THE BYTE

IS WHERE WE START

OCTOBER 2017

H&S DEPARTMENT

where roots are strengthened

ARTIFICIAL INTELLIGENCE

The future is here

ISSUE NO 02

H&S DEPARTMENT MENTOR PROFESSOR'S MESSAGE

I am captivated by the efforts of the students and Faculty of the department of "Humanities and Sciences" for bringing out the second edition of the technical magazine "THE BYTE". It is a proud moment for First Year students and faculties as well to release the second edition of the technical magazine followed to the first successful edition. The technical magazine has always been a great medium to create and enhance interests and attract every individual towards latest technical updates and "THE BYTE" is a great initiative.

This technical magazine has been creating a platform to enhance background knowledge through non-fiction and practical informational reading. Normally Technical Magazines are for the department and contribution from students of that department; i.e., department magazines are more inclined towards their own domains, whereas First Year Magazine is to promote culture and interview department ideas at first year itself. This will provide a platform for inter-discipline project ideas and will help to nurture student's minds for inter-disciplinary things. Also, students will realize the importance of all subjects as FE students always has a doubt of learning subjects not relating to their field.

I would like to congratulate all students, teachers and everyone involved in bringing out the second edition of "THE BYTE". I wish all the students a great success in their endeavours!

~ DR. RAJNI BAHUGUNA

F.E. INCHARGE MESSAGE

The H&S department of TCET, keeping the betterment and growth of First Year students in mind, has successfully been organizing various technical as well as non- technical events in the form of projects, workshops, and paper presentations. This initiative of technical magazine 'THE BYTE' which was started In the previous year has become one more platform for first-year students to participate and put forward their technical and creative skills in the form of articles and new endeavours in their technical journey. It is a great opportunity for first-year students to showcase their talent and enhance their aptitude and analytical skills as well as a great learning and knowledge improving opportunity. I congratulate the editorial team that has proven its worth by giving the magazine a fresh and grand look yet again. I wish all students all the very best and wish them a successful and bright future

~ DR. VIVEK MISHRA

ACTIVITY IN- CHARGE'S MESSAGE

I am really ecstatic to see that the H&S Department faculty and new TCETians have come out with the most awaited second edition of the technical magazine, “THE BYTE” beautifully! TCET has always given an opportunity to students by conducting different programmes to present their knowledge and skills in curricular, co-curricular and extra-curricular activities. The Department of Humanities and Sciences has the youngest minds and they came out with such innovative ideas and have expressed them in “THE BYTE”. This technical magazine has given an opportunity for students and faculty alike for expressing their talent in the form of articles. I hope that “THE BYTE” continuous to provide an open and creative platform for students to explore new ideas and present it in the best possible way. This will definitely provide the strong foundation inculcate self-confidence and steer assurance of our budding engineers and inspire them in ways that they are going to be grateful for in the future. I sincerely wish that all my students will contribute to the nation’s wealth and excel in their life!

~ DR. RAJNI BAHUGUNA

FACULTY IN-CHARGE MESSAGE

We are extremely grateful to express my views for the second successive edition of “THE BYTE!” This technical magazine is a student created a platform for and by all the first year students to encourage and provide an open and official platform and expose the students to the world of research at such a young age to encourage them to take an active part in such opportunities. This magazine has been a productive technical material and subsidiary skill developing tool.

And one of the most important aspects we derive from this stupendous effort is that it is capable of bringing out the various technical and analytical skills of the budding engineers. In such competitive world, it is necessary for the students to take part in every opportunity they are provided with so that they could improve their technical skills. Therefore, All the first year students have been given another opportunity of contributing to the second edition of “THE BYTE!.

We also take this opportunity to congratulate and applaud the coordination and efforts of the editorial committee for coming up and keeping the Legacy of “THE BYTE” first edition with the new and improved edition of “THE BYTE!” second edition.

As, “THE BYTE IS WHERE WE START”, The Byte is where you all first-year students have started.

~ FACULTY IN-CHARGES

H&S DEPARTMENT

PREFACE

To endeavour and to provide a strong base in Engineering and Technology where students, faculty, and staff work collaboratively to expand knowledge in the basic disciplines of providing a foundation that is appropriate to their career goals, equipping well with knowledge and skills that will allow them to function as responsible and contributing members of society.

DEPARTMENT VISION

"The Department of Humanities and Sciences shall strive to provide powerful educational effectiveness by linking facts, theory, inquiry, discovery, and solutions to real-world problems thereby providing a sound foundation to the undergraduate students."

DEPARTMENT MISSION

To endeavour and to provide a strong base in Engineering and Technology where students, faculty, and staff work collaboratively to expand knowledge in the basic disciplines of providing a foundation that is appropriate to their career goals, equipping well with knowledge and skills that will allow them to function as responsible and contributing members of society.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: To provide students with a strong foundation in mathematical, scientific and engineering fundamentals necessary to identify, analyze and solve real-life problems and to prepare them for graduate studies in their specific domain.
PEO2: To prepare students for a successful career in Indian and multinational organizations, by assessing current and emerging technologies.
PEO3: To develop the ability amongst students to synthesize data and technical concepts from applications to product design.
PEO4: to encourage students to identify and bridge gaps between the curriculum and industry requirements.
PEO5: To provide opportunities for students to collaborate and work in teams on multidisciplinary projects for accomplishing common goals.
PEO6: To motivate and prepare students for higher studies and specializations.
PEO7: To develop excellent written and oral communication skills, including presentation skills and technical writing for effectively interacting with clients, customers, co-workers, and managers.
PEO8: To promote awareness amongst students for life-long learning and to inculcate in them professional and ethical attitude, good leadership qualities and commitment to social responsibilities.

PROGRAMME OUTCOMES

PO1: Ability to apply knowledge of mathematics (differential equations, vector calculus, complex variables, matrix theory, probability theory), science (physics, chemistry, EVS etc.), and engineering (electrical, electronics, mechanical etc.)
PO2: Ability to design and perform experiments as well as analyze and interpret data.
PO3: Ability to design, simulate and test a system to meet the desired specification.
PO4: Ability to apply the knowledge of current techniques, concepts, skills, and modern tools for the solution of engineering problems.
PO5: Ability to function in teams on multidisciplinary projects.
PO6: Ability to communicate effectively in both oral and written form.
PO7: Ability to understand the impact of engineering solutions in a global/societal context.
PO8: Ability to recognize the need for and ability to engage in lifelong learning and understanding of professional and ethical responsibilities.
PO9: Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
P10: Ability to participate and succeed in competitive examinations like GATE, GRE etc. and also other professional examinations at various levels

PSO 1 Develop the ability to understand, demonstrate, identify, analyze and apply the skills and knowledge gained from foundational courses of humanities, sciences and engineering , and relate these fundamentals with core subjects in the relevant field.
PSO 2 Understanding basic skills and principles of engineering by developing and engaging them in life-long learning with effective skills inculcating quality of reasoning, logic, analysis and communication.
PSO 3 Cultivate the ability to work in teams and learn by participating in Technical Events and Social Welfare Programs and develop the attitude for working productively as an individual and in cross disciplinary teams to become better citizens in multicultural world.

FROM THE EDITOR'S DESK

The second edition of The Byte is even fresher than the first edition setting up new milestones for the future editions. We couldn't be any prouder releasing this magazine with the dreams and aspirations of our entire department including the variety the Byte always promises to offer, the plate will always be full of articles one would never expect. Still as proud as last year with the sole motive of the magazine being fulfilled by pouring life into the ideas of the first years and seeing to that they get the platform they need to showcase their skill-set and be who they truly want to be. Hoping our efforts match your interests and wishing everyone a pleasant and productive time reading this magazine

SIGNING OFF WITH LOVE
THE EDITORIAL DEPARTMENT OF THE BYTE 2017=18

CONTENTS

COMPRESS. CONCISE. CONTROL

NANOTECHNOLOGY

At some point, everyone of us must've heard about Nanotechnology, the one which consists of small nano dimensional parts. Its the next level technology, A technology of 21st century in real sense. Nanotechnology is a new branch of science and technology of small things that are measured in less than 100 nm. It is the branch which deals with dimensions and tolerances of less than 100 nm. This definition refers to number of dimensions of materials which are inside nanoscale (<100nm). dimensions between 1 to 100 nanometer are referred to nanoscale.

It is a study of extremely small things that can be used across many fields such as Chemistry, physics, material science, and engineering. The idea and concept behind nanotechnology started with a talk entitled `There's plenty of Room at Bottom '. Nanotechnology involve ability to see and control individual atoms and molecules. It is impossible to see atoms by a naked eye, it can be viewed by ideal concept microscope having high resolution and nanoscale.

Some fun facts: Nanoscale are one nanometer is billionth of a meter, there are 24500000 nanometer in an inch.

Engineers have found out a way to produce materials at nanoscale dimensions so that things have higher strength, light weight, and higher counterparts.

Nanotechnology consist of processing of separation, consolidation and deformation of materials by one atom or molecules. When anything is minimised to submit 100 nanoscale they attain new and unique properties regardless of what it is. Nanotechnology is functional in every field and brought a great change in various fields. Using nanotechnology researchers have customised size of molecules, so that it can be directly diagnosed into diseased cell. Nano patterning is used in medical imaging. Nanotechnology has increased capabilities of electronic devices and reduced weight and reduced power consumption.

Nanotechnology has brought high difference in food taste, food safety and benefited to human health. Nanotech solar cells are manufactured at low cost and are energy efficient. Nanotechnology is used in making sports goods, fabric, and also used in water treatment.

Nanotechnology is helping in upcoming economic business and other social phenomenon. Nanotechnology has great impact on security, the size of cameras has reduced and quality has also improved. Nanotechnology has a vast future ahead in future and we are constantly making break through in everyday life thorugh this amazing new branch of science.

By
Mukesh Choudhary
IT-A

NOT JUST SCI-FI ANYMORE

ARTIFICIAL INTELLIGENCE

What is Artificial Intelligence?
Artificial Intelligence, in its simplest terms, could be defined as the intelligence exhibited by machines, as opposed to that by humans. Thus, Artificial Intelligence is a way of inducing intelligence into man-made creations such as computers, computer-controlled robots, software, among others.
What contributes to Artificial Intelligence?
The major objective of Artificial Intelligence is to develop computer functions based on human intelligence and skill such as reasoning, logical approach, problem-solving, etc.
What are the Goals of Artificial Intelligence?
1. To create self-thinking systems which learn, explain and give advice to its users.
2. To create machines and systems with human intelligence which understand, think and behave like humans.
What are the applications of Artificial Intelligence?
Artificial Intelligence has played significant roles in various fields, some of which are-
1. Speech Recognition - Intelligent systems which are capable of hearing and understanding language and its various aspects such as accents, slang words, etc. work on artificial intelligence. Such systems have become widespread with the advent of the smartphone and are an excellent example of artificial intelligence around us.
2. Spying Aircrafts - Spying airplanes, as well as satellites, take photographs which are used to facilitate our knowledge of the largely unexplored spatial elements as well as the geography of the world. These systems are also largely used during warfare, to keep oneself updated about the actions of the enemy.
3. Gaming - Artificial Intelligence facilitates the 'Play Against Computer' feature in strategic games such as chess, tic-tac-toe, ludo, poker, etc.
2. In case of a breakdown, cost of repair may be very high.
3. Processes to retrieve lost data may be time-consuming and costly.
4. Intelligence is a gift of nature, and it might be considered by some as unethical to impart that gift to unnatural creations.
5. Machines are able to do the same task repetitively, without getting bored, but unlike humans, they do not learn with practice and experience.
6. Some jobs like that of doctors and teachers, along with knowledge, require an emotional connection with the person availing the service, which is impossible for a robot to inculcate.
7. Machines running on Artificial Intelligence lack creativity.
8. Robots replacing humans in so many fields leads to unemployment, posing a threat to the well-being of the society.

Therefore, even if Artificial Intelligence has a number of applications and advantages, it has a considerable number of disadvantages also. It is of vital importance to strike a balance between the two to ensure a peaceful and progressive existence of humans.

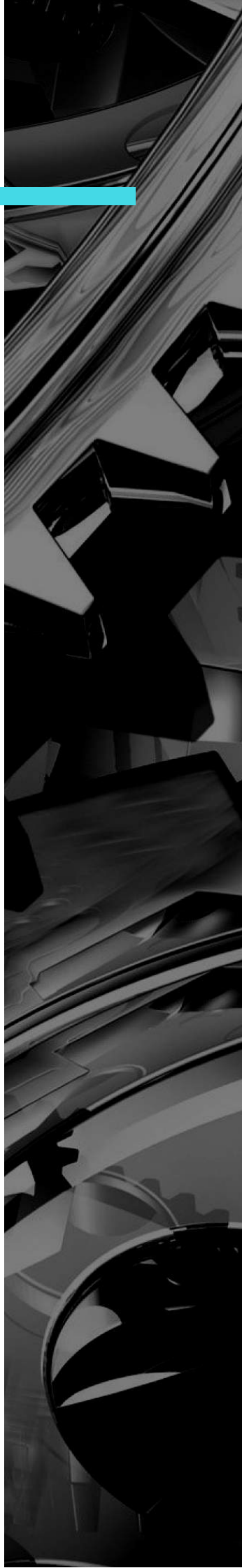
9. Reduced use of thinking of humans and over-dependent on machines for simple tasks might diminish their lateral thinking and multitasking abilities.

10. Ideally, humans are in control of machines. But accompanying the increased usage of Artificial Intelligence is the underlying fear of machines overtaking humans, which would lead to a brutal world and total chaos.

By: Aishwary Chauhan
EXTC A

TO BE EFFORTLESSLY PRODUCTIVE

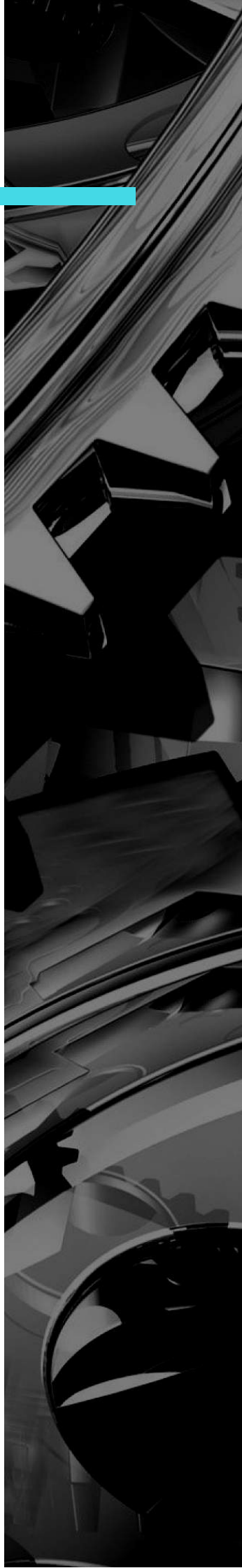
AUTOMATED CLEANING MACHINE



The aim of this project is to reduce human efforts and save time by using Automatic system for cleaning of household purposes. This project uses automatically programmed systems for cleaning of floors.
There are automated cleaning machine into the world-market, but in the name of Robot Vacuum Cleaner. The two machines are not exactly the same but the application of both is the same. First Robot Cleaner was produced by 'ELECTROLUX TRILOBITE', a Swedish company. Invented by Mr. James Dizon in the year 1996, it was not released to the market because of its high cost till the year 2002. As per the report by the year 2016, 20% of the vacuum cleaners were robots and by the year 2017, 23% of the vacuum cleaners are Robots. Still, the costing of Robotic Vacuum Cleaners is very high and is not affordable for the middle class residing in a metropolitan city. As the world market is exponentially moving towards advancement, especially in the field of inventions and science, one can even expect the cheaper robot-vacuum cleaner, probably in the coming 2 or 3 decades. This machine basically uses vacuum for suction of dust particles and other small wastes lying on the floor to be cleaned. The base of the machine is remote-controlled auto-programmed carrier, which helps in carrying the vacuum all over the surface to be cleaned.
For more advancement of the system, SONAR-sensing mechanism is installed on the top of the vacuum. This would sense the obstacle. An oscillating brush is installed at the backside of the machine for cleaning the adsorbed dust particles on the cleaning surface. This machine consists of mainly four major parts (sections) -
The Vacuum Cleaner, the Remote controlled carrier, SONAR sensing mechanism, the oscillator brush.
Let us now look at each part in detail
-The vacuum cleaner consists of a plastic body, which is made up of six detachable parts. The DC motor which plays a major role in the working of the vacuum cleaner, three types of internal screen fillers of different sizes for the collection of different sizes of waste materials, while the last part of the vacuum consists of holes for air to be blown out from by the motor. The middle portion consists of three types of screens, generally fine, intermediate, and coarse. The front parts consist of a long pipe having 3.5 cm internal diameter at the opening end. It consists of a filter of size bigger than that of coarse screen.
WORKING:-
The Vacuum Cleaner -
The exhaust motor on the back end runs on the power supply of 12V battery. This exhaust forces the air out of the system, hence creating suction. Now according to Pascal's law, "The pressure inside a system remains constant." Hence, to maintain equilibrium of pressure, it would take

(suck in) air from the front Nozzle. Now since the dust is sucked in with air and also other garbage, it is separated by different screens of various sizes.
This remote controlled carrier works similarly as that of an R.C. controlled toy car. The main engine consists of two motors - one for empowering the last wheels of the carrier to move forward and backward and the second one for the turning mechanism of the system. The main engine draws power from the power supply and then actually waits for the command to be received from the remote-controlled unit. The command of movement can be given manually or by automatic programmed mechanism. Manual mechanism is by normal remote controlled mechanism of toy R.C. car. Automatic mechanism may be by some programmed mechanism.
Remote Controlled Carrier -
This is the most important part of the machine, as this makes it different from a normal vacuum cleaner. It consists of a remote controlled unit which receives commands for movement of the system. The main power supply of 12V Battery which powers up the main engine, the exhaust motor and also the oscillator motor for oscillating brush. It also consists of oscillator motor which is used to oscillate the brush for advance cleaning.
SONAR Sensing Mechanism -
Sound Navigation and Ranging mechanism is a technique which uses sound waves to determine the distance of any object from the source of sound. It consists of internal circuits for sensing the sound waves. It has two major parts transmitter and receiver for transmitting and receiving sound waves. Internal circuits are responsible for measuring the distance from obstacle . The transmitter transmits the sound waves. These waves travel along a straight path. It is then reflected from the obstacle and comes back to the SONAR sensor.

When the receiver receives these sound waves, the time required between the transmitting and receiving point is used to calculate the distance. The velocity of sound in air at room temperature is already fed into the mechanism. It is generally 343m/s. By knowing the recorded time difference and velocity, the distance from obstacle to source can be calculated by taking product of velocity and time. Distance of obstacle from source=Velocity of sound in air*time recorded.
A certain distance known as the alternating distance is set up initially onto the sensor (for e.g. 0.5). Once the distance is reached from the obstacle, the internal mechanism sends a single to the R.C. control unit in the carrier. Once the signal is received, it stops automatically until the obstacle distance increases or it is manually forced in the forward direction.
The Oscillator Brush Mechanism:-
The oscillator brush mechanism is used mainly to remove the adsorbed particles present on the surface. It consists of the oscillator motor and gears and spring action mechanism for oscillation of brush. This brush is used for advanced cleaning of the surface.
The working mainly includes the oscillation motor which draws power from main power supply. The motor consists of a shaft especially designed for oscillation of brush. The spring action helps to maintain oscillation. This improves the cleaning quality of the system.
COST REDUCTION:-
When we talk about costing of vacuum cleaners, a rough idea suggest at least 6000 bucks for the non-automated version, and the price will increase exponentially as we think of big brands and big names. If you think about automated, one minimum 50,000 bucks and that too with no brand sticker on it. Ours would not cost you more then 1000-1500 bucks, which is automated. The main cause of such low costing



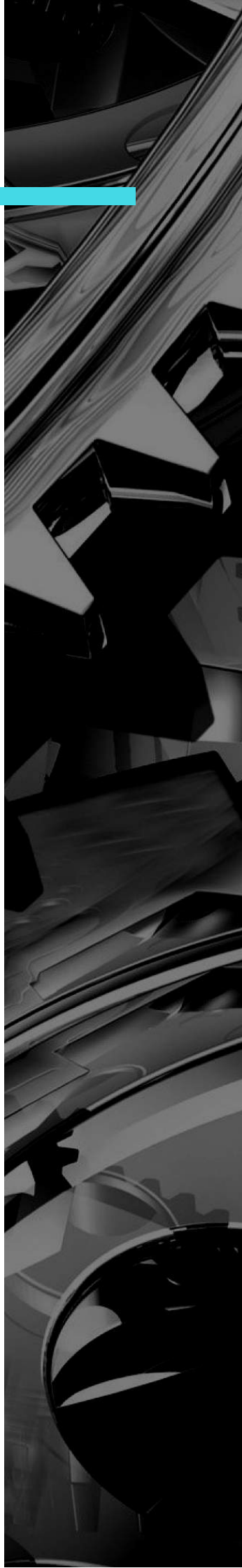
for our automated cleaning machine is that we have reused the things up to their optimum level, only the motors and the batteries are new and everything else is old. When we talk about costing of ultrasonic distance measurement sensor, it would cost us around 500-550 bucks which measure a wide range from 2cm to 4m, which is enough for our use.

BENEFITS:-

When we talk about the benefits of automated cleaning machine, the list doesn't consist of a number of points, as very limited points are more than enough to define its specialty. The word 'Automated' itself suggests that the machine would be self-programmable. As we think about cleaning by a vacuum cleaner a decade ago, we think of manually vacuuming the whole room. It becomes a very tiring job when we need to clean a big party hall. By this automated cleaning machine, we don't have to do this hectic work, only need to start and rest work will be performed by the machine itself. It can be applicable for the large scale cleaning processes such as that of stadiums, multipurpose party halls by replacing the human effort with the machine work. Almost at every possible place, we have tried to use recycled items and now motors of high moderated power are preferably used for increasing the efficiency of the machine, since motors are responsible for production of vacuum. Thus, by reusing everything in our project, we are contributing to sustainable development. In today's era of invention. 'Pollution' is one of the important aspects which you can't ignore. Our model is not polluting the environment in any terms. As our device is one of the cleaning devices, it directly or indirectly contributes to "SWATCH BHARAT ABHIYAN".

PROJECT PROPOSED BY:-
- Shubham Mishra
- Karan Gujaran
- Roshan Jha
- Dharmendra Jha

Branch – First Year, Mechanical A



A NEVER ENDING PROCESS

BIG DATA AND ITS MANAGEMENT

With the world having exponential growth in technology, the world has seen an incredible increase in the digital data as well, with the data consumption and storage of the users increasing to over 10 times in the past decade.

What is big data?

As the name suggests, Big data can be simply explained as a large amount of data, processed or unprocessed, structured or unstructured.

Industry analyst Doug Laney defines big data in terms of three Vs. They are –

1. Volume – Data is collected from various sources such as business transactions, social media, etc. Though the amount of data generated every second is huge, new sophisticated technologies have made the process of data collection easier.
2. Velocity – Data is created, collected and updated at an unprecedented speed.
3. Variety – Data occurs in all formats and is highly inconsistent when unprocessed.

It is not the amount of data that is important, but the way it is managed.

Why is it important?

Data collected from various sources is analysed for insights, for taking better decisions, for cost reduction, time saving, new product development, smart decision making, among others.

Who uses it?

Various industries make extensive use of data and statistics to improve their services and earn higher profits.

Some of them are –

1. Education – Data collection helps education institutions to keep a track of students' progress, understand student – teacher relationships through analysing trends, to implement better evaluation systems, etc.
2. Government – Analysis of data concerning population, natural resources, taxes, etc. helps the government manage utilities, prevent crimes, plan better welfare schemes, maintain transparency.
3. Banking – Analysing statistics helps banks and financial institutions formulate policies to boost the customers' satisfaction as well as to analyse the economic trends in the nation.

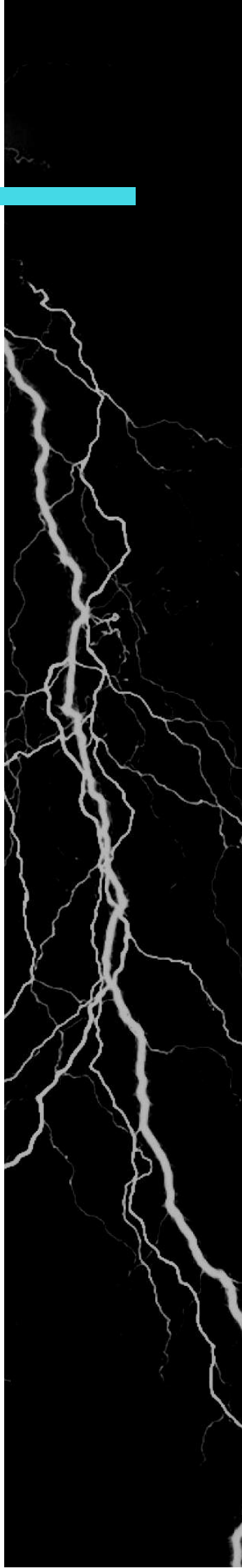
Where does it come from?

Data is collected from various sources, such as –

1. Publicly Available Sources – Government's data, open data portals, survey companies.
2. Social Media – Social media these days, provides insights into public opinion along with many data analysis tools for business pages.

With the increase in technological advances, the problem of data collection and preservation is gaining magnitude and needs to be addressed.

By:
Aanvi Tariharkar (EXTC B)
Aishwary Chauhan (EXTC A)



AN ALTERNATIVE SOLUTION

CONVERSION OF WASTE HEAT INTO ELECTRICITY

Introduction:
In this modern world, humanity has reached great heights in the field of technology. The rate of research is astonishing however advancement in tech comes along with some drawbacks which can't be ignored. For example, the automobiles which we use runs on fossil fuels. The internal combustion engines used are incredibly inefficient in turning fuel burnt into usable energy. Most of the gasoline powered engines have the efficiency in the range of 25% to 50% and for diesel powered engines its 45% in few cases. The unused heat is dissipated in the atmosphere. Converting this heat into some other useable form of energy will result in rise of the efficiency of the machine.
Why is it necessary to make a machine more efficient?
The second law of thermodynamics states that processes that involve the conversion of heat energy into other forms are irreversible. In layman's terms, once the fuel is combusted, then it can't be converted back to its original form. The law also states that all spontaneous processes results in increase of entropy of the surrounding. Hence efficiency is the key to minimize the loss of energy.
Approach:
Conversion of heat into electrical energy is achieved by thermoelectric effect. The thermoelectric effect is the direct conversion of temperature differences to electric voltage and vice versa. A thermoelectric device creates voltage when there is a different temperature on each side. Potential difference is induced when there is a heat flux through the plates of the module. The output voltage greatly depends upon the temperature difference applied on the plates. The image below describes the working of the generator.
Why thermoelectric generators over solar panels?
Such devices do not have any barriers over generation of energy. Unlike solar panels, these can be used 24/7 whereas generation of energy is independent of climatic conditions. Only a temperature difference is required to generate electricity which makes it feasible to be used indoors.
This is a clean source of energy as the unused heat is utilized in the generation of electricity.
Such modules are cost effective when compared to solar panels as solar panels require solar charge controllers either PWM (pulse width modulated) type or MPPT (maximum power point tracking) type for charging a battery. Such controllers are expensive when compared to TEGs. The size of these generators allows them to be used in small places. They are incredibly small in size, available in 4*4cm plates.
TEGs are durable and can withstand stress. On the other hand, solar cells are brittle and needs an extra casing for protection.
Applications:
1. TEGs along with dc-dc boost circuits can be added to coffee mugs so that the heat of the beverage can

be utilized to charge small electronic gadgets.
2. In the case of diyas and candles, most of the energy is wasted as heat. TEGs can be attached to candle stand to utilize the heat which is being wasted in this case.
3. In an automobile, the heat is carried from the engine by a coolant and is dissipated through a radiator. Just before the radiator, a square pipe can be added through which the hot coolant will flow and TEGs can be added on the walls of the pipe. Heat sinks must be added to the other side of modules to maintain a temperature difference.
4. Wearable tech like fit-bands, smart watches etc can use this effect to charge their internal battery with the help of the heat of the human body.
This project aims at making machines more efficient and takes a step towards sustainable development. It is a wise act to conserve energy as much as possible.

By: Rutvik Tondwalkar,
FE MECH B

THEY KNOW EVERYTHING

CYBER-SECURITY AND ONLINE PRIVACY

The ever-increasing social media platforms give people a way to connect with one another. People get together after decades, they find a way to express themselves to the whole world, entrepreneurs uses these to engage with customers, build their brands and communicate information with the rest of the world - the list goes on. As much fun and interesting it may be as we all know, with every good thing comes an equal quantity of bad things.

• VULNERABILITIES IN TODAY'S SOCIAL MEDIA PLATFORMS:

Many of the internet users have been called offensive names, many have had someone try to purposefully embarrass them, some have been stalked and then physically threatened, and many have been sexually harassed also. 40% of users think their online activities are private from everyone, a common misconception.

Now, why do these things happen? Cyber bullying happens for many of the same reasons as any other type of bullying, but it may be even more appealing because it can be done anonymously. Cyber bullying makes it easier for the bullies as they must avoid facing their victims and may have the impression that they won't get caught. The rise of the mobile app development over the years has in turn resulted in more of cyber security problems. Illegal downloads of mobile apps, even some play store apps containing malware designed to reveal the user's private information, replicate it on other devices, destroy user data or even impersonate the device owner. Number of scammers have got even bigger due to social media, taking advantage of the fact that people are more willing than ever to share personal information online via Facebook, Twitter, Foursquare and MySpace; lack of awareness just adds fuel to the fire.

• INTERNET'S A HUGE MARKET:

For example, whenever we send an email to someone, hypothetically say through G-mail; our emails are not actually not private, they are being read by the Google servers and analysed for information so that they can bombard our applications with advertisements of the same on our personal apps.

How they do it is by taping our emails through a computer program, find certain keywords and analyse the most used ones from a long bundle of data they have gathered and then sending the same to the most used online site in OUR LOCALITY by using our IP address.

• ATLEAST LET INTERNET STAY UNMONITORED:

There have been many incidents in the past years, where creators who have posted their work online have been mortified by others' opinions. The internet provides equal opportunity for sharing of one's opinions on an agenda, but most of them might be suppressed due to political and social fears due to the past incidents. Whether we are millennial or not, the latest research shows that employees, students or products

in market want more regular continuous input on their performance, rather than an annual assessment of how they are doing. Many times, people are not comfortable in revealing their actual Of these Sarahah was the trendiest app so far to get a constructive criticism. It works on the idea that the user signs up by creating an account, sends the link to whoever he/she wants feedback from; the link can be shared through social media sites and with that link, anyone can provide anonymous feedback to the user. But due to the nature of the app, the constructive criticism that the user expects might turn into cyber-bullying. It is a flaw in the app's nature itself, which should be known. There are also many chat forums, like 4Chan which allow you to start discussions on any topics and interested people join in and post their opinions anonymously, thus aiding constructive criticism. But these sites are cluttered with loads of inappropriate content, vulgar languages and less of healthy discussions.

• HOW CAN WE STAY SAFE ON THE INTERNET?

Aside from our ISPs and the sites that we visit, our internet traffic can be easily seen by eavesdroppers. Now with an increase in number of public Wi-Fi hotspots, there is also a need for people to understand that a public Wi-Fi hotspot is the most vulnerable network connection one can connect to.

The most used layer of security and privacy on the internet we can have are:

• VPN (virtual private network)
• Using Proxy Servers.
• Make sure you visit HTTPS sites instead of HTTP since the former is more secure.
• Change password for emails and social media platforms; to be sure you are safe you can keep your . password up to 16-digit long.

Garlic and Onion Routing, Use of network bridges, I2P anonymous proxy are some of the sophisticated methods used for being safe and anonymous on the Internet. Sadly, all these techniques are also being misused by a few people for illicit work, which is a matter of concern

• NET NEUTRALITY

Now that we have gone through the problems the internet is facing today, security-wise, let's see the problem that can totally change the internet we use today-

NET NEUTRALITY.

• Net neutrality is defined as a principle that states that all the Internet Service Providers and governments regulating the internet must treat all data as the same, without any differential discrimination.
• It is a basic principle that prohibits Internet Service Providers like Vodafone, Airtel, Reliance Jio, etc. from speeding up or slowing down or blocking any content, apps or websites.
• Net Neutrality is crucial for small business owners, start-ups and entrepreneurs, who rely on the open internet to launch their businesses, create markets, advertise their products and services, and reach customers. We need the open internet to foster job growth, competition and innovation. Also, the open internet allows people of colour to tell their own stories and organize for racial and social justice. When activists are able to turn out thousands of people in the streets at a moment's notice, it's because ISPs aren't allowed to block their messages or websites.

The Dark Web is a subset of the Deep Web, which is intentionally hidden from the conventional search engines. Dark web uses routing techniques like Garlic Routing and Onion Routing to keep their services hidden from people.

Dark Web sites are accessed by internet activists, for involving people doing all sorts of illicit works and hence are always closely monitored by the cyber police. Any change in regular bandwidth flow will alert them and then the police can easily track down criminal activities.In conclusion, the internet can be as scary as useful it is to us right now. India has entered the digital age, where most of the economic transaction happens through computers and so India has also become a potential target for data collection, online scams, etc. The people must be made aware about methods to browse the internet securely.

Pratimesh Majumdar FE IT A
Divyam Choudhary FE IT A
Tanya Gupta FE IT A
Prakash Jha FE IT A
Shubham Maheshwari FE IT A
Chinmay Dali FE IT A

LIFE IN NUMBERS

DOES NATURE SPEAK IN MATHEMATICS?

Mathematics is all around us. As we discover more and more about our environment and our surroundings we see that the nature can be described mathematically. The beauty of a flower, the majesty of a tree, human body and even the rocks upon which we walk exhibit nature's sense of symmetry.

THE FIBONACCI SEQUENCE

In mathematics, the Fibonacci numbers are the numbers in the following integer sequence, called the Fqonacci sequence, and characterized by the fact that every number after the first two is the sum of the two preceding ones.

0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144.....

By dividing a circle into Golden proportions, where the ratio of the arc length are equal to the Golden Ratio, we find the angle of the arcs to be 137.5 degrees. In fact, this is the angle at which adjacent leaves are positioned around the stem. This phenomenon is observed in many types of plants.

The Fibonacci numbers are Nature's numbering system. They appear everywhere in Nature, from the leaf arrangement in plants, to the pattern of the florets of a flower, the bracts of a pinecone, or the scales of a pineapple.

Hence, Golden Ratio, also called as the God's Ratio is 1.619, and the Golden angle is 137.5 degrees.

Fibonacci in Plants

Plants do not know about this sequence - they just grow in the most efficient ways. Many plants show the Fibonacci numbers in the arrangement of the leaves around the stem. In the case of tapered pinecones or pineapples , we see a double set of spirals – one going in a clockwise direction and one in the opposite direction. When these spirals are counted, the two sets are found to be adjacent Fibonacci numbers.

Branching plants also exhibit Fibonacci numbers. Again, this design provides the best physical accommodation for the number of branches, while maximizing sun exposure.

Fibonacci in Animals

The shell of the chambered Nautilus has Golden proportions. It is a logarithmic spiral.

A starfish has 5 arms. (5 is the 5th Fibonacci number

Humans exhibit fibonacci characteristics too the golden ratio see in proportions is the section of a finger

It is also worthwhile to mention that we have 8 fingers in total, 5 digits on each hand, 3 bones in each finger, 2 bones in 1 thumb, and 1 thumb on each hand.

The cochlea of the inner ear forms a Golden Spiral.

The ratio between the forearm and the hand is the Golden Ratio!

Fibonacci in outer space

It is merely breathtaking to see our own Galaxy to follow the Golden Ratio.

It is overwhelming to see how beautifully Nature goes hand in hand with a simple sequence. HOW CAN IT BE SO PRECISE? From tiny plants to our own Galaxy, this ratio seems to define a lot about the universe we live in.

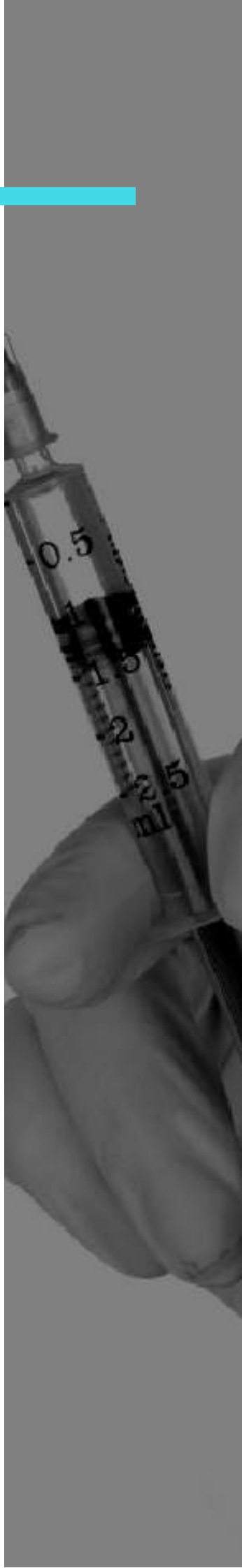
Hence, I conclude in agreement with Euclid, that GOD IS REALLY A GREAT MATHEMATICIAN.

ARTICLE BY,

ASAD LOHAR (F.E MECH-A)

REVOLUTIONIZING THE SCIENCE OF IMMUNOLOGY

GENOME VACCINES



Genomic Vaccines, composed of DNA or RNA instead of protein, promise a brighter and disease-free future of the world. "Genetic immunization is going to be a revolution in vaccines and now we've taken it to another level - genomic vaccination. We should be able to apply this technology to any pathogen," says Dr. Stephen Johnston, professor of internal medicine and biochemistry, UT South-western Medical Centre, Dallas.

Vaccines are made of killed or weakened pathogen or proteins from the pathogen, making our immune system recognise the antigens. Due to the action of B & T cells resulting in the formation of Memory Cells, the immune system attacks the pathogen the next time they come in contact. These standard vaccines are used in the prevention of deadly diseases, even cancer. Genomic Vaccines, on the other hand, enter cells and churn out the same proteins, bringing out the same effect, but with added advantages.

In the form of a major break-through, genomic vaccines promises fast manufacture for prevention of diseases on virulence or widespread of viruses such as Ebola or Zika. While normal vaccines take years to be formed - the HIV vaccine took 12 years - Genomic Vaccines are being ideated in months and being produced just as rapidly.

The process of producing Genomic Vaccines is also simpler and less expensive than conventional vaccines, which on the other hand, are fairly costly and require cold storage.

As a result, most of these are unavailable or too unaffordable in developing countries, which ironically need them the most.

The Genomic vaccines, being of the same basic form as that of the pathogen, can be changed readily if the causal agent undergoes mutation. Though most flu vaccines are revised annually, sometimes the vaccine does not match the viral strains when the flu season sets in. Through the new technology, this obstacle can be overcomed in a few weeks' time.

Genomics also makes way for new technique called Passive Immune Transfer. The researchers can identify people resistant to a particular pathogen, isolate the antibodies providing protection and design a gene sequence to induce the target's cells to produce the antibodies.

Though conventional vaccines have helped the world curb widespread diseases like Polio and Smallpox, they have failed with pathogen causing Malaria, Tuberculosis and Acquired Immuno Deficiency Syndrome (AIDS) caused by the Human Immuno-Virus (HIV). Unfortunately, these diseases form around half the infectious global infectious diseases.

To overcome these shortcomings of the traditional vaccine system, clinical trials for efficiency of Genomic Vaccines against diseases like Avian Influenza, Ebola, Hepatitis C, HIV, Breast and Lung Cancers, etc. are being conducted by the United States of America Government, academic laboratories, big and small companies alike. The American National Institute of Health has begun

a research program to see if this technology would work on the Zika virus.
Along with testing the Genomic Vaccines for their action against various diseases, scientists are also working for getting more efficient ways for the genome to enter the cell, to improve its stability under higer temperatures, etc. Though oral administration of these vaccines seems to be long way off, nasal administration is currently under study.
This high-speed technology is soon expected to be proven to be invaluable in the fight against rapidly increasing infectious diseases over the world.

BY
Shruti Mishra (Civil A)
Aishwary Chauhan (EXTC A)

INSIDE OUT OF

HOW DOES THE INTERNET WORK?

In today's world we can stay 3 hours without food and water but stay 30 minutes without Internet is too tough. But did you ever think how does it work? How some people get more speed and some get less? Why different terrain plans give different operators? Who is the owner of Internet? How does internet reach us?

So, we know that India is connected to the World through the internet, but we never thought how does internet work? We might have thought there are satellites, or there is a network connected somewhere, but you must not know that 99% internet works by the optic fibre cable, but we will now think we use internet on our mobile phones also, so where is the optic fibre connected. It is so because from whichever tower we get the network from that tower a network is connected to place you will send your data. The internet has to pass through 3 companies, the first one are the Tier 1 companies which have spread all the optic cables under the sea all around the world, this company connects the optic fibres all over the world from country to country, now this internet is to be divided from a country into a state and from state to a city and make it reach your local area. The cable connected is called optic cable or submarine cable, each cable has a thickness of your hair, these are covered up together in big thick sheaths to protect them from damage and every cable has a 100 Gbps speed that means every optic fibre has a bandwidth of 100 Gbps. The companies which lay these optic fibres are called Tier 1 companies or providers. In India, we have TATA communication, and when you will actually search on the internet you will get to know that how cables are laid under the sea all over the world, and all your internet is accessed with the help of these cables. The Tier 1 companies lay these cables with their investment and maintenance. If we see for India, the connection of cable has a main landing point which is at Mumbai, so if we consider the operators all over India like Reliance Jio, Airtel, Idea, etc. They have set-up all their towers and have made their own individual infrastructure.

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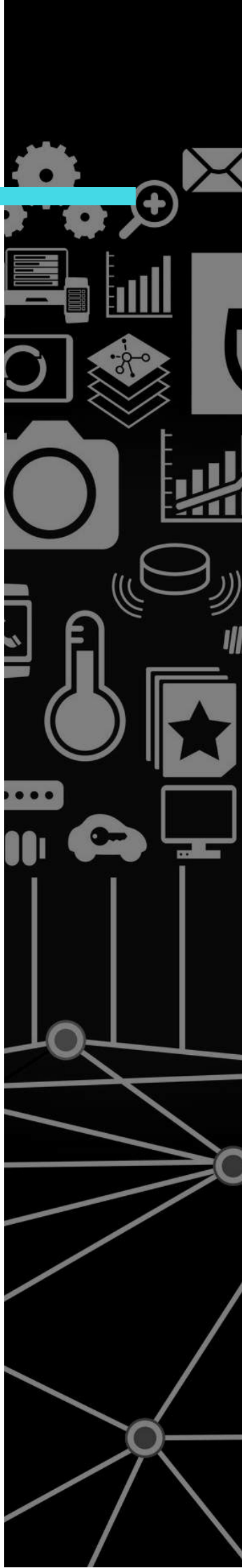
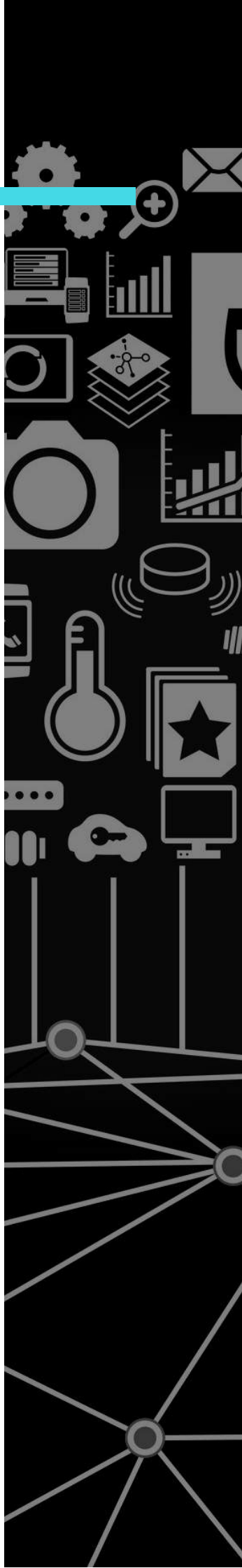
And when you try to connect the link or website outside India, the servers are lying in countries away from India, so the whole data traffic will come out from the landing point and reach the server wherever it is located. And the maximum data traffic that goes is from Mumbai, and there is Chennai next where there are a lot of cables connected through the sea to the nearby countries. All operators like Jio, Airtel, and Idea remove your data from landing point and make the data reach the place wherever its server is connected.



Now, if we talk about Reliance Jio, then it has played its own submarine cables between Asia, Africa and Europe so in this they get 40 terabytes capacity, and this is the reason why Reliance Jio was giving you free internet, because it had invested its money already once and if we visit the website of countries like Asia, Africa, and Europe then automatically they remove the traffic data from their cable and so even they don't have to pay anything.
Now the Tier 1 companies have played their cables and so they don't need to invest anything again since they have connected the world with each other so that there is a beginning of the internet. Now what happens is these submarine cables have a lifespan of not more than 25 years so they may break or else think if a shark eats it or it has a wear or tear, so for this we need a backup and for the backup they have already played many cables and they do not need to pay again and again, the internet is totally free, but they have invested for the connections.
Now, the Tier 2 companies say that since now you have brought everything till India, now give us something, so that we create a setup, take money from people and give you some money. So according to per Gb, Tier 1 companies get their money and automatically how much ever the Tier 2 companies take from them per Gb, the more they give us. And by the time it reaches us, the Tier 3 companies get in which work locally like Hathway, Tikona. This means Tier 3 buys from Tier 2 and Tier 2 buys it from Tier 1. So ultimately everything is free it's just that the cost needed is for setting up the cable.
Now, talking about Reliance Jio, Idea, etc. They also have set-up their towers and cables. Now the question is how did Reliance Jio bring 4G connectivity because it was working from last 5 years to lay the optic fibre inside India since Tier 1 has already played it outside India. Now Reliance Jio laid it inside India due to which we get a very good speed. Now assuming Reliance Jio has set-up a tower in your area of bandwidth 100 Mbps, but 100 Mbps is being used by all the phones in your area, taking it to be 20-20 Mbps, max to max 5 people can use the 100 Mbps. So their every tower is having a particular bandwidth in their wires and they divide these wires to reach your area and if many people are using Jio, due to a lot of rush your speed will get low. Every tower has a fixed bandwidth 100 Mbps or 1 Gbps, they have to divide it among this only, but indirectly for connecting outside India they have to pass the data traffic through the submarine cables only, like Google , it has its server outside India, so the traffic will exit through the submarine cable and reach its destination, but if we talk about India only, we have flipkart.com, amazon.com since it has a server of India only it does not go around the world through the submarine cable , hence even while making a website people recommend to use the Indian server so that we get the connectivity very quickly.
Now if at any time the submarine cable breaks the internet cuts they have already made backups, assuming the data was to be sent from Mumbai will now be sent from Cochin but the route that will be received from Cochin may be time-consuming since the data will take different routes and travel a lot. So there are a lot of things to be taken into consideration and to be managed. You don't have to do anything, you just have to use the internet, you will be provided your IP address and your traffic data will somehow to reach your destination.
So overall Internet is completely free only costing is of maintenance. And this how we get internet and now we know how it works.

TANVI PRADHAN
IT - B, ROLL NO. 17



THE FUTURE OF INTERNET

LIGHT FIDELITY

INTRODUCTION

Internet is used daily for various purposes (Google now processes over 40,000 search queries every second on average (visualize them here), which translates to over 3.5 billion searches per day and 1.2 trillion searches per year worldwide). The mode used by us for accessing internet is Wi-Fi or the broadband. Wi-Fi and broadband use the RF transmission for data transmission. The Wi-Fi signals or the speed of Wi-Fi to exchange our data reduces much when multiple or many users are connected to it. Nobody likes their internet slow. There are lots of transactions to be carried out on time or various works which demand our punctuality. To overcome these problems we have come across a new technology know as LIGHT-FIDELITY or LIFI.

Life the improved or optical version of Wi-Fi. The term was given by German physicist Hass Harald. Lifi uses the light spectrum for transmission in place of traditional radio transmission. The light spectrum is 10,000 times larger than the radio spectrum which also is crowded. Lifi provides a cheap alternative to internet access. It is faster than any regular broadband. The tests conducted gave the results that it can reach a speed of 224 gbps ,which is immensely high as compared to current networking scenario.

Lifi is more safe option for data as the data is available only when the lights are on. Thus, Lifi is a technology for the future. Lifi can be used for any internet supporting device. CONCEPTS and WORKING

LIFI uses light of wavelength between 375 nm to 780 nm as optical carriers for transmission. The two main components required are:-

a) A white bright LED which acts a transmitter.
b) A silicon photodiode with good response to visible light which works as receiver.

A string of data is generated by flickering LED in quick succession. The LED appear constant to the human eye by the virtue of fast flickering rate of the LED. The Li-Fi emitter system consists of 4 primary subassemblies:
a) Bulb
b) RF power amplifier circuit (PA)
c) Printed circuit board (PCB)
d) Enclosure

The PCB controls the electrical inputs and outputs of the lamp and houses. The micro-controller used to manage different lamp functions. A RF (radio-frequency) signal is generated by the solid-state PA and is guided into an electric field about the bulb. The high concentration of energy in the electric field vaporizes the contents of the bulb to a plasma state at the bulb's centre; this controlled plasma generates an intense source of light. All of these subassemblies are contained in an aluminium enclosure.

The bulb sub-assembly is the heart of the Li-Fi emitter. It consists of a sealed bulb which is embedded in a dielectric material. This design is more reliable than conventional light sources that insert degradable electrodes into the bulb [3]. The dielectric material serves two purposes. It acts as a waveguide for the RF energy transmitted by the PA. It also acts as an electric field concentrator that focuses energy in the bulb. The energy from the electric field rapidly heats the material in the bulb to a plasma state that emits light of high intensity and full spectrum.

There are various inherent advantages of this approach which includes high brightness, excellent colour quality and high luminous efficiency of the emitter – in the range of 150 lumens per watt or greater. The structure is mechanically robust without typical degradation and failure mechanisms associated with tungsten electrodes and glass to metal seals, resulting in useful lamp life of 30,000+ hours. In addition, the unique combination of high temperature plasma and digitally controlled solid state electronics results in an economically produced family of lamps scalable in packages from 3,000 to over 100,000 lumens.

The working of Li-Fi is very simple. There is a light emitter on one end, such as, an LED, and a photo detector (light sensor) on the other. The photo detector registers a binary one when the LED is on; and a binary zero if the LED is off. To build up a message, flash the LED many times or use an array of LEDs of perhaps a few different colours, to get data rates in the range of hundreds of megabits per second ADVANTAGES
• HIGHLY COST EFFICIENT WHEN COMPARED TO WIFI.
• HIGH SPEED AND 100 TIMES FASTER THAN WIFI.
• EASY TO INSTALL AND DOESN'T REQUIRE COSTLY INSTRUMENTS.
• MORE SECURED THAN ANY OTHER NETWORK AS THE DATA TRANSMISSION IS THROUGH LIGHT. LIGHT CANNOT PASS THROUGH WALL.
APPLICATIONS
• LIFI HAS VERY HIGH SPEED FOR DATA TRANSMISSION. IN VARIOUS RESEARCH INSTITUES AND DEFENCE UNITS WE NEED VERY FAST CONNECTIVITY. THESE NEEDS ARE EASILY MET BY LIFI.
• OPERATION THEATRE IS THE PLACE WHERE QUICK DECISIONS ARE REQUIRED. IN THIS MODERN WORLD, VARIOUS DOCTORS FROM VARIOPUS PART OF THE WORLD JOINTLY PERFORM AN OPERATION. THUS THEY REQUIRE VERY FAST INTERNET WHICH IS PROVIDED BY LIFI OR LIGHT FIDELITY.
• THE PLACE WHERE MANY ARE THINKING OF SOLUTION, LIFI IS THE BEST SOLUTION FOR IT. THE ISSUE IS INTERNET ACCESS IN AEROPLANES. WIFI IS NOT USED IN PLANES AS WIFI SIGNALS MAY INTERFERE WITH THE SIGNALS OF CONTROL STATIONS. LIFI PROVIDES FAST INTERNET THROUGH LIGHT LAMP OVERHEAD THE PASSENGER.
• THERE ARE VARIOUS UNDERWATER EXPEDETION CARRIED OUT TO FIND WHAT LIES BENEATH. THE MACHINES THAT ARE SUBMERGED USE LONG CABLES TO TRANSMIT AND RECEIVE DATA FROM THE CONTROLLER. CABLES LIMIT THE AREA COVERED BY THE MACHINES. USE OF LIGHT FOR TRANSMISSION IS VERY GOOD REPLACEMENT FOR IT AS LIGHT CAN TRAVEL LONG DISTANCES IRRESPECTIVE OF THE MEDIUM OF TRANSMISSION.
• LIFI CAN BE USED TO SEND QUICK MESSAGES IN THE CASE OF DISASTERS.
DISADVANTAGES
• THOUGH INSTALLATION IS CHEAP BUT IT REQUIRES WHOLE NEW INFRASTRUCTURE IN THE HOUSES OR OFFICES.
• THE VISIBLE LIGHT CANNOT PENETRATE WALLS AND OPAQUE THINGS. THUS THE LIFI SIGNALS ARE CONFINED TO A SINGLE ROOM.
• WHEN WE NEED TO USE THE INTERNET, WE NEED TO KEEP THE LIGHTS OF THE ROOM ON AND CAN'T WORK IN DARK.
• IT MAKES IMPOSSIBLE FOR THE PEOPLE TO DO ONLINE ACTIVITIES AT NIGHT WITHOUT USE OF LIGHTS
• LIGHT TRAVELS IN STRAIGHT LINE. THUS IF WE NEED THE ACCESS TO THER INTERNET WE NEED TO BE IN STRAIGHT LINE WITH THE TRANSMITING LIGHT SOURCE

CONCLUSION

If this technology becomes justifiably marketed then every bulb can be used analogous to a Wi-Fi hotspot to transmit data wirelessly. By virtue of this we can ameliorate to a greener, cleaner, safer and a resplendent future. The concept of Li-Fi is attracting a lot of eyes because it offers a genuine and very efficient alternative to radio based wireless. It has a bright chance to replace the traditional Wi-Fi because as an ever increasing population is using wireless internet, the airwaves are becoming increasingly clogged, making it more and more difficult to get a reliable, high-speed signal. This concept promises to solve issues such as the shortage of radio-frequency bandwidth and boot out the disadvantages of Wi-Fi. Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented technologies. Hence the future applications of the Li-Fi can be predicted and extended to different platforms and various walks of human life.

MITESH M DEODHAR
CMPN A 22

A WHOLE NEW LEVEL OF GAMING

LIQUIDSKY

Nobody knows about the future, we don't even know if future exists or not. Well but it doesn't matter, our present is a pure glimpse of the FUTURE. Every passing day the advancements in computer hardware are bringing new possibilities in gaming.

What is second generation gaming? X Box? PS5? P.C? Or V.R Headsets? Nah. Well of course not! I am talking about mobile devices! Yes I am talking about playing your Xbox, P.S-4 and P.C games right on your Android phone. Well, how is that possible? Answer to this question is Liquid Sky. Oops did I spell it wrong? Well NO.

So what is ' LiquidSky'?

LiquidSky is a software that turns your phone into an ultimate gaming console or P.C! Is it free? Well no, it's not free but it's better than buying a $1000 gaming P.C or console. Does it really turn our phone into a gaming P.C or console? Well obviously not, LiquidSky is a second generation gaming software it allows the gamers to play all their P.C and console games right on their phones either by using a controller or onscreen controls, is that it? No, it is far more than just a software that allows you to not only play games but basically after registering for LiquidSky ,the company provides a virtual or a cloud desktop which you can access through any device using LiquidSky, yes the company provides you a complete gaming computer running the latest windows 10 and having configurations that can run all of the latest and old games that you would like to play right on your phone or any other android based devices and you can install any of your work software to work on cloud and install any game on it to play it anytime, anywhere and anyhow. LiquidSky is something that sets a huge example in front of the world regarding what more can be done using cloud technology. Best thing about it is that only you can excess your virtual computer with your login credentials and so all your data is safe online in your cloud computer, not only that if you ask me I would recommend all to keep their confidential documents on LiquidSky virtual P.C because it makes more challenging for hackers to get to your documents since the hacker will have to hack through the firewalls of LIQUIDSKY and its other encrypted securities and then, particularly locating your P.C after getting into the LIQUIDSKY system would be a even bigger challenge since there are millions of virtual P.C that the company has in their database which will take a lot of time in particularly locating your specific P.C. So yeah if you ask me what is future then the future is people will be carrying their computer with them, right on their phone which will acquire zero storage of your phone since the whole computer would be on cloud technology.

Do we need to link our computer or laptop to the LIQUIDSKY servers in order to play on phone?

NO, you don't need your laptop or P.C, you just need to get yourself a membership with LIQUIDSKY and you have a P.C right on your phone without actually buying a P.C.

Is this software available for free?

Yes it's available on Play store for free and currently the company is working on making a software for iOS devices too.

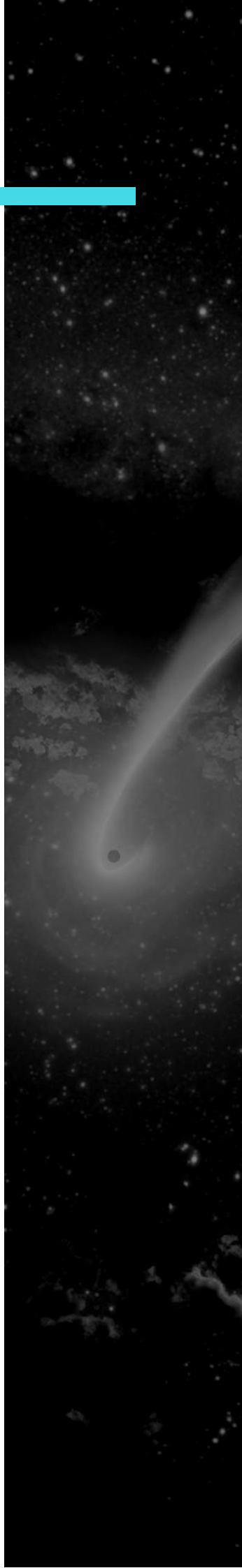
So which is a better choice 1000$ P.C or a couple of $'s membership?

My preference would go for LiquidSky membership because in order to play the future games you need to upgrade your P.C every year probably, but LiquidSky makes sure to keep your cloud P.C updated with upcoming new software and hardware so probably it's a better option than a $1000 P.C.

By
RONIT FOZDAR
CMPN-A FE
Roll no: 29

INTO THE DARKNESS

PHOTON EMISSION THROUGH A BLACK HOLE



It is commonly believed that a black hole sucks in everything and emits nothing. There are some theories given by scientists like Stephen Hawking that predict emission of matter through the event horizon but none talk about emission of a photon. In this article I intend to give a simple model to understand the above mentioned phenomena with the help of Quantum Tunneling and General Relativity.

What is Quantum Tunneling?

Let us consider a free particle which is trying to interact with a potential wall with potential V.

After striking the potential barrier the wave reflects back classically and some part of it is decayed into the forbidden region. This gives us a non zero chance of finding the particle on the other side of the potential wall. The same effect can be applied to a photon trying to escape a black hole which is travelling at high-speed and some photons can use their characteristic wave nature to tunnel out of the event horizon. Let us consider a Schwarzschild black hole with mass 3M ; M = Solar mass where is the Schwarzchild's radius. General Relativity predicts that singularities bend the space-time fabric and light that travels in a straight path is forced to move along a curved space-time. Imagine a photon spiraling down into a black hole.

After entering the event horizon, If under some special conditions it is able to reach the other side of the black hole then the event horizon starts to act as a potential barrier

The situation looks like quantum tunneling, although the potential inside the black hole is not zero and varies However, it is noted that the potential outside the event horizon is not constant and thechance decrease makes it impossible to detect such type of emissions. For real calculations one has to take into account the changing gravitational potential energy , bending of space-time, presence of a firewall around the black hole and other extreme conditions. This is an intuitive explanation of a very complex phenomena with suitable assumptions being made. The fact of the matter is that we get a non zero chance of finding the photon outside the black hole even though it posses less energy to cross the potential barrier of the event horizon.

Classical Analogue

When a pulse travels through a string made of two parts with different mass densities, one part of the pulse is reflected back at the junction and the other part is transmitted through the other part. If the second part of the string would have been a wall or a potential barrier with infinite potential then the wave would have been completely reflected , but due to different mass densities of the two parts of the string , one part of the wave gets reflected and the other part gets leaked even though To comprehend the entire phenomena, one has to have complete or thorough understanding of quantum physics, wave particle duality, classical gravity and some aspects of general relativity. For those readers who don't

have the requisite background of science can understand the effect in the following:

Imagine a string being attached to let's say a huge object like earth. When you give it a jerk, the pulse travels through the string but gets reflected by the earth which acts as a potential wall that does allow the wave to pass through it. It is important to note that some part of the wave will be transmitted to earth and it will vibrate a bit but that vibration would be impossible to detect. Now because we considered a solid object like string, which consists of particles it is not possible to detect it passing through earth. However, if we consider particles in form of waves and replace mass by energy using quantum mechanics and general relativity, one would expect some part of the wave to be transmitted through the potential barrier even though it has energy less than the potential wall.

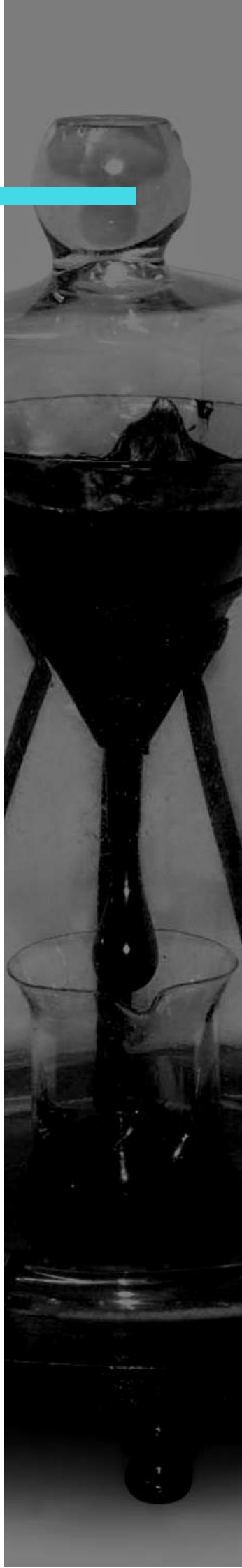
Thus with culmination of three principal theories of quantum tunneling, classical physics and general relativity one is able to explain that the probability of finding a photon outside a black hole's event horizon.

By
Navjyot Purohit
Mechanical B – 7

TO TRY IS TO LEARN

PITCH DROP EXPERIMENT

Have you ever thought? Why exactly do things exist in different phases such as solid, liquid, gas etc.?
We all learn things which were assumed/proved/discovered by great scientists but I'm sure you all must have thought your own set of assumption about those.
Just like this, Professor Thomas Parnell has its own set of explanations and assumptions about phases of substances. According to him, Solid state doesn't really exist, there's only liquid phase which exists. All solids are merely liquid substances with infinite viscosity.
To prove his points and assumptions he started Experiment which is today, World's longest experiments in terms of time which he named "PITCH DROP EXPERIMENT"
The pitch drop experiment is a long term experiment that is currently used to measure the flow of a piece of pitch over many years. Pitch is the name for any number of highly viscous liquids that appear solid, most common of them are bitumen. At room temperature, tar pitch flows at a very low rate, taking several years to form a single drop. For easy understanding, let's take an example of stalactites and stalagmites structure formation in the caves. (Please note, this example is just to explain structural but not scientific aspect)
University of Queensland experiment
The most popular version of the experiment was started in 1927 by Professor Thomas Parnell of the University of Queensland in Brisbane, Australia, for the purpose of demonstrating it to the students that some substances that appear solid are, in fact, very-high-viscosity fluids proving which was the main motive of this entitled longest experiment ever. Parnell poured a pitch sample which was heated before putting it into the sealed funnel and then it was allowed to settle for three whole years. In 1930, the seal at the neck of the funnel was cut in order to allow the pitch to start flowing. A funnel covered with the glass dome was then placed to display it outside a lecture theatre. During the experiment large droplets form and falls over almost after a period of decade.
On 28 November 2000, a drop fell and this allowed the experimenters to calculate that the pitch has a viscosity approximately 230 billion (2.3×1011) times that of water. As mentioned, it is recorded in Guinness World Records as the world's longest continuously running laboratory experiment, and it is predicted that there is enough pitch in the funnel to allow us to expect it to continue for at least another hundred years. This experiment is been predated other two still-active scientific devices, the Beverly Clock (1864) and the Oxford Electric Bell (1840), but each of these has experienced brief interruptions since 1937 which can become the reason of minor errors.Originally, this experiment was not carried out under any special controlled atmospheric conditions which mean that the viscosity could vary throughout the year with fluctuations in temperature which will add up to error. After some time, the seventh drop fell in 1988; after which air conditioning was added to the location where



the experiment takes place. The lower average temperature has lengthened each drop's stretch before it separates from the rest of the pitch in the funnel therefore calculations has to been expected to get fluctuations in the results and conclusion.

“I am sure that Thomas Parnell would have been flattered to know that Mark Henderson considers him worthy to become a recipient of an Ig Nobel prize. Professor Parnell's award citation would of course have to applaud the new record he had thereby established for the longest lead-time between performance of a seminal scientific experiment and the conferral of such an award, be it a Nobel or an Ig Nobel prize”.

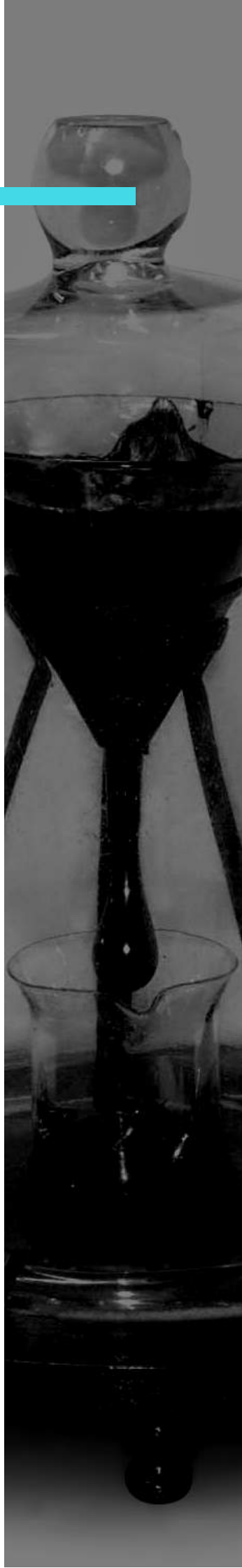
The experiment is currently monitored by a webcam but technical problems prevented the November 2000 drop from being recorded. The pitch drop experiment is planned for public display on 2nd Level of Parnell Building in the School of Mathematics and Physics at the St Lucia campus of the University of Queensland. Of which hundreds of, thousands of Internet users check the live stream each year and is attended by giant names of the world of science and technology, Students and many others.

On 23 August 2013, Professor John Mainstone died at the age of 78, following a stroke. After which the Custodianship of this experiment passed to Professor Andrew White.

On 17 April 2014, the ninth drop touched the eighth drop. However being still attached to the funnel.

On 24 April 2014, Professor White decided to replace the beaker holding the previous eight drops before the ninth drop fused to them. While the bell jar was being lifted, the wooden base wobbled and the ninth drop snapped away from the funnel.

By
Dipesh Sharma



A NEW DAWN

QUANTUM COMPUTERS

In the fast paced world of today, a life without computers is almost impossible to imagine. But human wants being unlimited, even the massive amount of processing power of traditional computers, it is unable to satisfy our unquenchable thirst for greater speed and more storing capacity. It is predicted that if we continue with the current usage of computer, by 2040, our computers would be unable to power all machines around the world.
Quantum Computers have a relatively small history, being first theorised less than thirty years ago. They are based on the strange abilities of subatomic particles to exist in more than one space at a time, thus performing certain calculations significantly faster than any silicon-based computer.
Traditional computers use bits while quantum computers, on the other hand, use 'qubits', which store much more information than just 1 or 0, due to existence in superposition. Thus, if conventional computers use bits present at two ends of a pole of a sphere, quantum computers utilize the entire sphere, making the operations quicker and the using less energy. Classical computers manipulate ones and zeroes to crunch through operations, but quantum computers use quantum bits or qubits. Just like classical computers, quantum computers use ones and zeros, but qubits have a third state called “superposition” that allows them to represent a one or a zero at the same time.
“We can say that one qubit, quantum object with d possible states may consist of several virtua l qubits including their interactions,” says Federov, one of the authors of the study conducted by Moscow Institute of Physics and Technology. Here, d stands for different energy levels, while the term ‘level’ refers to the values of possible energy.
D-wave quantum computers are said to be a 100 million times faster than normal computers. IBM claims that commercial quantum computer systems, with upto 50 bits in the next few years would be made available.
Though the basic quantum computer is formed by scientists, a practical version of this technology is still far away. The obstruction facing scientists and researchers about quantum computers is because they haven’t yet found a simple way to control complex systems of qubits. Nevertheless, quantum computers are gradually coming in existence around us. An example can be sited as that of Logic Gates, which use two qubits. However, getting then to work on an industrial scale is the problem. Though most research in quantum computing is very theoretical at this stage, quantum computers could one day replace silicon chips, just like the transistor once replaced the vaccuum tube. Quantum Computers one day will eventually prove to be the major revolutionaries in technology.

BY
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A NEW DAWN

THERMOELECTRIC EFFECT AND ITS APLLICATIONS

It is quite common to hear that electricity produces heat, the best example being “My phone gets so hot when I use Wi-Fi, GPS and put the phone on full brightness alone!”. However heat producing electricity directly is not something you get to hear every day. This is what this Thermoelectric Effect is all about.
Basically it creates a potential difference using temperature difference or a temperature gradient.
The thermoelectric effect is the conversion of temperature differences to electric potential difference or the other way around.
A thermoelectric device creates potential difference across the terminals when there is a temperature gradient available across these sides. Conversely, when a potential difference is applied to it, it creates a temperature difference.
At the atomic scale, an applied temperature gradient causes the charge carriers to diffuse from the hot side to the cold side.
This can be used to generate electricity, measure temperature differences or even change the temperature of objects. As the direction of heat flow is determined by the polarity of the applied potential difference, these devices can be used as temperature controllers.
The term "thermoelectric effect" basically comprises of three different effects. These were discovered and credited to different people over a period of time.
These three effects are the Seebeck effect, Peltier effect, and Thomson effect. The Seebeck and Peltier effects are different manifestations of the same physical process.
Peltier effect is named after Jean Charles Athanase Peltier, while the Seebeck effect is named after Baltic German physicist Thomas Johann Seebeck.
The Thomson effect is a supplementation of the Peltier–Seebeck model and is accredited to Lord Kelvin.
1. Seebeack Effect - The Seebeck effect is the conversion of heat energy directly into electrical energy at the junction of different types of wire. Eg; Bi and Cu junction.
2. Peltier Effect - The Peltier effect is the occurrence of heating at one surface while cooling takes place at the other surface of an electrified junction of two different conductors.
3. Thomson Effect - In different materials, the Seebeck coefficient is not uniform in temperature, and so a spatial gradient in temperature can result in a gradient in the Seebeck coefficient. If a current is driven through this gradient then a continuous version of the Peltier effect will occur. This Thomson effect was discovered and predicted by Lord Kelvin (William Thomson) in 1851. It describes the heating or cooling of a current-carrying conductor with a temperature gradient.
Now that we know what exactly thermoelectric effect is and what it encompasses, we will now explore the different applications for this technology.
The Basic Applications of Thermoelectric effect include:
1. Generating heat
2. Absorbing heat or cooling
3. Generating electricity
Experimentally we can generate up to 2V from simply a candle and heat

sink.
Using this we can build portable and highly compact cooling/heating devices and even generate electricity from small camp fires to charge our phones.
The advantages of this peltier is that it has no moving parts and so friction losses are significantly minimized.
The efficiency of generating heat is 95% while that of cooling is 5%.

By:
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Balaji Murthy
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IF YOU EVER WANTED A BIGGER MAGNET

GRAVITATIONAL WAVES

Not a long time ago, the Nobel Prize for Physics was awarded for the observations of gravitational waves to Rainer Weiss, Kip Thorne and Barry Barish. This brings to one's mind the question: 'What exactly are gravitational waves?' The answer takes us to a story told a hundred years ago, but actually takes us billions of years back in time. Gravitational waves, put very simply, are analogical to electromagnetic waves. They are waves which travel through space-time at the speed of light. They are ripples created in space-time caused by the acceleration of bodies with mass through space-time. Like all the others of its category, gravitational waves follow the inverse-square law. To explain gravitational waves to the layman, we will have to look at Albert Einstein's theory of general relativity. General relativity states that everything in the universe is like a flat plane of space and time, just like a very large piece of fabric. Whenever a body with mass is present in this fabric of space-time, one can observe the bending of the space-time fabric. The more the body has mass in a unit volume, or in other words, the more the density of the body, the more it will cause space-time to bend. Now let's assume the said body begins moving with a constant acceleration. This motion of the body causes ripples in the space-time fabric. These 'ripples' are gravitational waves. These gravitational waves travel at the speed of light through the universe. Gravitational waves follow the inverse-square law. It means that the force of the wave is inversely proportional to the square of the distance between them. That means the farther the source, the lesser impact of the wave. Why don't we feel gravitational waves when we have matter in motion all around us? The answer is that all the gravitational waves produced around us, amount close to zero. The gravitational waves of higher orders are caused by extreme cosmic events like the merging of two black holes. The gravitational waves detected by the LIGO and VIRGO observatories were due to the merging of two black holes. Even the waves produced by such events have negligible impact on us. These events occur at around a billion light years away, which are so far that by the time they reach us, they are merely infinitesimal tickles. Gravitational waves are very much akin to their relatives of sound and electromagnetic waves. All of them carry energy and momentum when being transmitted. For example, let's take the case of a binary star system. The angular momentum of a star lost due to the spiraling inward motion of the star is carried away by the gravitational waves. The upsides to gravitational waves are they can travel to places where even electromagnetic waves can't travel, like in the case of singularities. Gravitational waves are a groundbreaking discovery in the field of astrophysics. Their origin and propagation can be recorded and can enable scientists in studying the origins and the beginning of the Universe itself. It is also theorized that gravitational waves can help us in detecting singularities like black holes. It could also be major in proving the Big Bang Theory, which will explain to us the origins of all that is there.

Written By
Paarth Singh Dahima

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From the editorial team.

ACTIVITIES

EDITORIAL COMMITTEE

LOWER ROW（LEFT TO RIGHT）SHIVANI, DIXITA, SHRUTI

MIDDLE ROW（LEFT TO RIGHT）SHLOKA, AISWARY, DIPESH

UPPER ROW (LEFT TO RIGHT) ANIRUDH, BRIJ, SHASHANK