the inference engine. The knowledge base consists of the membership functions and the fuzzy rules, which are obtained by knowledge of the system operation according to the environment. The Defuzzifier converts this fuzzy output to the required output to control the system.

Suppose you want to control the speed of the fan depending on the temperature of the room. For a normal layman if the temperature of the room is such that he/she feels too hot, then the fan speed is increased to the full value. If he/she feels a bit hot, then the fan speed is increased moderately. If he/she feels too cold, the fan speed is decreased drastically.

This is how we can achieve this:



Controlling Fan Speed based on Temperature Input

- The temperature sensor measures the temperature values of the rooms. The obtained values are taken and then given to the fuzzifier.
- The fuzzifier assigns linguistic variables for each measured value and the rate of change of measured value.

For example, if the measured value is 40^0C and above, then the room is too hot

If the measured value is between 30^0C to 40^0C, the room is quite hot

If the measured value is 22 to 28^0C, the room is moderate
If the measured value is 10 to 20^0C, the room is cold
If the measured value is below 10, the room is too cold.

- The next step involves the functioning of the knowledge base which contains the information of these member functions as well as the rule base.

For example, if Room is too hot AND the room is getting heated up rapidly, then set the fan speed to High
If Room is too hot AND the room is getting heated up slowly, then set the fan speed to less than High.

- The next step involves converting this linguistic output variable into numerical variables or logical variables used to drive the fan motor driver.
- The final step involves controlling the fan speed by giving proper input to the fan motor driver.

Chapter-6

Technical Magazine

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Basic Science & Humanities

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1. Mr. Debashis Banerjee (HOD in-Charge- BSH)
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Internet Security

Author: Mrinal Tudu (2nd SEM, CST)

Cyber Security Challenges of Virtual Reality and Augmented Reality

When we think of virtual and augmented reality, we think of media, entertainment and breakthroughs in education, healthcare and various industries. However, there is one more thing we should be thinking of: the potential security risks accompanying these technologies.

New Technologies–a Tempting Target for Cyber Criminals

The pattern is clear: as soon as a new technology emerges, unscrupulous persons will try to take advantage of it for personal gain. This was true for the internet, smart phones, social media networks and online games, and it is quite likely that cyber criminals will soon start targeting virtual reality and augmented reality apps, platforms and devices.

Hackers will find ways to exploit vulnerabilities in virtual and augmented reality technology and will use them to infect devices and steal personal data and other types of sensitive data stored in the users' devices.

It is important to understand these vulnerabilities and find solutions for them. These are the most sensitive aspects we have identified so far (but the list is still open):

1. Ransom ware Risks

Hackers may gain access to a user's virtual/augmented reality device and record their behavior and interactions in the AR or VR environment. Later on, they may threaten to release these recordings publicly unless the user pays a ransom.

This is a sensitive situation–especially for public personalities who need to maintain a certain image. But it can also be embarrassing for regular individuals, who do not want to see their game play and other VR/AR interactions made public.

2. Fast Releases Shortcut Security Checks

There is constant pressure on virtual and augmented reality device and content producers to come up with new releases. The public is impatient and wants new games, as well as improved and more realistic VR/AR interactions.

Hurrying up to launch a product may come at the expense of full security checks and testing. The market may be invaded by products and apps with undiscovered vulnerabilities. These products will be undoubtedly targeted by hackers, who will soon discover these vulnerabilities.

3. Gaining Control of Devices

What happens when users are targeted while they use virtual/augmented reality devices, with the malicious intent of harming them? It is quite possible, as we've seen in the past. Gaming website Kotaku recently brought back to memory the 1997 episode of Pokémon that contained flashing strobe lights, causing seizures in almost 700 Japanese children.

Let us imagine the potential harm that can be brought to people in the deeply immersive environment of augmented reality and virtual reality. AR/VR device manufacturers have a huge responsibility to safeguard their devices against hacking.

4. Interference with AR Medical Devices

Augmented reality and virtual reality have already become a part of healthcare. Medical students, doctors and nurses use VR and AR devices and apps for training and even treating patients.

Should such a device or app become hacked, the cyber criminals could cause untold harm to unsuspecting patients, and demand huge amounts of money from hospitals to give them back control over these devices.

5. Sabotaging VR/AR Shopping Apps

Ecommerce websites are already under fire by hackers who attempt to steal their customers' card details. It is only a matter of time until they start hacking retailers' augmented reality and virtual reality shopping apps.

After all, customers have their cards and mobile payment solutions already recorded in their user profiles. Thus, hackers may gain access to these and deplete accounts silently, since mobile payment is such a seamless procedure.

These and many other security risks need to be dealt with urgently by virtual and augmented reality producers of devices and apps. The growth of new technologies and their increased popularity among people means that hackers will also develop an interest in these technologies. Without proper security practices in place, the virtual/augmented reality industry will become the victim of serious cyber attacks sooner than we may think.

Virtual Reality

Author: Abhijit Mondal & Sudip Mondal (2nd Sem, CST)

Virtual reality is simulated reality. Computers introduced us to the virtual world. In the virtual world one can assume any identity and no one will be the wiser. Such identities are called "avatars".

This is part of its attraction. But it also has its dangers. Many youngsters today live more in the virtual world than in the real world. This has made sociopaths out of some of them. They are so used to interacting with people in the virtual world that they no longer know how to interact with real people.

In face-to-faceencounters they may be shy and awkward. But their online personas might be the exact opposite. This is not conducive to form stable relationships with people in the real world. Computer games which are played on a computer or on a console system like the Sony Play station or Microsoft Xbox are a favorite with children and teenagers.

They spend many hours, even days, playing such games, sacrificing food and sleep. In short, it becomes an addiction. In China, such youngsters are sent to camps which are like de-addiction centers. These youngsters are known to get violent if they are not allowed to play these games

People play computer games to escape their mundane lives. Gaming allows them to live out their secret fantasies. They offer a world of excitement, challenges and non-stop action where one can indulge one's wildest fantasies. As it is a virtual world, one can inflict harm and kill enemies knowing that it is not real and therefore harmless.

But soon one finds that it is becoming increasingly hard to tear oneself away from the game and return to the real world. Even adults get addicted and they may quit their jobs and neglect their loved ones so that they can keep on gaming with single-minded obsession.

Lives have been wrecked by such addictions. The virtual world is also a place where unknown dangers lurk. Lonely women have been lured to their deaths by strangers whom they met on the net. Pedophiles on the prowl in the virtual world assume the identities of children to lure innocent children into their trap.

So, parents have to keep an eye on what their children are doing and who they are meeting on the net. Technology is only a tool. It is how we use it that matters. If we don't use it wisely, it can even destroy us.

Cyber Security

Author : Souvik Chatterjee (2nd Sem, CST)

Cyber-Security means protecting data, networks, programs and other information from unauthorized or unattended access, destruction or change. In today's world, cyber-security is very important because of some security threats and cyber-attacks. For data protection, many companies develop software. This software protects the data. Cyber-security is important because not only it helps to secure information but also our system from virus attack. After the U.S.A. and China, India has the highest number of internet users.

Cyber Threats

It can be further classified into 2 types. Cybercrime – against individuals, corporates, etc.and Cyberwarfare – against a state.

Cyber Crime

Use of cyberspace, i.e. computer, internet, cellphone, other technical devices, etc., to commit a crime by an individual or organized group is called cyber-crime. Cyber attackers use numerous software and codes in cyberspace to commit cybercrime. They exploit the weaknesses in the software and hardware design through the use of malware. Hacking is a common way of piercing the defenses of protected computer systems and interfering with their functioning. Identity theft is also common.

Cybercrimes may occur directly i.e, targeting the computers directly by spreading computer viruses. Other forms include DoS attack. It is an attempt to make a machine or network resource unavailable to its intended users. It suspends services of a host connected to the internet which may be temporary or permanent.

Malware is a software used to disrupt computer operation, gather sensitive information, or gain access to private computer systems. It usually appears in the form of code, scripts, active content, and other software. 'Malware' refers to a variety of forms of hostile or intrusive software, for example, Trojan Horses, rootkits, worms, adware, etc.

Another way of committing cybercrime is independent of the Computer Network or Device. It includes Economic frauds. It is done to destabilize the economy of a country, attack on banking security and transaction system, extract money through fraud, acquisition of credit/debit card data, financial theft, etc.

Hinder the operations of a website or service through data alteration, data destruction. Others include using obscene content to humiliate girls and harm their reputation, Spreading

pornography, threatening e-mail, assuming a fake identity, virtual impersonation. Nowadays misuse of social media in creating intolerance, instigating communal violence and inciting riots is happening a lot.

Internet Security

Author: Abhinaba Mitra, (2nd Sem, CST)

Although augmented reality (AR) and virtual reality (VR) are related, they are not the same. Augmented reality enhances our "completes" the real world by incorporating digital elements (visual, auditory, or sensory) into it. The popular game Pokemon Go is one of the most well-known examples of augmented reality in recent years.

Virtual reality, on the other hand, creates its cyber environment rather than adding to the existing world. Instead of viewing content on a screen, virtual reality is typically experienced through an interface, such as headphones or glasses.

Mixed Reality (MR) is similar to AR but takes it a step further by projecting 3D digital content. Users can interact with and manipulate both physical and virtual objects and environments using MR; for example, a virtual ball can bounce off a real table or wall.

Augmented reality is the umbrella term for VR, AR, and MR (XR). Every year, the global market for XR hardware, software, and services expands. However, the rapid development of these technologies has led some consumers to wonder what privacy and security concerns they are causing.

AR challenges privacy

One of the most serious perceived risks of augmented reality is the loss of privacy. Because AR technology can see what users are doing, user privacy is jeopardized. AR collects far more information about who users are and what they are doing than social networking or other types of technology. The potential loss of privacy if a hacker gains access to the device is enormous.

Social Engineering Attacks

Given the potential for content unreliability, augmented reality systems can be effective tools for deceiving users via social engineering attacks. Hackers, for example, can manipulate a user's perception of reality by sending false signals or displaying false information to entice them to act on the hacker's behalf.

Through advertisements, AR hackers can embed malicious content into apps. Unsuspecting users can jeopardize AR security by clicking on advertisements directing them to hostage websites or malware-infected AR servers hosting untrusted images. Android wearables can be used by criminals to steal online credentials. Hacking can be a cyber threat for retailers who use augmented and virtual reality shopping apps.

Many customers have already entered their credit card information and mobile payment methods into their user profiles. Because mobile payment is a simple process, hackers can enter them and silently close accounts.

Denial of service is another potential threat to augmented reality security. One example is when users who rely on augmented reality for work are abruptly disconnected from the stream of information they receive. This is particularly concerning for professionals who rely on technology to complete tasks in critical situations, where a lack of access to information can have serious consequences. For example, a surgeon may lose access to critical real-time information about their AR glasses, or a driver may lose sight of the road if their AR windshield becomes black.

Communications between AR browsers and AR providers, AR channel owners, and third-party servers can be monitored by cyber attackers.

Man-in-the-middle attacks may result as a result of this. Hackers can gain access to a user's augmented reality device and record their interactions in an AR environment. If the user does not pay the ransom, they may threaten to publicly publish the recordings. This can be embarrassing or frustrating for people who do not want their augmented reality games and interactions to be made public. Physical damage is one of the most serious AR security flaws for **AR wearables.**

Although some wearables are more durable than others, all devices have physical flaws. It is critical to keep them operational and secure, such as preventing someone from leaving with a headset that can easily be lost or stolen. Virtual reality security threats differ slightly from virtual reality security threats because virtual reality is limited to the internal environment and does not involve interaction with the real physical world. Despite this, VR headsets cover the user's entire field of view, which can be dangerous if the device is compromised by hackers. They can, for example, manipulate content to make the user dizzy or nauseous.

Security Tools, Virus , Hacking

Author: Priyanshu Maji (2nd Sem, CST)

The computer has become a very important section of the banking exam. Today in this section, we are going to study about the security tools, virus, and hacking in computer.

Computer security which is also termed as cybersecurity nowadays is the protection against the damage of the hardware or theft, protection to software and the information stored in it as well as the disruption in the services they provide. The security tools of the computer on which it is based on our trust, authenticity, integrity, and privacy.

Threats and their classification into one of the Categories

Back doors: A cryptosystem or a back door in any computer system is the secret method of bypassing the security controls or normal authentication. Also, there may be several reasons for it to exist like including any original design or from poor configuration.

Direct access attack: An unauthorized user that is gaining the physical access resource and which is not available to him.

Spoofing: Spoofing of the user identity that describes a situation in which a program or one person successfully masquerades as another person with the use of false data.

Eavesdropping: It is the act of listening to a private conversation. Also, it typically happens between the hosts on a network.

Tampering: This describes a malicious modification of different products. Also, so-called 'evil' mind attacks and different security services that are planting on surveillance of the capability into the routers.

Phishing: This is the attempt to acquire various sensitive information like passwords, username, and card details directly from the users.

Good Computing Tips and Practices

Minimize your storage of sensitive information.

Protect your passwords and use those passwords that can be easily guessed by others.

Protect your information while using the email and internet.

Also, make sure that your computer has security patches and updates. Also, it should be protected with any kind of anti-virus.

Furthermore, secure your mobile devices and laptops, computers all the time.

Do not download or install any third party software or unknown programs.

Computer Viruses

A virus is considered as a parasitic program that infects another running, legitimate program. This program is called the host. To infect it, the virus modifies the host so that it contains a copy of this virus.

Cluster viruses: If a program is running from the infected disk, the program also causes the virus to run. So, the technique creates a sort of illusion that the virus uses to infect all the programs on the disk.

Boot sector virus: This kind of virus infects the boot record part of a hard disk. It allows for the actual boot sector data to be read through a normal startup.

Trojan horses: A trojan horse is a malicious program that also appears as friendly. Also, this virus does not make any duplicate of themselves and store it on the host's disk.

Robotics

Author: Shrasta Laha (2nd Sem, CST)

In recent years the mushrooming power, functionality and ubiquity of computers and the Internet have outstripped early forecasts about technology's rate of advancement and usefulness in everyday life. Alert pundits now foresee a world saturated with powerful computer chips, which will increasingly insinuate themselves into our gadgets, dwellings, apparel and even our bodies.

Yet a closely related goal has remained stubbornly elusive. In stark contrast to the largely unanticipated explosion of computers into the mainstream, the entire endeavor of robotics has failed rather completely to live up to the predictions of the 1950s. In those days experts who were dazzled by the seemingly miraculous calculation ability of computers thought that if only the right software were written, computers could become the artificial brains of sophisticated autonomous robots. Within a decade or two, they believed, such robots would be cleaning our ours, mowing our lawns and, in general, eliminating drudgery from our lives.

Obviously, it hasn't turned out that way. It is true that industrial robots have transformed the manufacture of automobiles, among other products. But that kind of automation is a far cry from the versatile, mobile, autonomous creations that so many scientists and engineers have hoped for. In pursuit of such robots, waves of researchers have grown disheartened and scores of start-up companies have gone out of business.

It is not the mechanical "body" that is unattainable; articulated arms and other moving mechanisms adequate for manual work already exist, as the industrial robots attest. Rather it is the computer-based articial brain that is still well below the level of sophistication needed to build a humanlike robot.

Nevertheless, I am convinced that the decades-old dream of a useful, general-purpose autonomous robot will be realized in the not too distant future. By 2010 we will see mobile robots as big as people but with cognitive abilities similar in many respects to those of a lizard. The machines will be capable of carrying out simple chores, such as vacuuming, dusting, delivering packages and taking out the garbage. By 2040, I believe, we will nally achieve the original goal of robotics and a thematic mainstay of science ction: a freely moving machine with the intellectual capabilities of a human being.

Reasons for Optimism

In light of what I have just described as a history of largely unfilled goals in robotics, why do I believe that rapid progress and stunning accomplishments are in the offing? My condense is based on recent developments in electronics and software, as well as on my own observations of robots, computers and even insects, reptiles and other living things over the past 30 years.

The single best reason for optimism is the soaring performance in recent years of mass-produced computers. Through the 1970s and 1980s, the computers readily available to robotics researchers were

capable of executing about one million instructions per second (MIPS). Each of these instructions represented a very basic task, like adding two 10-digit numbers or storing the result in a specied location in memory.

In the 1990s computer power suitable for controlling a research robot shot through 10 MIPS, 100 MIPS and has lately reached 50,000 MIPS in a few high-end desktop computers with multiple processors. Apple's MacBook laptop computer, with a retail price at the time of this writing of $1,099, achieves about 10,000 MIPS. Thus, functions far beyond the capabilities of robots in the 1970s and 1980s are now coming close to commercial viability.

For example, in October 1995 an experimental vehicle called Navlab V crossed the U.S. from Washington, D.C., to San Diego, driving itself more than 95 percent of the time. The vehicle's self-driving and navigational system was built around a 25-MIPS laptop based on a microprocessor by Sun Microsystems. The Navlab V was built by the Robotics Institute at Carnegie Mellon University, of which I am a member. Similar robotic vehicles, built by researchers elsewhere in the U.S. and in Germany, have logged thousands of highway kilometers under all kinds of weather and driving con-ditions. Dramatic progress in this field became evident in the DARPA Grand Challenge contests held in California. In October 2005 several fully autonomous cars successfully traversed a hazard-studded 132-mile desert course, and in 2007 several successfully drove for half a day in urban traffic -conditions.

In other experiments within the past few years, mobile robots mapped and navigated unfamiliar ofce suites, and computer vision systems located textured objects and tracked and analyzed faces in real time. Meanwhile personal com-puters became much more adept at recognizing text and speech.

Still, computers are no match today for humans in such functions as recognition and navigation. This puzzled experts for many years, because computers are far superior to us in calculation. The explanation of this apparent paradox follows from the fact that the human brain, in its entirety, is not a true programmable, general-purpose computer (what computer scientists refer to as a universal machine; almost all computers nowadays are examples of such machines).

To understand why this is requires an evolutionary perspective. To survive, our early ancestors had to do several things repeatedly and very well: locate food, escape predators, mate and protect offspring. Those tasks depended strongly on the brain's ability to recognize and navigate. Honed by hundreds of millions of years of evolution, the brain became a kind of ultra sophisticated—but special--purpose—computer.

The ability to do mathematical calculations, of course, was irrelevant for survival. Nevertheless, as language trans-formed human culture, at least a small part of our brains evolved into a universal machine of sorts. One of the hallmarks of such a machine is its ability to follow an arbitrary set of instructions, and with language, such instructions could be transmitted and carried out. But because we visualize numbers as complex shapes, write them down and perform other such functions, we process

digits in a monumentally awkward and inefcient way. We use hundreds of billions of neurons to do in minutes what hundreds of them, specially “rewired” and arranged for calculation, could do in milliseconds.

A tiny minority of people are born with the ability to do seemingly amazing mental calculations. In absolute terms, it’s not so amazing: they calculate at a rate perhaps 100 times that of the average person. Computers, by comparison, are millions or billions of times faster.

Cute Humans & foolish Technology

Author: Sayan Karamakar (2nd Sem, CST)

Humans and their endless greed, me and my endless assignments. The fusion of these gives birth to what you are about to read now. Humans are cute when they are infant, technology is foolish when they are in their infancy. When humans or technology is in their infancy, we predict their future albeit in a grand way. Social media, a few short years ago, was the tech of future. Now it just is you. And your device of course. Social media was supposed to bring us together in ways we could never imagine. And the predictors were correct. People are now talking to one another without the awkward discomfort of eye contact. I call that advancement.

Now the million-dollar question is - are we more connected with others.??, or are we just more connected to our devices? Social media was supposed to place us in a veritable town square, where we could engage one another with challenging ideas and debates. And instead, what we got were trolls. This is an actual tweet that I received. “Richard, no one wants to hear your stupid, ill-informed comedic views! I hope you get leporsy and die. Love, Mum.”

Now, the great thing about that tweet if you look at it, just like most trolls, it’s not that bad, because this woman wished “leporsy” on me instead of “leprosy,” and “leporsy” is not dangerous at all.

Along with trolls, we got a brand-new way of torturing teenagers — cyberbullying. A concept that my 80-year-old grandmother just can’t seem to wrap her head around.

“So, uh, did they hit him?”

“No, Grandma, they didn’t hit him.”

“Did they take his money?”

“No, Grandma, they didn’t take his money.”

“Did they put his face in the toilet?”

“No, Grandma, they didn’t –”

“Well, what did they do?”

“They attacked him on the internet.”

“Attacked him on the internet?”

“Well, why don’t you just turn off the internet?”

“Your whole generation is a bunch of wussies.”

She’s got a point. Yeah, she’s got a damn big point.

And I don’t even want to talk about what social media has done to dating. I was on Grindr until I found out it wasn’t a sandwich app.

A feat which Elon Musk and the whole world “thinks” he recently achieved - Driverless cars. Something that has already been around for many years, just without the assistance of computers.

Because for years, we have been driving while texting, putting on makeup, shaving, reading — actually reading — that would be me. And now TikTok or Instagram reels. People even take their phones into the bathrooms for God knows what kind of things they want to record. Just imagine holding your stomach in front of a public washroom for half an hour just because someone is in there with his phone making reels...!!!

So, what else do we have to look forward to? That's right, artificial intelligence. You know, there was a time when artificial intelligence was a joke. I mean, it's still now when you see teenagers asking Siri - "Hey Siri do you love me...?"

Stephen Hawking, Elon Musk, Albert Einstein and Bill Gates have all gone on record expressing grave reservations about artificial intelligence. That's like Buddha, Jesus, Moses and Muhammad coming together and saying, "Guy, guys — here's something we can all believe in."

You might want to go with that, is all I'm saying. We are actually teaching machines how to think, how to understand our behavior, how to defend themselves and even practice deception. What could possibly go wrong?

The one thing that's for sure: the creation always despises its creator. OK? The Titans rose up against the gods; Lucifer against Jehovah. I rose against my parents too but I was ruthlessly subdued. And anybody who has a teenager as a child, friend or neighbor has heard these words: "I hate you and you are ruining my life! I hate you!" Now just imagine that sentiment with a machine that can outthink you and is heavily armed.

The result? Absolutely.

What we need to do before we perfect artificial intelligence is perfect artificial emotions. That way, we can teach the robots or machines how to love us unconditionally, so that when they figure out that the only real problem on this planet is us, instead of destroying us — which, by the way, is totally logical — they will find us adorable — like baby poop.

"Oh my god, I just love the way you just destroyed the planet. I can't stay mad at you, you're so cute!"

Can't talk about this without talking about robotics, right? Remember when you thought robotics were cool? I remember when I thought robotics were cool, until I figured out that they were going to take everybody's place, from the delivery guy who plays Frisby with my delivery packets down to the heart surgeon who operates on my dad. Like what if there is an electricity problem? And I prefer ganging up on a human doctor rather than a robot. The feel of hitting the flesh is something which most Asian parents know. Its intoxicating. Why else would my mum hit me when I came back home at 10 smelling like women's perfume? The one thing, though, that is very disappointing about robotics is the holy grail of robotics, and it hasn't even happened. I'm talking about the robot girlfriend, the dream of one lonely geek in a windowless basement who vowed one day: "I am going to marry my creation." And there actually is a movement underway to stop this from happening, for fear of exploitation. And I, for one, am

against that movement. I believe we should have robot girlfriends. I just believe that they should come with a feminist protocol and artificial intelligence, so she can take one look at that guy and go, “I am too good for you. I’m leaving.”

And finally, I have to talk about bioengineering, an area of science that promises to end disease before it even begins, to help us live longer, fuller, healthier lives. And when you couple that with implantable hardware, you are looking at the next incarnation of human evolution. And all of that sounds great, until you figure out where it’s really going. One place: designer babies, where, no matter where you are on the globe or what your ethnicity, babies will end up looking like a top star. It would be disastrous for actors or any industry that depends on lookism.

A boy is surprised because he just found out both his parents are black.

Can you imagine him at a cocktail party in 20 years? “Yeah, both my parents are black. I mean, it’s a little awkward at times, but you should see my credit rating. Impressive, very impressive.”

Now, all of this seems scary, and everybody knows that it isn’t. Technology isn’t scary. Never has been and it never will be. What’s scary is us and what we will do with technology. Will we allow it to expose our humanity, showing our true selves and reinforcing the fact that we are indeed our brother’s keeper? Or will we allow it to reveal our deepest, darkest demons?

The true question is not whether or not technology is scary. The true question is: How human are you?

- Stressed by a mountain of books

References-

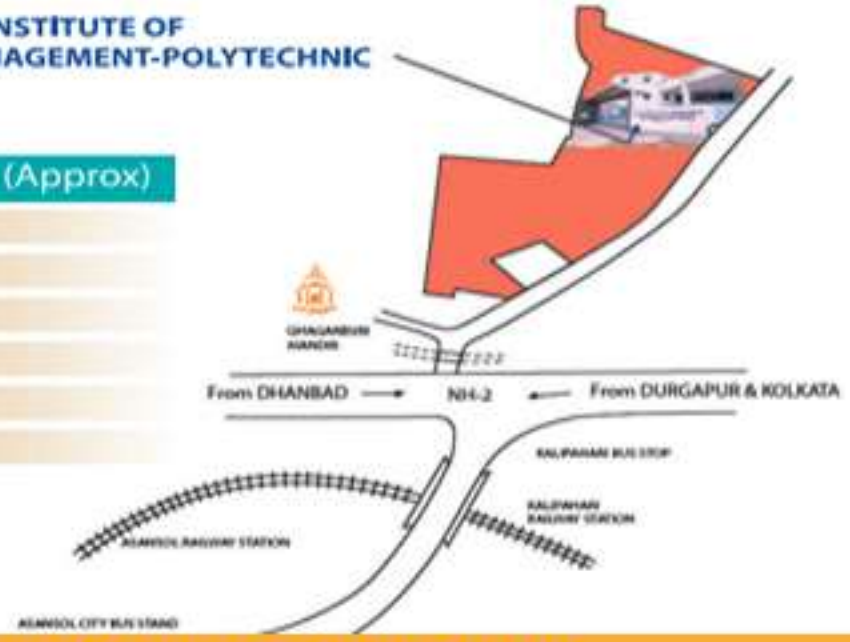
A funny look at the unintended consequences - Comedian Chuck Nice

Man Vs Machine - dwayneperkins

ASANSOL INSTITUTE OF ENGINEERING AND MANAGEMENT-POLYTECHNIC

Distance from AIEM-P (Approx)

- Asansol Railway Station **5 Km.**
- Asansol City Bus Stand **3 Km.**
- Kalipahari More **600 Mts.**
- Durgapur **36 Km.**
- Kolkata **200 Km.**
- Dhanbad **75 Km.**



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