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# TECHNOLOGY NOW

Vol. 3
March 2018

H&S DEPARTMENT

ALL THINGS TECHNICAL

# THE BYTE

WHERE IT ALL BEGINS

**The Holographic Reality | Fighting HIV AIDS using Nanotechnology | Reality goes Augmented**
**Light in a world full of darkness - Astrophysics**

**A desire can change nothing, a decision can change something, but a determination can change everything.**

Nurturing creativity and inspiring innovation are two of the key elements of a successful education, and a college magazine is the perfect amalgamation of both. It harnesses the creative energies of the academic, student community and distils the essence of their inspired imagination in the most brilliant way possible. I am pleased to know that the magazine ‘THE BYTE’ by department of Humanities and Sciences is ready to its publication. It is a platform for our students to showcase their creative abilities, hidden dreams and aspirations for writing innovative ideas of science and technology. ‘THE BYTE’ aims towards bringing out the latent talent in our students through technical articles. I take this opportunity to congratulate the editorial board for bringing out this magazine as per schedule which is an achievement considering the effort and time required. May all our students soar high in uncharted skies and bring glory to the world and their profession with the wings of education!

Dr. Deven Shah

Vice Principal,

# "Try not to become a man of success. Rather become a man of value" - Albert Einstein

Department of Applied Sciences and Humanities plays a vital role in an engineering college catering to the teaching of basic Sciences and Humanities courses for engineering students of all branches. The department has been simply unstoppable in its progress as it has been actively involved in various activities that have brought to light the hidden talents of the students and faculty members. Keeping in mind the betterment of the students, the department has started its magazine two years back. It is a great pleasure to see the creative expressions of students who had contributed to The Byte. The essential purpose of this magazine is to inform, engage, inspire and entertain a diverse readership. I am happy to see the amount of enthusiasm of eminent members of the department to contribute to the magazine. The Byte has grown abundantly in the span of two years. It continues to sustain its growth. People reading this magazine will realize the tremendous changes that are happening in the technology. The magazine is presenting a glimpse of the new technologies that arises in the field of science and technology.It remains a privilege to be head of the department with highly motivated and dedicated personnel, who are all prepared to go the extra mile. We intend to continue presenting the talent and creativity of our staff and students through The Byte every year. I invite you to read and immerse yourself in the unfolding art and be exulted.

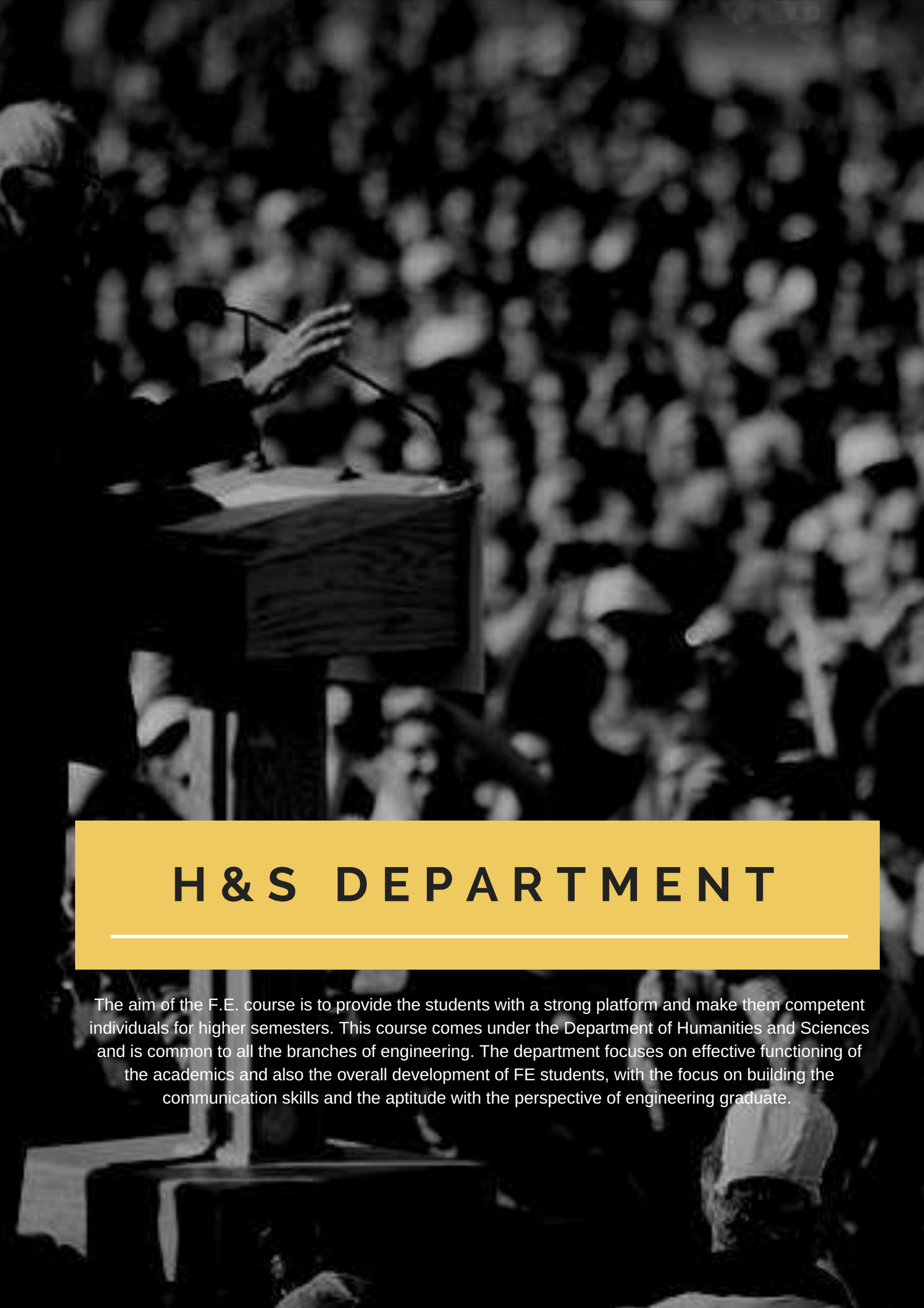
Dr. Vivek Mishra
FE-In charge

# DR. RAJNI BAHUGUNA , HEAD ACTIVITY STUDENT DEVELOPMENT CO- CURRICULAR

"Reading makes a full man; conference a ready man; and writing an exact man."
- Francis Bacon.

TCET believes in the all-round development of a students' personality and lays emphasis on holistic development through engagement in academics, sports and co-curricular activities.
Co-curricular and Extracurricular enrichment are central to the educational experience offered to students and a core component of the Curriculum. At TCET, we provide the opportunity to students to enjoy new experiences and to develop inside and outside the classroom. If academic rigor is at the heart of the TCET curriculum, Co-curricular and Extracurricular enrichment is the soul that brings meaning to the lives of our students, ensuring our students graduate from TCET not just as intelligent, confidant lifelong learners, but as passionate, emotionally mature young men and women, imbued with the capacity to form healthy relationships, and a willingness to give back to the community in a sincere and meaningful way.

We have been publishing THE BYTE since last two semesters which has ignited young minds to develop research attitude in their interested domain. It gives a platform to come up with their innovative ideas which imparts the fruitful results in science and technology. THE BYTE has a strong emphasis on interdisciplinary issues as we are conscious that many complex problems in the built atmosphere require multi-disciplinary solutions.
Interdisciplinary research is often difficult to publish in specialized journals and THE BYTE aims to capture high-quality work that doesn't clearly fall within the remit of other journals focusing on research related to interdisciplinary issues.
I wish you all the best to all aspirants for meaningful contribution on diverse issues of science and technology in "THE BYTE". I assure you that the smack of research would make you feel proud of yourself as a confident and much wiser technocrat than many other Engineering graduates.



# H&S DEPARTMENT

The aim of the F.E. course is to provide the students with a strong platform and make them competent individuals for higher semesters. This course comes under the Department of Humanities and Sciences and is common to all the branches of engineering. The department focuses on effective functioning of the academics and also the overall development of FE students, with the focus on building the communication skills and the aptitude with the perspective of engineering graduate.

# 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 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 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 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.

# Editor's Desk..

**The Byte**

- Where It All Begins, was a little baby a year ago, with its first ever edition put forth with the sole motive of giving voice to the unheard enthusiasm, unabating passion and uncelebrated talent of our dear FE students. We are back with its 3rd edition and, this time with marvelous variations in the articles and views put forth by the freshmen. This Year, we follow a theme in our approach, where all technical disciplines are taken care of. As we believe that everything in the world in its truest sense has a technicality. Not just scientific domains, but domains like arts, commerce and humanities too have deep technicalities and this being a technical magazine, we endeavour each domain and present to you, a combination of versatile articles. Some authors have even had a research paper published at this young age, which shows the real potential of the students of TCET. Getting exposure in their foundation course at such an extent is not less than a privilege for the students given by the esteemed college like ours through our department magazine. Striving to improve the legacy set by our seniors, we are "carrying it forward" to the students of the H&S Department. With a hope that the vivid information and knowledge put up by us is matching the caliber and markup of our vision. We hereby believe that everyone will have a blissful experience with this Third edition of 'The Byte'.

Add a little bit of body text

AI AND FUTURE STUFF

the dark side of artifilicial intelligence

holographic reality

brain computer interface - illusion to reality

Active Galactic Nuclei

light fidelity

HUMAN EXTENSIONS

wearable tech meets medicine

advancements in prosthetic legs

quadcopters

noCaptcha, reCaptcha

procrastination

PIONEERING IN ENGINEERING

augmented reality

string theory

gravitational waves

pollution the unused resource

soil less farming

# THROWBACK TO ADVANCED TECHNOLOGIES

magnetic levitation

mathematical realism

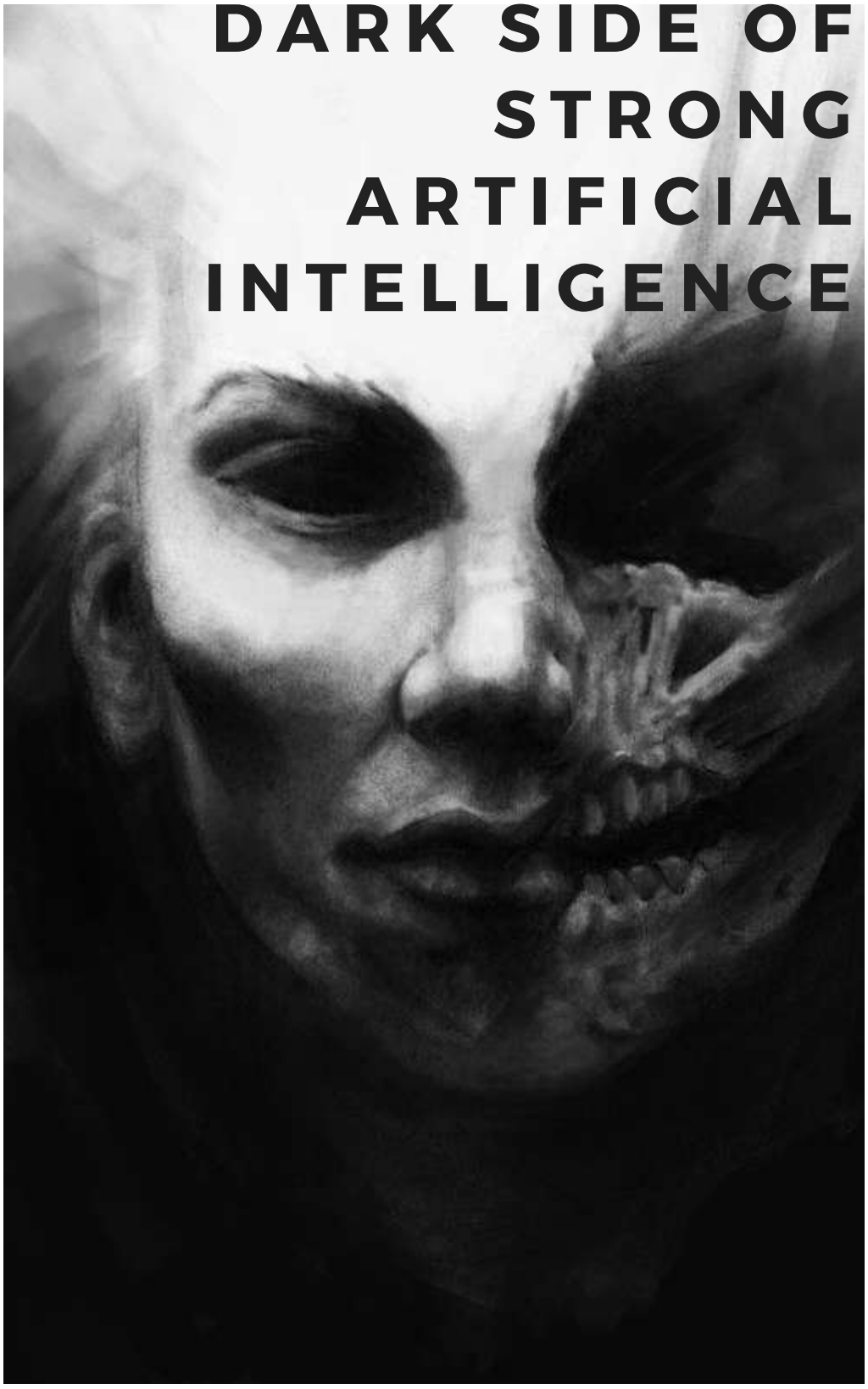
gravity light

smart grid

RFID

photo acoustic tomography

# A DYSTOPIAN FUTURE?



# DARK SIDE OF STRONG ARTIFICIAL INTELLIGENCE

Artificial Intelligence(A.I.) is a part of technology which simply means inducing intelligence in an artificial object, that is machine. It aims at the development of computer systems which are capable of executing tasks that require human level intelligence such as speech recognition, visual perception, decision making and so on. As the implementation of A.I. continues at a lightning speed, now is the time to ask ourselves what path the future will follow. The following article will put some light on how A.I. can prove to be a bane if handled recklessly.

Artificial Intelligence is a complex subject for a person who actually has no idea about it. It is basically the ability of a machine to perform work which exceeds human capabilities. A.I. can be classified into two parts:-

WEAK A.I

The most commonly used among the two is the weak A.I or the narrow A.I. The best example of weak A.I. could be virtual or computer gaming. We think we play against the computer but we actually play against the person who has pre-coded the game by a situational and logical algorithm. Weak A.I.is not actually smart, but is made to look smart. Overall, this is a well tried and tested field with a major improvement in recent years.

STRONG A.I

Strong A.I. is something developers are looking forward to. They are creating virtual robots which can work like humans without taking help from any external source. There is an impressive development in this field. An example of Strong A.I. is the first ever robot citizen of Saudi Arabia 'SOPHIA'. The robot has been a great success and has taken A.I. to new heights. However, there is still a lot to be explored in this field.

Many scientists and researchers think that for an artificially intelligent machine, it is implausible to develop emotions or to become intentionally benevolent. There are two possibilities where it can create a problem:-

• The A.I is designed to do something destructive

Autonomous weapons and machines are made for defense purposes but if they fall in wrong hands, it can be a big threat to humans and result in mass casualties. These machines are designed in such a way that they can identify and kill their targets without any manual operation. If we design it such that it could be extremely difficult for a foe to overpower, then at times, we may lose control over the machine which can cause a major loss to life.

• The A.I is designed for a constructive task but it adapts a destructive way to accomplish it.

If we consider a very basic situation where we just instruct our self-driving car to take us to the airport as quick as possible. Now just for the sake of completion of this task, it might take us through unsafe roads or just smash through the traffic. This situation can occur if we fail to strike a balance between the goals of A.I and ours. It can so happen that our own machine can backfire at us or even cause us harm.

• UNEMPLOYMENT

There is no organization around the globe, may it be domestic or a Multi-National Company, which does not require skilled man power which could complete their jobs in a lesser interval of time. The hunger for such skilled workers has lead to an exponential increase in demand of such super intelligent machine which will ultimately build a staircase towards unemployment.

• Threat to Human Civilization

Ray Kurzweil, the director of engineering at Google predicts that by 2029, computers will be able to outsmart even the most intelligent humans. Further, he stated that they will understand multiple languages and learn from experience. But once a machine achieves that, we confront two major issues:- First, how to make them differentiate between what is right and what is wrong. As this is a major criteria in the defense of mankind, even a small mistake can endanger multiple lives. Second, these robots are highly plausible to evolve faster and get accustomed to the environment they are surrounded by. Their evolutionary speed would overtake the slow evolving humans. This may cause a high probability of us losing control over them and they may outsmart us any second.

It is not that they will be hostile towards humanity, but if we are creating a machine just like a human, it will also try to achieve the goal of expansion of its own civilization. It's like I want to build a road and I don't hate the anthill, but I want to build the road so, BYE BYE ANTHILL! If they see us as an obstacle to their expansion, then we may be in serious danger. Hence the question is not who is physically stronger but the question is who is smarter? We can cage a tiger not because we are stronger but just because we are smarter. So if we lose our spot as the smartest on our planet its possible we might lose control.

Tesla and SpaceX founder Elon Musk was quoted saying, "If not regulated or controlled soon, A.I. will become an immortal dictator and there will be no escape for humans."

*By: Mohit Porwal, Asmita Singh*


# HOLOGRAPHIC REALITY

Blackholes are the strongest objects in the universe, strong enough to rip any matter into a mere mixture of atoms. A blackhole is formed when an extraordinary amount of matter is concentrated in a tiny space. At their centre, gravity is almost infinitely strong and whatever gets too close is ripped apart into its elementary particles. Not even light can escape blackholes, and so we perceive them as spheres of blackness. Black holes also radiate their mass away. This is called Hawking Radiation. Blackholes constantly lose an extremely tiny amount of their mass, a process that's unbelievably slow. In the far future, they will evaporate faster and disappear, leaving behind just a bit of radiation. But this is a problem, because in the process of disappearing, blackholes might delete something fundamental- information. We shall throw light on the same through this article.

Information is nothing tangible. It is typically understood as a property of the arrangement of particles. Imagine a bunch of carbon atoms. Arrange them in a certain way, you get coal. Arrange them in a different way and you get a diamond. The atoms are the same, what changes is the information. Without information, everything in the universe would be the same. According to the Theory of Quantum Mechanics, information cannot be destroyed. It might transform, but it can never be lost. For example, if you burn a piece of paper, you get ash. That ash will never become paper again. But if you were to collect the information of state of every particle that is present in the system, then theoretically the paper can be reconstructed. The information of the paper is still there in the universe. It's not lost, it's just hard to read. Blackholes are entities in the universe that take different things and make them the same. They destroy information. This creates the information paradox.

The Information Paradox:

It is fundamental for all our laws of physics that information can never be lost. Without information, everything is relative. When it comes to our understanding of reality, we need absolutes.

Solutions:

Information is lost, irretrievably and forever.

This means all the laws of physics become invalid and new theory must be formulated from the scratch.

Information is hidden.

Maybe a little part of the blackhole splits off and forms another universe. The information would be transferred into this new place, where we could never observe or interact with it, but technically it would not be lost. It's like having a broken hard drive with all the data that you could never access. It is nice that they have not been deleted, but also not very helpful. Or maybe blackholes don't disappear completely after the end of their life cycles, but a little piece is left.

Information is safe, not lost or hidden.

We know that blackholes trap information, but we do not know what happens to the information in the meanwhile. Let's create a blackhole with baskets. First, we fill up a room with baskets. But at some point, the room is completely stacked and not a single extra basket fits in. The room is at maximum capacity. But if we still squeeze in the basket with a lot of energy, the room collapses in on itself and forms a black hole. But the capacity of the room remains the same. Fitting in more stuff or information is still impossible. The room itself makes adjustments by getting bigger for storing more information. It turns out a blackhole grows its surface by a tiny fraction for each bit of information it takes in. In a nutshell, more information means more surface area. Even the smallest blackhole can store information on its surface than any other physical storage device. This solution is called the holographic principle.

The universe is a hologram.

If information is actually stored on the boundary of a blackhole, the Hawking radiation has a chance of learning about the information encoded there and can carry it away. So, information remains safe even when black holes fade away. If everything that falls into the blackhole is stored on its event horizon, that basically means that 3D entities are encoded on a flat surface. We call it a hologram. A hologram is like a 3D photo, a flat piece of material that encodes a 3D image. Therefore, blackholes might be a key to understanding the nature of reality itself.

By Harsh Kudtarkar
FE EXTC A

# A SMART STRAP

*By :Saurabh Singh*

The main objective of this article is to bring up the concept of Smart Safety Belts which contain a detailed description regarding how the smart belts arrived, what are their functions, their contruction, etc.

Road accidents are inevitable. Failing to fasten the seat belt is one of the major reasons of crash deaths. The smart seat belt contains variegated sensors which monitor the heart rate and simultaneously react by triggering an alarm in the vehicle to prevent motorists from causing accidents. An action of slowing down the vehicle if the driver is found drowsy is another feature of this belt. This is the concept of smart seat belt.

In a country like India, more than 140000 people die every year due to drowsy-driving, which in case of countries like America and China, is even worse. A European project named HARKEN created a sensor system.

This system is not only built into the seat belt but also into seat cover, which could disclose lethargy or laziness even before the introduction of obvious symptoms like yawning or bad patterns in driving.

According to the statistics of national highway traffic safety in India, seat belts saved an estimated of 12,173 lives. It is the culpability of both, drivers and passers-by to follow seat belts rules.

Road accidents due to drowsy driving has become a major issue in tthis century. According to a survey, around 254 million people go for road trips in the USA, in which 1.5 million are involved in car accidents.

When investigated further, about 30% of these accidents are due to fatigue. This represents an economic issue to social, medical and human cost of car accidents.

Road accidents due to drowsy driving has become a major issue in this century. According to a survey, around 254 million people go for road trips in the USA, in which 1.5 million are involved in car accidents.

When investigated further, about 30% of these accidents are due to fatigue. This represents an economic issue to social, medical and human cost of car accidents. HARKEN (Heart and Respiration and Kat Embedded Non-intrusive Senses) came into light to deal with this. Alteration occurs in the respiratory cycle as the human body goes into the state of fatigue. This invention, which was built by companies, universities and technology centers by two corporations, is based on a cluster of components that is capable of performing non-invasive measurements of heart and respiratory pace. The mechanical effect generated by heart and respiratory tract gets detected by this system.

This smart belt monitors all the mechanical, physiological activity corresponding to respiration and the cardiac cycle. The non-intrusive sensing system embedded inside the seat belt invigilates the heart and respiration activity. The periodicity of heart rate (HR) and heart rate variability (HRV) are the best examples of examining the concentration and wakefulness. This was observed by Lal and Craig in 2001. In addition to this, the decrease in the rate of respiration rate is also one of the symptoms of fatigue while driving. This was examined by Milosevic in 2010.

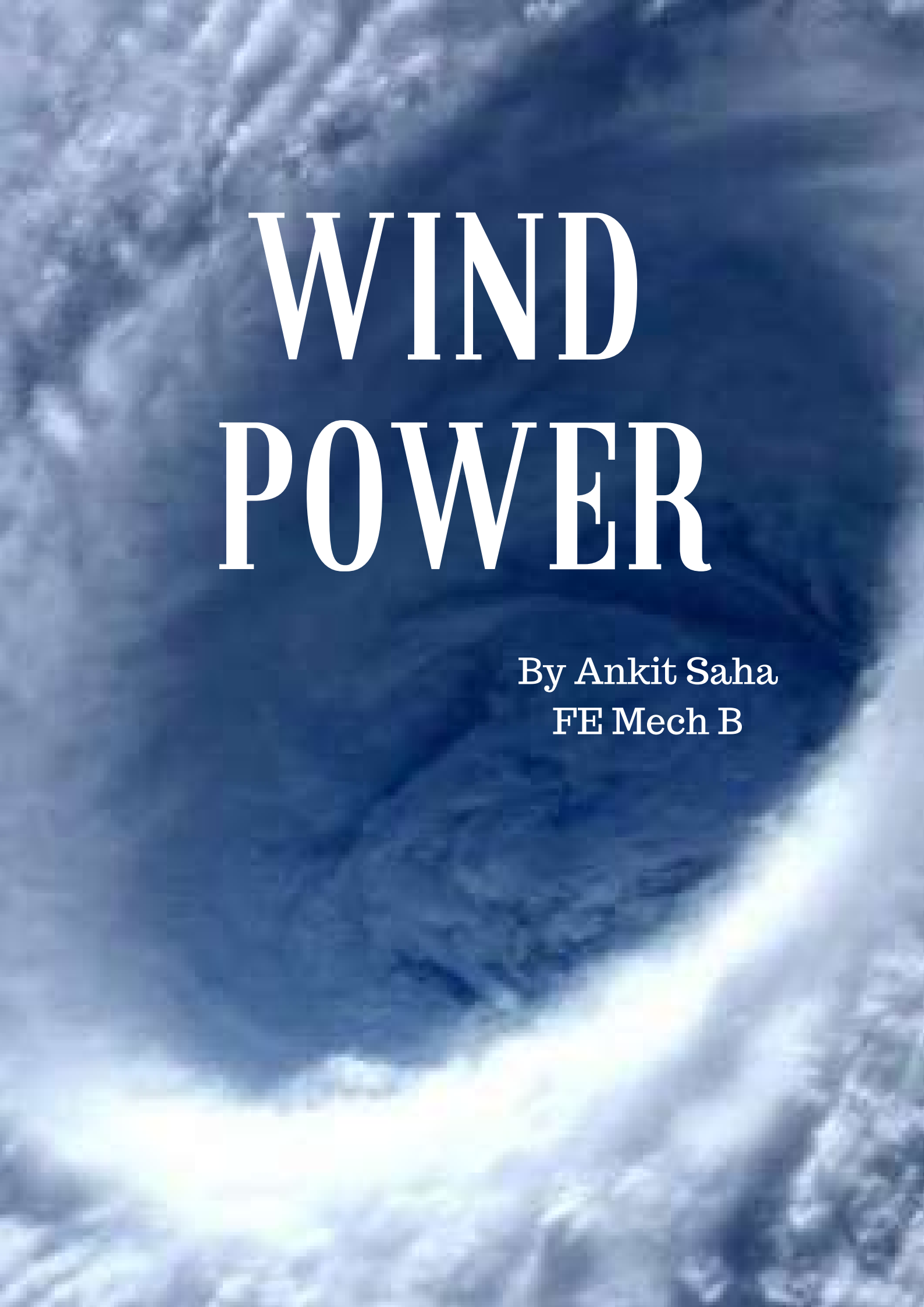
As the belt detects the alteration generated due to decrease in the respiration pace and heart rate, it signals the system that the motorists is progressing towards fatigue. The non-intrusive embedded system then plays a vital role by responding to these pulses. The sensors after getting signals oblige the vehicle in deceleration mode and hand-in- hand trigger an alarm in the vehicle. This smart embedded system is technologically correlative to plethysmography monitors.

These monitors are usually helpful in measuring rate of respiration, through strain of a couple of thoracic as well as abdominal strips. For sustaining homogeneity in the pressure levels, areas of sensing were assigned in seat belt as well as seat cover in order to achieve more accurate signals.

When the seat belt was tested on different individuals, following results came into consideration-

These statistics were plotted on graphs. While driving, heart beats and respiration were mixed with motion relic. Regular waves due to physiological activity could be hinted in the raw signal, but very noisy and contaminated, that hindered the characteristics of information. During drowsy phase, noise and motion artifacts were absent. The sensors had enough sensitivity to show clear waveforms repeating every 8 seconds approximately, that could be associated to respiration. The intensity of heartbeats was very small as compared to the effort exerted by breathing, so they could not be seen together.

Hence it could be inferred that during the drowsy phase, heart and respiration signals lower and the percentage of experiencing an accident became high. With the increase in the number of road accidents per year, the idea of Smart Strap could play a vital role in decreasing the accident graphs and provide better driving experience to the motorists. The outcomes from the tests display its feasibility as a smart and potential tool which should be integrated in cars in the future. This contraption is a big advancement in solving a peculiar problem of drowsiness.



# WIND POWER

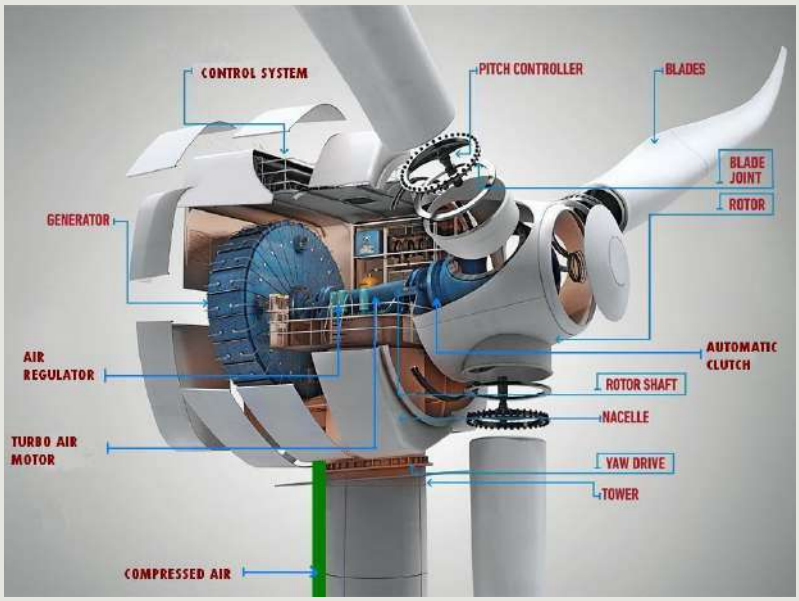
By Ankit Saha
FE Mech B

# The Power of Wind

*Today the kinetic energy of wind is the most used renewable source of energy.*

Wind power is the power that one can generate through wind by using wind turbine. Wind turbines are used in hilly areas and near the seashores, that is, in windy regions. Wind turbines are the devices that change the kinetic energy of wind into mechanical energy and transfer it to the generator. The generator connected to it converts mechanical energy into electric energy and then it supplies electricity everywhere in the region through cables. It is a pollution free source of energy. It uses sunlight and wind to produce electricity. Wind turbines are of two types - Vertical Axis Wind Turbine and Horizontal Axis Wind Turbine.For this the wind turbine is used. Wind turbine is one type of windmill that converts the kinetic of wind to produce the formation of electricity through electric generator.

The supplies of non-renewable sources are decreasing day by day, while the renewable resource is becoming more efficient. In ancient period, the kinetic energy of wind was used as for rotation of windmills and for sailing the boats. Windmill forms the rotation of the shaft which is generally used for various purposes such as pumping water and grinding corn, etc. The motion of the shaft of the windmill can be used for generating electricity by connecting electrical generator to the rotating shaft of windmill. e sea.Wind turbines are used in hilly areas because in many such areas, there is no supply of electricity. For generating electricity for large areas, many wind turbines are used which are called wind farms. These wind farms are located on flat lands, mountain tops, offshores in th




The wind turbine consists of different equipment which are as follows- rotor, pitch drive, nacelle, brake, low speed shaft, gear box, high speed shaft, generator, wind vane, yaw driveEach wind turbine has wind vane constructed on the top which inspects the direction of the flow of wind. The kinetic energy of the flow of wind makes the blades of the wind turbine spin. These blades are as long as 60 meters and are very light in weight. That is why they can produce energy even with very light winds. It starts from 11kph and its maximum velocity is 90kph. The blades are attached to the wind turbines through the hub and connected to the low speed shaft. It revolves with same speed as that of the blade.

To produce electricity, it is necessary to increase the rotating speed of the low speed shaft that is done by the gear box, which raises the speed by 100 times and transfers it to the high speed shaft. The high speed shaft rotates at a very high speed of 1500 revolutions per minute (rpm) and the generator converts the energy produced due to rotating of the high speed shaft into electrical energy. The electricity produced in the generator has direct current which passes through the base, where the converter transformer converts it into alternating current and this AC passes through the substations from where it gets supplied throughout for industrial and commercial use.

# SOIL-LESS FARMING

THE ROOF TOP FARMING SOLUTION-
BY-ABHISHEK PATHAK

Since the establishment of Human civilization, humans are continuously discovering, developing and finding better methods and ways to generate food. Agriculture is one of the oldest and most basic forms of occupation for food dependency. Agriculture was still under an optimistic growth until few hundred years ago until when humans realized the traditional farming methods will not help for long run due to high population growth rate and urbanisation, which results in covering major land portions and decrease of cultivation lands. The ever increasing population demands more and more farm output in lesser time and the increasing instability in the natural environment and climates can be harmful for agricultural practices therefore need of new technologies arises. Hence in just few decades, agricultural industry has experienced an exponential growth with techniques, technology and methodologies.

One of such revolutionary method developed in just recent times commercially is soil-less farming. Hydroponics is the process of growing plants in sand, gravel, or liquid, with added nutrients but without soil. Aeroponics is a technique in which the roots hang suspended in the air while nutrient solution is delivered to them in the form of a fine mist and Aquaponics is a system of aquaculture in which the waste produced by farmed fish or other aquatic creatures supplies the nutrients for plants grown hydroponically, which in turn purify the water. The systematic techniques can be extremely helpful in urban farming and are extremely useful if used and promoted to be used locally.

In urban areas, soil cannot be used properly and due to the regular and normally compact nature of urban towns and cities, lack of space also becomes an obstruction for farming. Hence by using such soil-less farming techniques most of such problems can be easily solved. In the present time, Agricultural activities are mainly been practised in two ways viz, traditional outdoor land farming and indoor farming. Indoor farming has witnessed an exponential growth in its trend to be used as a commercial technique because of the control it establishes to the farmers. As witnessed and also by simple predictable results of rapid growth in the development of cities and new concrete jungles is on its peak and is rapidly affecting the environment, land space and fertility of land and hence agricultural practices, therefore, soil-less farming can be considered as the new and perfect solution to such problems.

TECHNIQUES IN SOIL-LESS FARMING

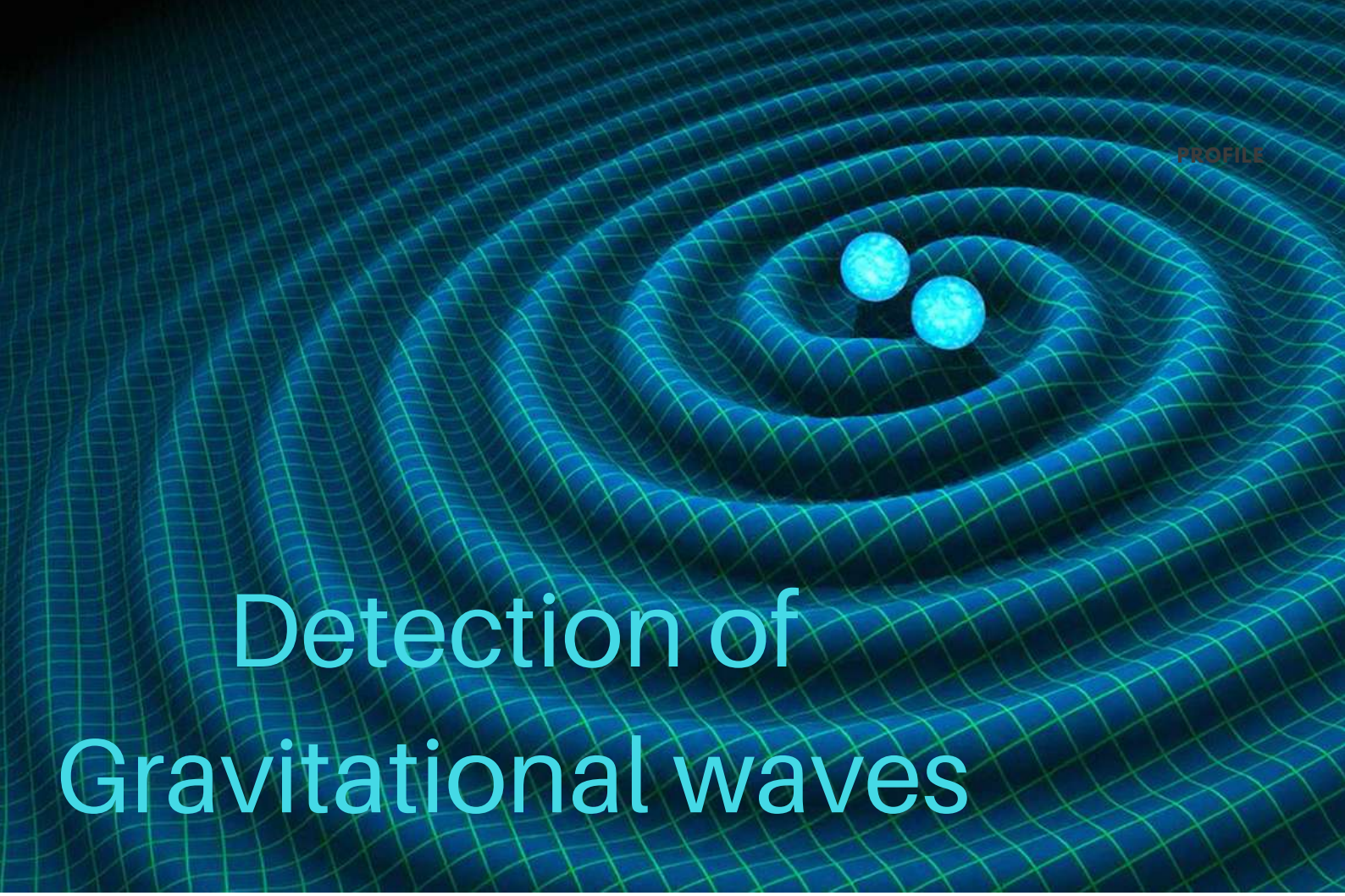
There are three main techniques involved in Soil-less Farming which are being used to grow better yields and in better ways.

1. Hydroponics
2. Aeroponics
3. Aquaponics

Hydroponics

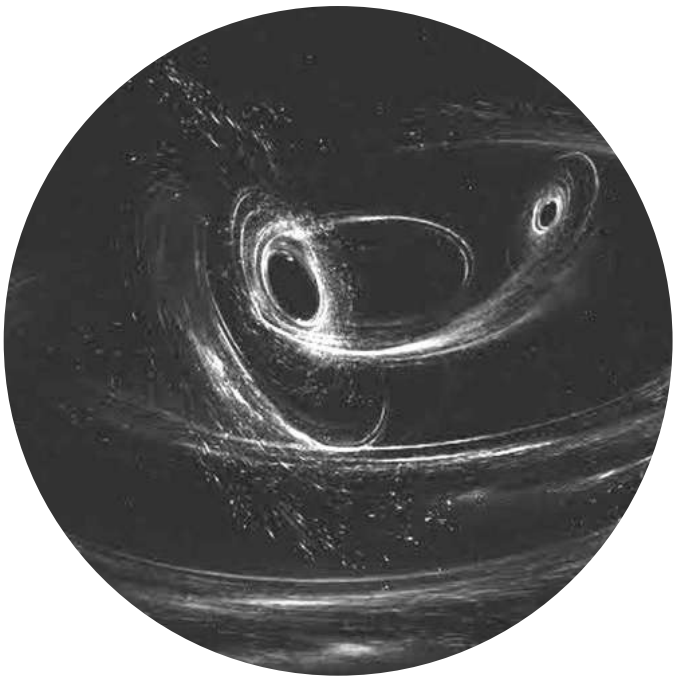
Hydroponics is a newly emerged technique and is the first concept of soil-less culture. In this technique, Plants are grown in rows just like in a traditional ways of gardening or even some modified and improved ways, but they have their roots in water which is infused with required nutrients and minerals, through conducting materials and not in soil and if not only water, some mechanical support like gravel, sand etc. is also used.

Most of us think soil as a requirement but the fact is it’s all about nutrients. In fact, soil provides only stature and support, not the actual food itself for plant roots. The food/nutrients come from the materials mixed in the soil, such as compost, plant waste or natural/artificial fertilizers. It is observed that Plants which is grown hydroponically grows faster and in the healthier way than plants in soil because they don't have to fight soil-borne diseases and more specifically required nutrients and minerals are given and in much controlled and favourable techniques and surroundings.

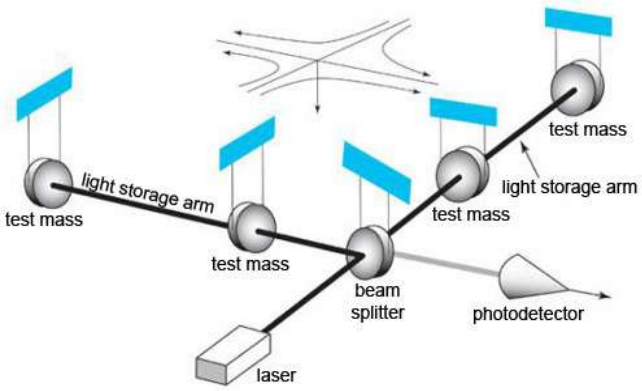


# Detection of Gravitational waves

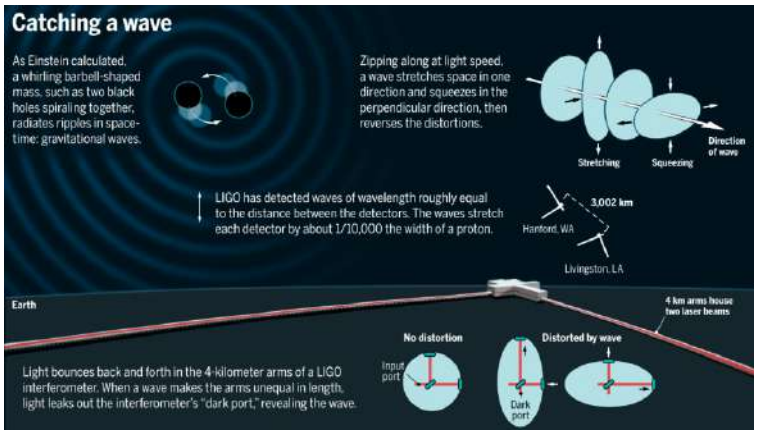
While listening to the words 'gravitational waves', what is the first thing that comes to your mind? Some of you might think that they are waves related to gravity. But in reality, they're not. Basically, gravitational waves are the waves coming from two black holes revolving around each other along spiral path, which are on the verge of motion or the waves coming from collision of two neutron stars. The most amazing thing about these waves is that they produce distortion in space-time fabric. This means you will see the fluctuating space around. Ever seen the disturbance created on steady surface of water when something falls on it? Just like that, this violent event produces some distortion in space time fabric.  If you really want to observe what it would look like during fluctuations in space-time fabric, just stand in front of crazy mirror. It will give you an idea. These waves alternately stretch  or compress the space. Just think of a piece of torn balloon. If you stretch it in one direction, it will get compressed in the other direction . Same thing happens in space time distortion. Note that Einstein discovered these waves when the all the countries were busy in First World  War i.e. in 1915. But the true justification was given to his theory in 2015 practically by LIGO (Laser Interferometer Gravitational Wave Observatory) when we were busy in mugging about what gravity is! LIGO is an observatory located in the US which covers a large area. It is located far away from noisy places. Laser emits constant and continuous light of wavelength of about 1064nm . Then comes the beam-splitter, which splits the light coming from laser into two parts to travel through the long 4km arms which plays the most important role. The inner pressure of pipes is pumped down  to one-trillionth of atmospheric pressure. Then, the pipe is heated vigorously to remove all the residue gases. It takes almost 40 days to create a vacuum inside the pipe. It is the 2nd largest vacuum in the world after the Hydron Collider. The other end of pipes are covered with the heavy mirrors of about 40kg, suspended with silicon threads having thickness less than a human hair.



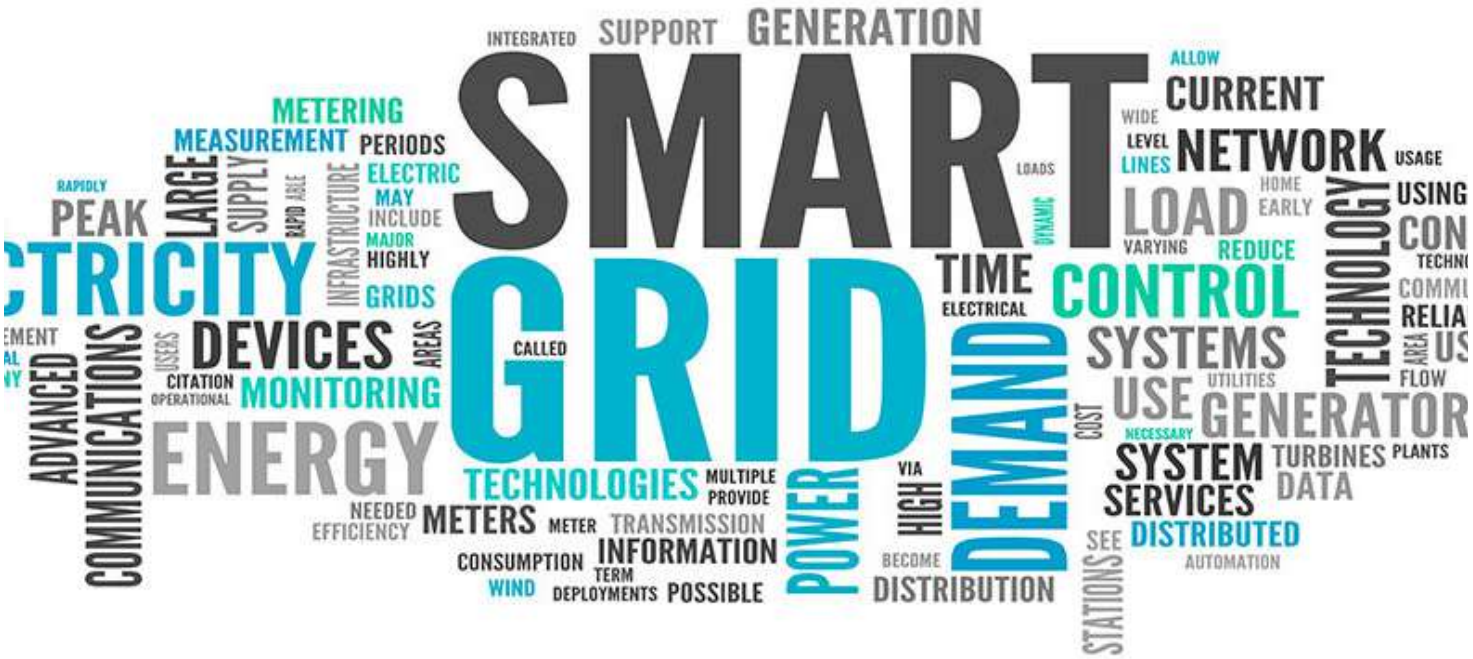
So, in short they are using a laser which constantly emits light of wavelength 1064 nm , two isolated pipes with the inner pressure pumped down upto one-trillionth of atmospheric pressure, two mirrors of 40 kg each suspended with silicon thread, a more precise photo detector to measure the variation of 5mm in 10^21 m. You will say the whole thing is bogus, but no. It's not!




These mirrors help to reflect the rays coming through the pipes. Then these reflected rays again travel a distance of 4km after getting reflected and then interfere with each other at beam-splitter. This interference pattern gets detected by photo detector. The adjustment is done so that the rays will cancel each other and produce destructive interference which may lead to no detection of light at photo detector. In presence of gravitational waves the space gets disturbed , so one pipe will get stretched and other will get compressed as they are perpendicular to each other. So it will take less time for the light to travel through the pipe which gets compressed and will take more time through the pipe which is stretched .When it comes to the interference of two waves, they will be out of phase, which will help to detect the change at photo detector . This variation in signal gets converted into sound signal. That's why it is said that it is more like hearing rather than seeing and LIGO provides an ear to hear the presence of waves. It consists of two arms perpendicularly held to each other.



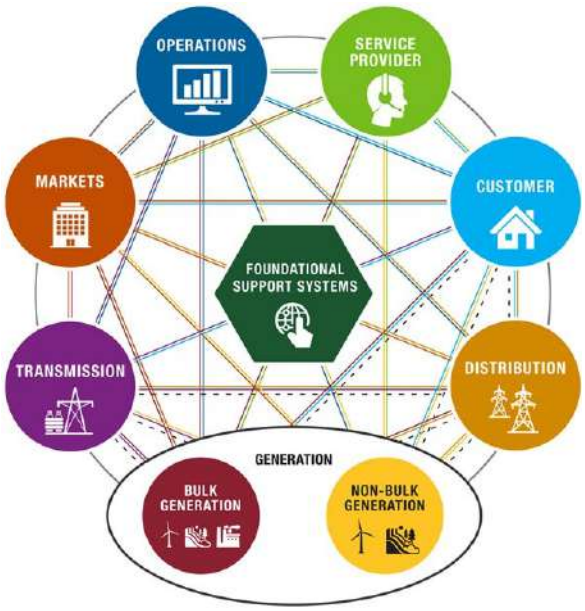

The waves come from violent events in space which are very far from us. So, its intensity will decrease. Recently, the physicists Rainer Weiss, Barry C. Barish and Kip S. Throne who were involved in this project got Nobel prize. LIGO and an Indian initiative started to work under the project known as LIGO-INDIA or INDIGO which is located in Hingoli district. We have never observed collision of neutron stars in terms of both sound and light. So, by detection of gravitational waves, we can get our traditional telescopes to observe the light effect. By more and more investigation, they aim to reveal the secrets of universe, and probe Einstein's general theory of relativity even deeper and unravel mysteries of black holes in it. So be ready to know more about unfathomable universe!




Electricity is imperative to contemporary society and the economy. Our current electric grid was conceived more than a hundred years ago. When electrical energy needs were simple and energy generation was localized and built around communities, most properties had only small electricity demands such as a few mild bulbs. However, most of the world depends on electricity systems built around 50 years ago. These are inefficient and cannot provide a fantastic response to trendy pressing international challenges. Smart grids will be a necessary enabler of this transition. In the rising strength needs of the 21st century, the smart grid introduces a two-way dialogue where electricity and data can be exchanged between the utility and its customers.

A smart grid is an intelligent, digitized strength network handing over electrical energy in an optimal way from source to consumption.This is carried out with the aid of integrating information, telecommunication, and energy applied sciences with the present electrical energy system. It's creating a community of communications, controls, computer systems, automation and new technologies and tools working collectively to make the grid extra environment- friendly, greater dependable, more tightly closed and greener. This smart grid enables more modern technologies to be integrated such as wind and solar power manufacturing and plug-in electric powered automobile charging. There is an estimated $13 trillion investment required in energy infrastructure over the next 20 years.

A poorly deliberate and completed pilot can set back the adoption of smart grids and negatively have an effect on the public understanding of low-carbon technologies. The grid allows consumers to manage their electricity usage by measuring their home's electricity consumption via smart meter utilities and can grant their customer with a lot of data to control their electrical energy bills inside their smart homes. Smart Grid technologies furnish certain information that enables grid operators to see and manipulate electricity consumption in real time. This higher perception and control reduces outages and lowers the need for peak power across the energy
control rooms. The grid engineers will be capable to precisely and predictably control electricity production, lowering the want to hearth up steeply-priced secondary electricity plant.




The distribution system routes energy from the utility to residential and commercial customers through strength lines; switches and transformers utilities typically are counted on complex energy distribution schemes and manual switching to preserve strength flowing to their customers. Smart Grid applied sciences and patron participation utilities can easily manage the increased demand for power to run the electric powered cars and make sure charging needs are met by adding more plug-in electric cars to the grid. They have a smart grid pilot which provides functions that aid buyers to minimize their electricity invoice and obtain visibility and control. The Government needs to take on board these guidelines to deliver smart grids, a cornerstone for a low-carbon, efficient, and secure energy future. Information science will not solely assist the smart grid to be routinely observable and controlled. More importantly, it will help us to achieve the location of smart grids for everyone. Undertaking smart grid research in India is
critical for protection and stabilization of countrywide energy grid, optimization of countrywide energy shape, etc. The electricity devises improvement as the world's new vogue of change, the smart grid will lead the Indians to repair confidence, revive enterprise and promote sound and quick financial growth.

THANK YOU
- AMIT SINGH (IT B)
- PRIYANKA SHARMA (IT B)

# WEARABLE TECH IN MEDICAL FIELD

## *HOW FLEX CIRCUITS AND WEARABLE TECH ARE CHANGING THE WORLD OF MEDICINE..*

Wearable tech is something that quite a large number of people use every day—and don't even realize they are using it. The term sounds complicated and highly technical, but in reality, most wearable technology devices in use today include products like smart watches (Apple iWatch or the Fossil) and activity trackers (such as Fitbit and Fastrack.) Wearable technology has improved lives for a lot of people in rather many different ways. Wearables are beginning to seek a lot of attention for their potential to do more than just tracking steps and controlling activities.

In the future, it is entirely possible that wearable technology and flex circuits could play a major role in the medical industry. In fact, these devices have already begun showing up in certain medical fields.

Medical Wearables Tend to be Single Point Solutions

The consumer market is pushing wearables to do more and more, while the wearable medical market is going in the opposite direction. Most medical wearables tend to be one solution devices. For example, a medical wearable will track "insulin levels" or " steps walked." Just because these devices only keep track of just one number does not make them any less efficient. In fact, this was done to ensure that the data collected is used, and not tarnished because the instrument is trying to do too much with too small of a device.

Wearables for Physicians

Integration of current devices into practice – one of the main ways that wearable technology is most likely to impact the medical industry is if the devices move from being strictly a consumer device into being a "medical" device. Case in point—a doctor may provide an activity tracker, much like a Fitbit to his or her patients.

Wearables to Track Chronic  Conditions

Wearables can help doctors keeping up with patients activities. Even if the doctor asks the patient to keep up with certain numbers or track exercise and diet, the patient may not always comply. A wearable helps the doctor be there 24 hours a day, seven days a week.

The adoption of wearables is still in its growth phase. In fact, it is estimated that the wearable market will grow from a $50 billion dollar market to a $80 billion dollar market from 2017 to approximately 2022.

# ADVANCEMENTS IN PROSTHETIC LEGS

## HOPE FOR THOSE WHO HAVE LOST A PART OF THEMSELVES

What is a prosthetic leg? It is a gift even by engineers to disabled. The meaning of prosthetic is derived from early Greek which means addition or attachment. It can easily define as tool which helps a disable to give an ability of missing limb. It can be due to reasons in congenital defect (birth defect), accident, wartime injury or illness such as diabetes. People who lose their limb or a part of it can be easily replaced with these prosthetics. Due to advancements in technology, prostheses work efficiently with no suffering. Trans-Femoral prosthesis is an artificial limb that can be used as a replacement for leg missing above the knee, which transects the tibia bone. In this condition, the amputee has to use 80% more energy to walk than a person with two legs. A transtibial prostheses provides replacement for leg missing below the knee, which transects the femur bone. The amputee usually regains the normal movement, making it easier for the person to walk without exerting oneself. There are many types of prosthetic legs i.e. above knee, below knee, hip disarticulation, partial foot, and lower limb. Different materials are available like polymers, aluminium, titanium, carbon fibre, and some folks love to use gold plated prosthesis.

A

As technology is developing, there are new upgrades in prosthetics like robotic legs & myoelectric leg. As we are talking about robotic legs, robots can be used to assist in diagnosis, customize remedies based on patient's motor abilities, and assure compliance with treatment regimens and maintain patient's information. It is shown in many studies that there is a significant development in upper limb motor function after stroke using robotics for upper limb rehabilitation. In order to a robotic prosthetic limb to work, it must have several components to combine it into the body's function: Biosensor detects signals from the user's nervous or muscular systems. It then relays this data to a controller position into the device, and functions feedback from the limb and actuator, e.g., position, and dispatches it to the controller. In myoelectric leg, A Myoelectric Prosthesis uses electric signals produced from muscles' movements which is in contact, as information. It is generated by electrodes applied on the skin to control the movements of the prosthetic i.e. knee flexion / extension, ankle supination/ pronation (rotation) or opening / closing of the toes. Prosthesis of this kind uses the remaining neuromuscular system of the human body to control the works of an electric powered prosthetic foot.

Prosthetic legs are a gift to mankind as it gives amputees another chance to live their life in a normal way. But the technologies nowadays have made it possible to not only let the amputees walk but also run, swim, climb mountains, etc. These manmade prostheses are not less than original legs, but technological advancements will make it easier for amputees to use them, almost nullifying the disadvantages.

By Abhinav Vishwakarma
FE CIVIL B

# RFID TECHNOLOGY

## *The future of tracking*

Radio Frequency Identification System (RFID) is a smart automatic identification technology which, with the help of smart labels i.e. RFID tags, uses radio frequency electromagnetic fields to identify objects with RFID tags. This article throws some light on the same. It has the ability to track a product from its manufacturing till it reaches the trash can. It has the ability to store, update and lock data. It helps the merchant for stocking and marketing. RFID tags are of different types such as: Active, Semi-active and Passive.

RFID broadcasts over a fragment of electromagnetic spectrum. They have the capacity to store data up to 2kb. They are composed of an antenna and a microchip. It is also used in transportation devices like the toll pass cards where they can calculate the toll cost and deduct it from the traveller's account. Veterinarians can scan the lost pets with the help of an RFID reader technology.

Radio-Frequency Identification system has three parts:

a. A scanning antenna

b. A transceiver with a decoder to interpret the data

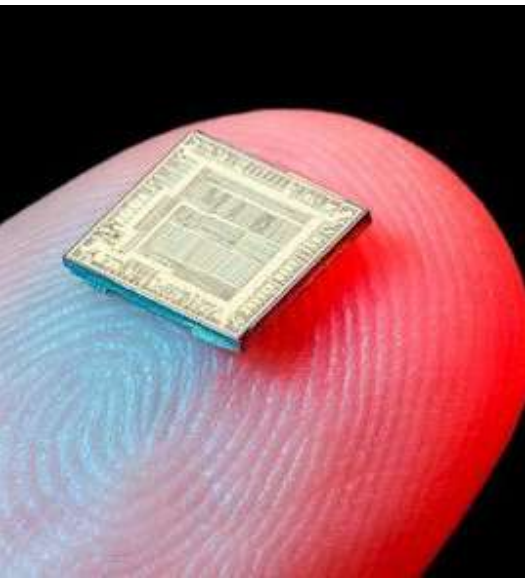
c. A transponder - the RFID tag - that has been programmed with information.

The scanning antenna puts out radio-frequency signals in a relatively short range. The RF radiation does two things:

a. It provides a means of communicating with the transponder (the RFID tag) and

b. It provides the RFID tag with the energy to communicate.

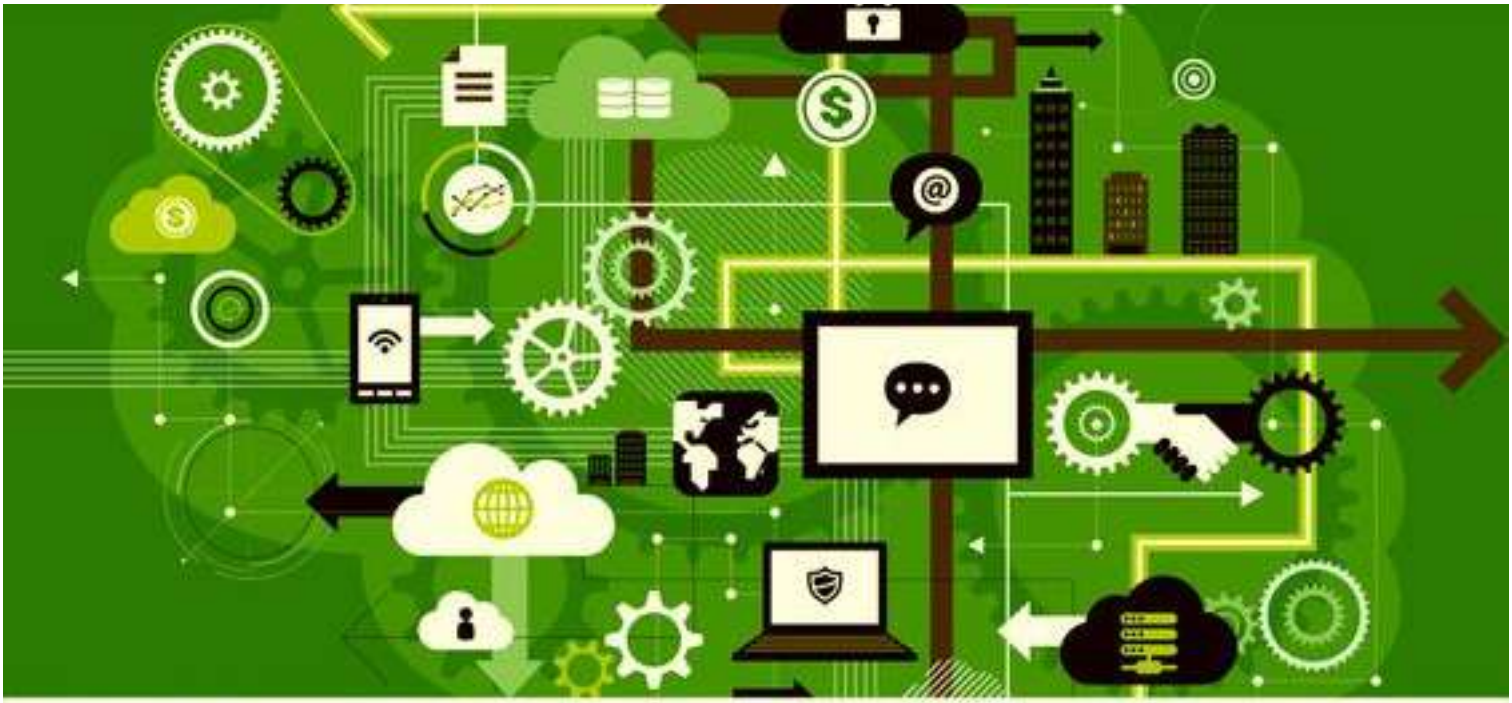
This is an absolutely key part of the technology; RFID tags do not need to contain batteries, and can therefore remain usable for very long periods of time (even decades).
The scanning antennas can be permanently affixed to a surface; handheld antennas are also available. They can take whatever shape you need; for example, you could build them into a door frame to accept data from the person or objects passing through.
When an RFID tag passes through the field of the scanning antenna, it detects the activation signal from the antenna. That "wakes up" the RFID chip, and it transmits the information on its microchip to be picked up by the scanning antenna.
In addition, the RFID tag may be of one of two types.  Active RFID tags have their own power source; the advantage of these tags is that the reader can be much farther away and still get the signal. Even though some of these devices are built to have up to a 10-year lifespan, they have limited life spans.  Passive RFID tags, however, do not require batteries, and can be much smaller and have a virtually unlimited life span.
RFID tags can be read in a wide variety of circumstances, where barcodes or other optically read technologies are useless. The tag need not be on the surface of the object (and is therefore not subject to wear). The read time is typically less than 100 milliseconds. Large numbers of tags can be read at once rather than item by item.



The major applications of RFID in day-to- day life-
• Bus Ticketing
Bus ticketing helps in vehicle monitoring such as fuel and feat level monitoring order, cargo tracking, fleet performance analysis, security, road assistance etc. The best application is school bus ticketing.
School bus tracking view student behaviour in school bus and send alerts to both, the school management and parents in time of emergencies along with notifying both parties on boarding and disembarking of students from the school bus.
RFID consists of TWO components : RFID TAG and RFID READER
RFID TAG: It contains information such as name, address and mobile number. RFID READER: It reads the above information from the RFID TAG.
RFID tag it must be within the range of an RFID reader, which ranges from 3 to 300 Feet, in order to read.

• Smart Supermarkets

A supermarket is a large service shop providing basic entails/needs to the customers. So it is mandatory to compute the number of products sold and produce a bill for the customers. A smart shopping cart system is implemented that will keep all the traces of purchased products and online billing using an RFID and ZigBee module. The system will recommend the customer for products based on their purchase history. An RFID tag is attached to all the products of the mall while every cart is designed with PID (Product Identification Device) which contains a microcontroller, LCD, RFID reader, EEPROM, and ZigBee module. Through the centralized database, we can give suggestions and information regarding the product to the customer which will be displayed on the LCD screen situated on the shopping cart. The LCD can display characters, numbers and also provide expiry date and better alternative.



# RFID based Logistics Management Application Suite

ZigBee is a device which broadcasts data over large distances through intermediate devices. It acts as a communication link between the shopping cart and the server. It provides a data rate of 250 kbps at 2.46 Hz,40 kbps at 915 MHz and 20 kbps at 868 MHz.
The proposed system is centralized, including all the products to be supplied with an RFID tag. The cart consists of an RFID reader, ZigBee module and an LCD screen. The RFID reader will read the products information present in the cart. The EEPROM will store the products information in it. It is dispatched to the central billing system via ZigBee. The central billing system collects the cart information and ingress the products database and calculates the total amount. The payment is uploaded to the web and the total cost is withdrawn from the registered cash account of the customer. An RFID reader is also provided with the exit door for antitheft.

AmazonGo is one of the examples of a smart super market. They have promulgated their first commodious store which is privately on beta testing in Seattle. AmazonGo allows the customer to scan their smartphone the moment they enter the shop, pick up the products they want and leave. An RFID reader is provided at the exit door where the products are scanned and immediately cash is withdrawn from the account.

**By Nairuti Mehta**
**Akshata Parulkar**
**FE ETRX**

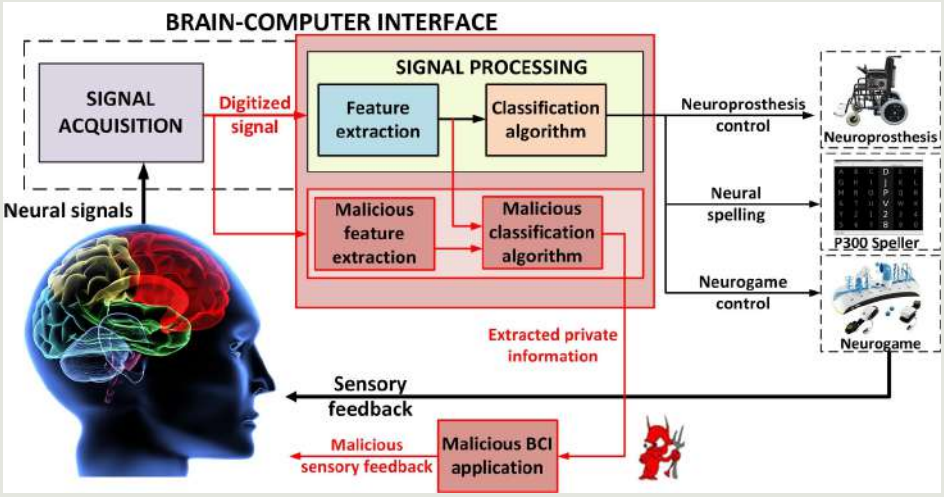
# BRAIN COMPUTER INTERFACE

Illusion to Reality

Brain-Computer Interfacing (BCI) is a technology that has enabled us to understand the complexity of the brain. It has wide clinical applications such as prosthetic limbs, deep brain simulators, early detection and diagnosis of tumours and brain disorders and a variety of non-clinical applications in Neuromarketing, Neuroergonomics, Security, Gaming and Entertainment. It is a technology that can totally change our lifestyle, our perception and interaction with the external environment.

BCI is a technology that enables us to interact with electronic devices directly with our brain. For that we have understood the synaptic activities of the brain. These synaptic activities are extracted in the form of electrophysiological signals. The process of brain interacting with the computer starts with signal acquisition where the electrical potential created by the synaptic activities of the brain are captured by the electrodes. This process can be Invasive, Partially Invasive or Non Invasive. In these techniques, five different types of brain waves pertaining to different emotions and other electrophysiological signals by Electroencephalography (EEG) are captured and then used to extract useful information by the translation algorithm and then is sent to the application to do the concerned tasks. Apart from EEG wave scanning, we also have other electrophysiological methods like Electrocorticography (ECoG) used in the Invasive Technique. Now with the help of MRI scans, we can have data of cerebral activity.

BCI plays an integral role in communication also. Communication is the act of sharing feelings, thoughts, and intentions with one another with verbal and non-verbal means. The complex language being unique to humans makes the task difficult to achieve so several invasive and non-invasive techniques have been deployed, one of which being front-central cortical oxygenation and deoxygenation-based BCI, where the corresponding state of oxygenation and deoxygenation denoting ‘Yes’ or ‘No’. Some of the patients having CLIS (Completely Locked-in State) communicated using this method with a correct response rate of 70%. At the same time, BCI based on neuro-electrical technology have failed in providing these patients with means of communication. After a few hundred times, answering the same question makes the computer roughly understand how yes and no looks like in our brain. Furthermore, machine learning is also being implemented in BCI.




A Model BCI system

BCI systems comprise four basic components:

• Signal Acquisition: This part records the brain waves by measuring neural oscillations and send them to the pre-processing part for signal amplification. The multi-electrode array is used to fetch information from the brain.

• Signal Processing

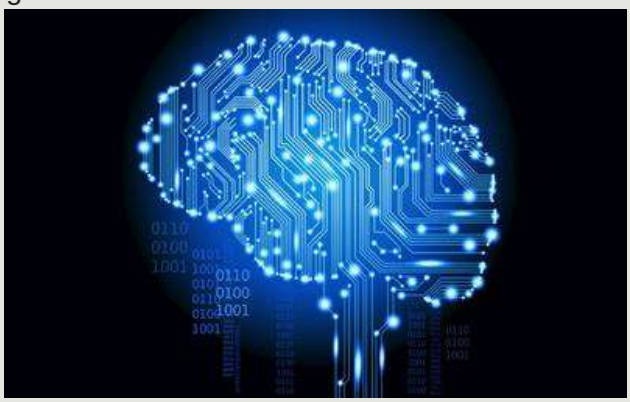
• Feature Extraction: The discriminative characteristics for the improved signal is generated by feature extraction.

• Classification: Classifiers are translating the produced features into device commands.

Some neuroscientists have designed a practical and functional pathway for information transfer from human brain to a cockroach brain developing an even complex brain to brain system. Through surgery, a microstimulator was integrated with a cockroach brain which will send invasive electrical nerve stimulations. Out of many experiments conducted, the cyborg cockroach was able to trace an S-line path from with the help of signals transmitted from a human brain.

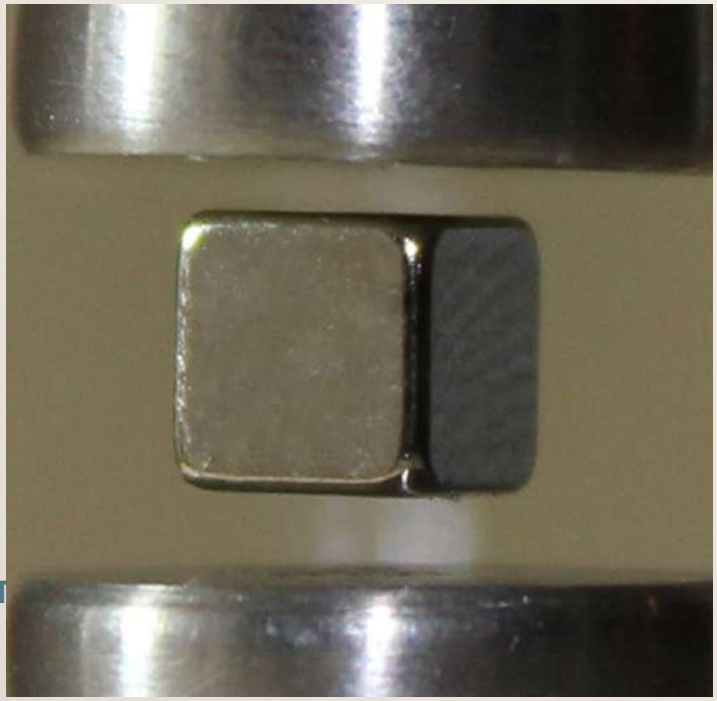
BCI technology has a lot of applications in medical, neuro-marketing, gaming, entertainment and security fields. This technology promises to revolutionize our interactions with the outside world. But the developers for the BCI are focused mostly on the application part and lesser on the privacy and security concerns seeing how much intimately this technological advancement interacts with the user.The usage of BCI might now be limited to research and medical fields, but we should not decline the possible attacks on user privacy and security when BCI devices become ubiquitous.

Neurosecurity is an upcoming discipline that talks about privacy and security ethics in these devices. The data about a person's EEG waves can be used to know the user's card pins, passwords, and other security details. It is also possible to know about a person's likes and dislikes and based on those, his decisions can be predicted and maybe even made to change. In security and authentication of users, the researchers are successful at identifying a person by using his EEG waves while performing a particular task (viz. singing, dancing, jumping etc.) with an accuracy of over 95%. But again these can be cracked by thought impersonators. In many cases it is possible to change the users' decision and basic cognitive function of the brain by interference in the EEG signals. The user might even lose his free will to make decisions. Neuroscientists have addressed this concern and have created "BCI Anonymizer". This might be a software in the core application of the device or an added hardware. What it does is pre-processes and transmits the signals acquitted without storing them and only sending intended BCI commands. Studies about how much an adversary can affect the user have been conducted. It has been concluded that the current systems need design improvements. In brief, there is a need for privacy and security designs in the system so as to avoid any future catastrophes. By integrating privacy and security concerns in the system design for BCI, we can create devices that respect user privacy, are safe to use and follow ethical guidelines.



So, in conclusion, BCI proves to be a dawn of newer technological advancements to make human lives even more comfortable. It has abled the disabled. Devices working directly through our brains are now a huge possibility in evolving humans. All the risks mentioned are a necessary concern as any problem detected in these devices might directly affect our brain. What we risk here are our memories and free will to interact with our surroundings.

By
Prakash Jha IT A
Divyam Choudhary IT A
Shubham Maheshwari IT A
Pratimesh Majumdar IT A



# MAGNETIC LEVITATION

By: Shivam Sharma, Srishti Singh

Magnets are present on Earth from the past billions of years. Magnetic fields, Magnetic moments and many other magnetic forces have a strong impact in today's scientific world. Technology is getting advanced every year. But along with these advancements, it is also becoming a tough call for the engineers and technical departments to think of environment-friendly techniques. Some of the engineers and inventors found an interesting way to cope up with the grievance of the technology advancement. This was the start of using Magnetic Technology as an alternative technology.

In the late 1900's, it was the time of the Industrial Revolution, when the main focus was the use of new technologies or making changes in existing ones for decreasing labour's work and increasing the production rate. This was mainly done by a new mechanism.The first of Magnetic Levitation is Maglev Train.

Maglev is the term used for Magnetic Levitation. Levitation means rising or hovering in the air, thus magnetic levitation is a mechanism which helps to suspend or rise the body freely in the air. The body possesses some magnetic properties by virtue of which it can be lifted in the air
.

When the onboard superconducting magnets pass at a high speed of several centimetres below the centre of these coils which then acts as electromagnet temporarily. As a result, there are forces which push the superconducting magnet upwards and ones which pull them upward simultaneously, thereby levitating the maglev vehicle.

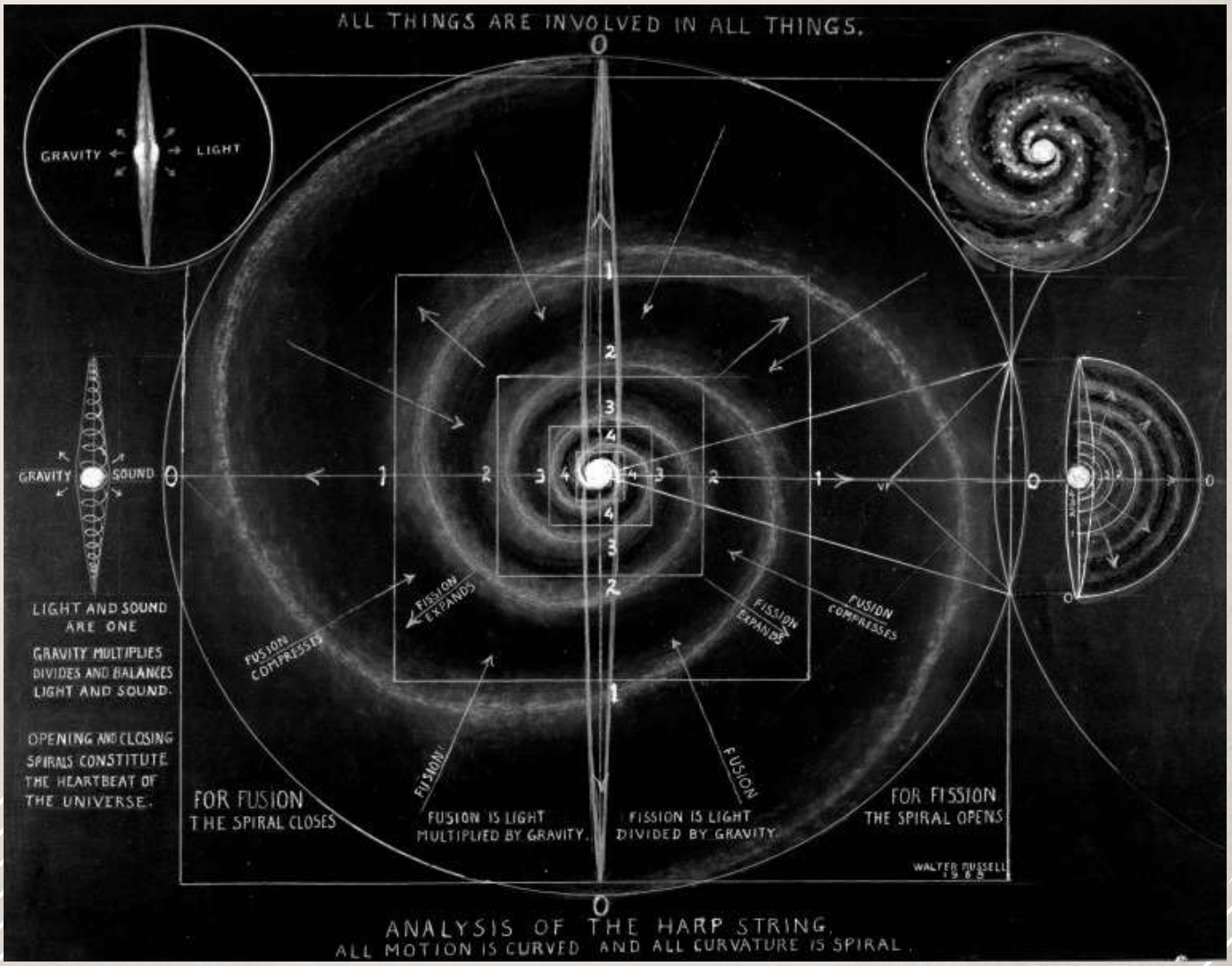
Since the invention of the railroad, Maglev is the first fundamental innovation in the field of railroad technology. The magnetically levitated train is a highly modern vehicle

The train works on the principle of EMS and EDS,i.e. Electromagnetic Suspension and Electrodynamic Suspension in which EDS is most applied system to assist magnetic levitation. In this motion, the body is suspended in air by electromagnetic forces of repulsion. Along the track, a guide-way is present with magnetized coils. The current is passed through the tracks because of which there is change in polarity of magnet causing the train to levitate between 0.39 and 3.93 inches (1 to 10 cm) above the guide-way. There is no friction acting on the train excluding air resistance. The major advantage of this train is that it consumes 30% less energy than normal trains and also it reaches up to a speed of 500-600 km/h.

Facts about Maglev Train

- Maglev train covers a distance of 30.5 kilometres in 8 minutes.
- They have very low maintenance cost, because there is no friction means to cause wear and tear of train.
- It's design is such that it does not have a chance of derailment.
- There is also no air pollution because no fuel is used for running the train.
- Maglev train does not produce noise.
- Average cost of production ranges between USD 1.4 to 4.4 billions.

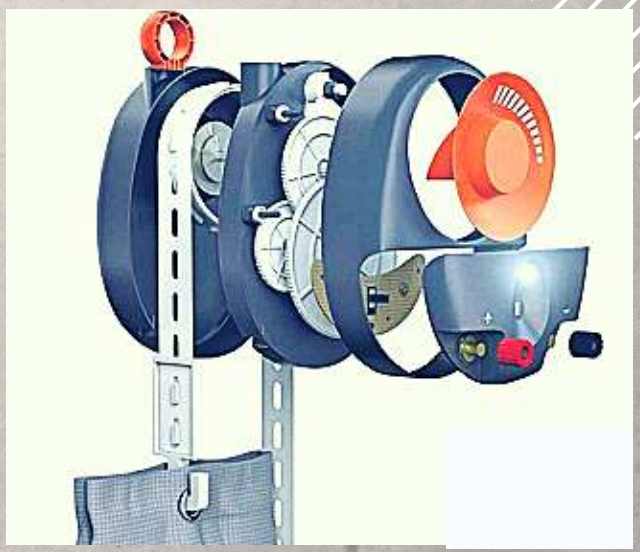

Marshall's Advanced Space Transportation Program is developing a magnetic track to get a running start for the space launch and break through free from Earth's gravity. A magnet launch system uses magnetic fields to levitate and accelerate the vehicle along the track at a speed of 600 km/h. The vehicle will take the rocket engine for launching it into the space. Use of Magnetic levitation technique would reduce the cost of fuel required to launch the space vehicle dramatically and thus also creates lesser air pollution than fueled launching vehicles.

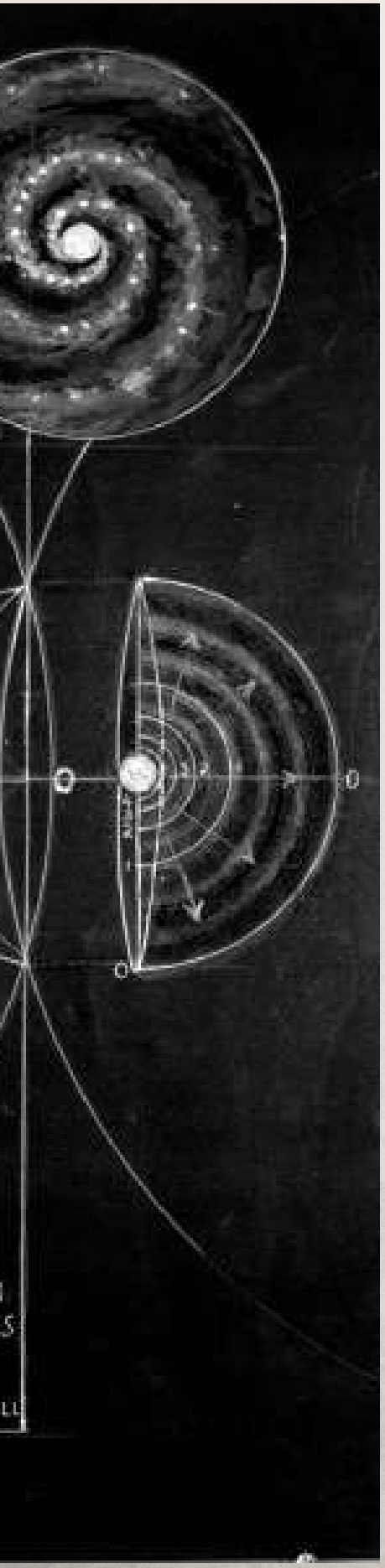



# Gravity light

**BY SHRUTI MISHRA**

In this 21st century, the mankind is developing at the highest rate of success and are using the resources to the fullest. This has raised an alarm for the future generations. The resources are on a verge of extinction. Hence alternative sources are in a huge demand. One of the most efficient way to produce light is via gravity. Yes! Gravity could be used in producing light. The only concept behind it is the bicycle dynamo electricity generation.Here gravitational force is used instead of pedaling. There are power cuts in rural areas, due to the setup of industries which demands more supply of electricity. The only alternative used by the villagers are kerosene and wooden lamps which affects their health eventually. Lack of electricity or power is one of the biggest hurdle faced by any country at the stake of growth and development.

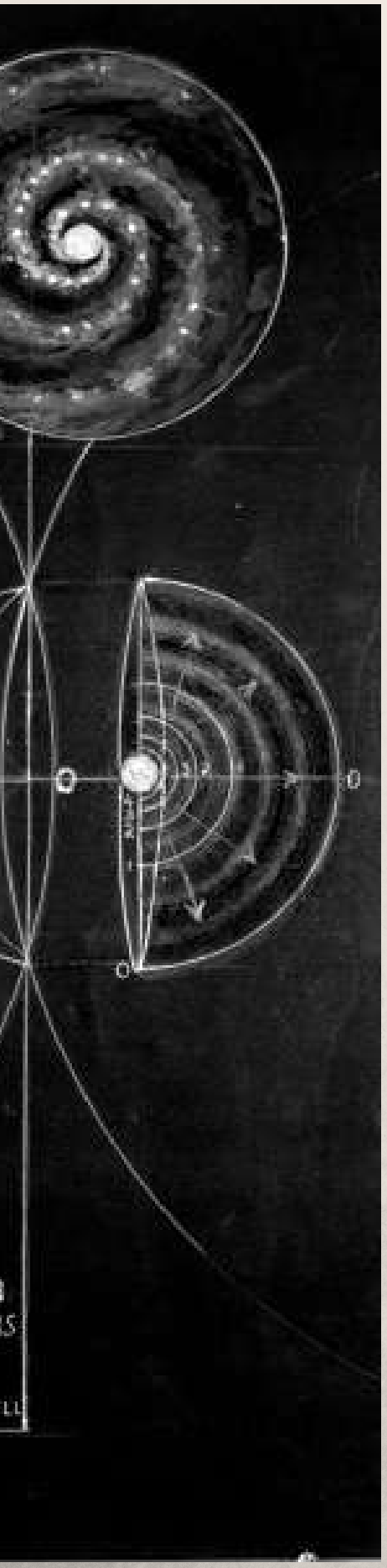




Gravity light produces electricity enough to run 3 LEDs for about 25 minutes. It requires low-cost budget and the cost could be covered up in 3-4 months. It is easy to assemble and requires less space.

Materials required:-
The synchronous motor, wheel, sprockets, chain, pulley, V belt A95, Mild steel shaft, U clamp, M12 Bolt, M6 screw, washer, wood piece, 0.5 W LED bulb, AC to DC circuit.

Mechanism:-
Mass falls as slowly as possible, while still causing the generator to turn fast enough to power the LED light. The whole system would be turning slowly, except the outer pulley that is attached to the edge and is having faster speed. The generator is a motor from a microwave oven, which slowly turns the tray inside the oven. If we turn the shaft of a motor manually then the motor acts as a generator and produces power. This motor has a lot of gears inside it that makes it turn very fast. It produces a useful amount of power, which is used in the pulley system. Also as the motor is also a generator, conversion from slow to fast is done.



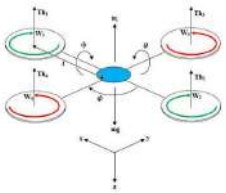
Total Cost: - Rs.1308.00
It has lower cost budget and high income. It's safe, cheap and produces clean light. It's one of the best energy solutions. It has the ability to study and work after dark, unlike solar energy.

The efficiency of gravity light calculated:

The efficiency of the System is calculated
Height of fall of 2 metres and Mass of S
Output Voltage Measured = 25V
Output Current Measured = 3mA
Output Power = 0.08W
Efficiency = (Measured power/Theoretical Power) * 100 Efficiency
= 22.36%
Considering the Frictional losses, slip in belt drive and losses in circuit 22.36% efficiency is a fair value achieved.

Hence, gravity light could be considered as a good source of electricity for small purposes, especially in rural areas. More research work on this and other alternatives will lead to a better future ahead.

# Quadcopters



ROBOTS THAT FLY

What is Quadcopter?

A quadcopter is an aircraft. It is a multicopter which is based on a number of propellers mounted on the aircraft. A quadcopter has 4 horizontal rotors each consisting of two/threerotor blades. It is a 4 propeller multicopter hence the name, quadcopter. For past few years, remote control airborne veicles have attained popularity. These are popularly known as
quadcopters, quadrotors or even drones.

These flying objects specifically fall into the category of unmanned aerial vehicles (UAV).This actually means that it is controlled by a pilot on the ground or in another vehicle. According to Artificial Intelligence (AI), quadcopters are nothing but Autonomous Flying Vehicles. This category of craft has no pilot. In this, simply one has to connect the battery to an electronic system and let it fly. Sensors such as GPS, Accelerometers, cameras, etc. are all included in it. The controller gathers data from all sensors and according to the algorithm it autonomously decides how and where it should go.

Basic Components of the Quadcopter include Motors, Propellers, Electronic Speed Controllers
(ESC), Battery and Power Distribution Board (PDB), Flight Controller (FC) and Frame.

HOW QUADCOPTERS WORK?

A quadcopter is in an H, Plus or X Shape, of which, the X shape is widely used. The 4 motors at the edge of 4 arms produce thrust and torque. When all 4 motors have same torque and total thrust is equal to or greater than mg, the quadcopter can hover and stay steady on the ground. The direction of rotation of each motor counteracts the torque generated by the motor
that is placed on opposite side, thus canceling the torque.

SO HOW DO QUADCOPTERS FLY HIGH?

All 4 motors increase speed simultaneously to gain altitude. Forward and backward movement of the quadcopter is enabled by its Pitch Control. Yaw is a rotation movement of the quadcopter. In order to have Yaw rotation, the speed of any of the 2 opposite motors is lowered. This increases/decreases the left/right torque, creates imbalance, thus causing rotation.

## APPLICATIONS:

By the end of 2014, quadcopters were released in the market for the public. Phantom is the most common commercial quadcopter from DJI. Quadcopters capable of autonomous flight can help remove the need for people to put themselves in a no. of dangerous positions. For e.g: A mountain climber can deploy a quadcopter autonomously to check whether he should be more careful or not while climbing further.

Also in case of disasters, quadcopters can be deployed in a house to check whether there are human survivors or not. They are even used by military and rescue teams to search, spy, and indoor 3D scanning. They are now used to capture images and videos of areas that are rough or dangerous for humans. Thus, this technology is constantly bringing new innovation and big investments as more evolved and advanced drones are launched in the market every few months. The world needs something fast, light and reliable, so what better than quadcopters?

BY
Rucha Belgali
FE IT A

# No CAPTCHA, reCAPTCHA!

Whenever you are about to login/sign up to an account or about to book a ticket, or when you fill a form, you see a checkbox at the end beside which it is written, "I'm not a robot". Ever wondered, just by checking a box, how does the system come to know that you are not a bot?


It all started when sites started to crash, 12 years back. Artificial intelligence came into the picture and automated computer programs were built to buy all the tickets at the same time. It took only a few seconds for a bot to do this. Spamming increased and Turing Techniques were used in which the computer automated program analysed if it was a human or a bot by asking questions that were considered to be non-answerable by robots, but later this theory was proven to be wrong.

Then, reCAPTCHA came up with the idea of using CAPTCHAs. A CAPTCHA is an acronym for Completely Automated Public Turing Test to tell Computers and Humans Apart. You must have also been recently deciphering data which is distorted/misaligned and had stray lines over it. In 2012, it was assumed that robots are unable to read a misaligned text but a human can and distorted synthetic images of data were put forward to decipher. But then, Artificial Intelligence advanced and it was all possible. In fact, the success rate for humans to decipher was just 33% while for bots it was 98%. A synthetic image of data used already

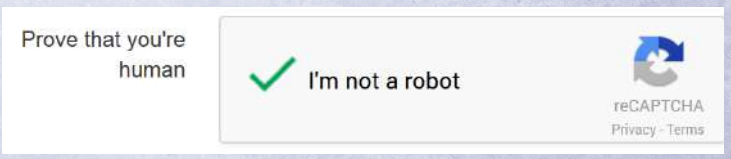
digitized images of books those were available on google books and matching with the growth curve of artificial intelligence got tougher.

Then Luis Von Ahn came up an idea of digitizing new books which will help the unknown authors to develop. Those newspapers and books were analysed by two OCRs. The words which were scanned different by both of them were considered to be suspicious. A suspicious word along with a control word (a control word is the one which is known to the computer) was distorted more and used as a CAPTCHA. If the control word was deciphered perfectly, then the user was considered to be a human or else it was not allowed to move further to the page.

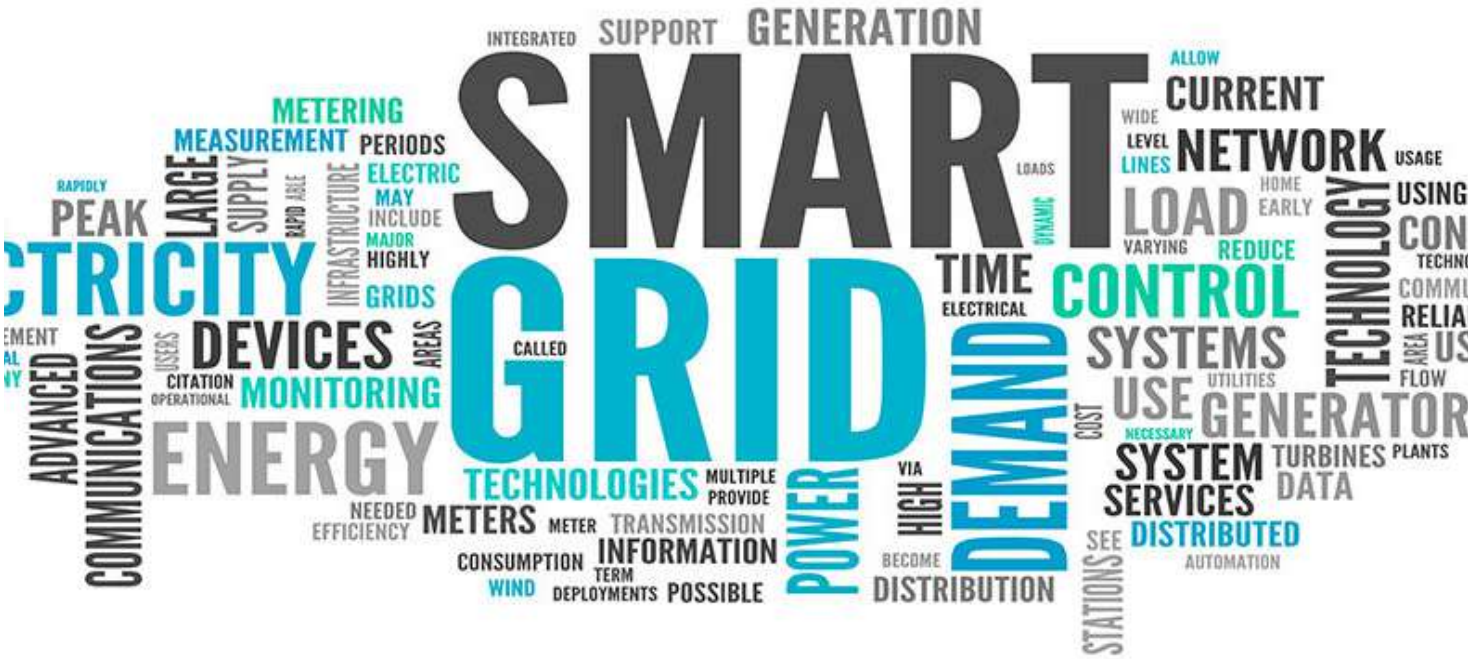
If the unknown/suspicious word was deciphered same by 3 users, then it was converted into control word and which eventually helped in digitizing the respective book. Around 7 million people were deciphering CAPTCHA at a time around the world which led to tremendous growth in the market of digitizing of books but it had lots of cons. Many-a-times, a free CAPTCHA software provided CAPTCHAs that were rendered on the user's computer screen and were perfectly fine at the server so, bots got a back door to access them. Also, there were problems for visually impaired people for deciphering and therefore google provided an audio alternative.

Last year, Google, beating all the disadvantages of earlier CAPTCHA method put on a slogan which says, 'No CAPTCHA, reCAPTCHA '. It is also called as invisible CAPTCHA where a user has to just tick a checkbox and it is analysed if you are a bot or a human. What it requires is your IP address, HTTP cookie and just with the movements of your cursor few seconds before you tick the checkbox, a human and a computer is told apart. It works on the principle that the behaviour of a bot and human varies with the way they make movements of their mouse. A still suspicious user is set to determine images those are alike which is simply impossible for a bot to do so.

It provides free CAPTCHA service and around 200 million CAPTCHAs are ticked every single second. So, now you know what this ticking a checkbox means and why it came to the picture. Thanks to Google, 5000 hundred hours of people around the world are not wasted deciphering the distorted data.



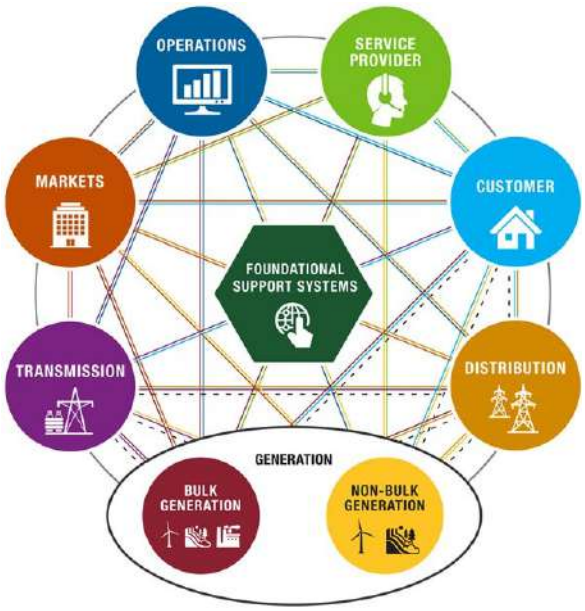

By,
Sanya Gandhi
IT A




Electricity is imperative to contemporary society and the economy. Our current electric grid was conceived more than a hundred years ago. When electrical energy needs were simple and energy generation was localized and built around communities, most properties had only small electricity demands such as a few mild bulbs. However, most of the world depends on electricity systems built around 50 years ago. These are inefficient and cannot provide a fantastic response to trendy pressing international challenges. Smart grids will be a necessary enabler of this transition. In the rising strength needs of the 21st century, the smart grid introduces a two-way dialogue where electricity and data can be exchanged between the utility and its customers.

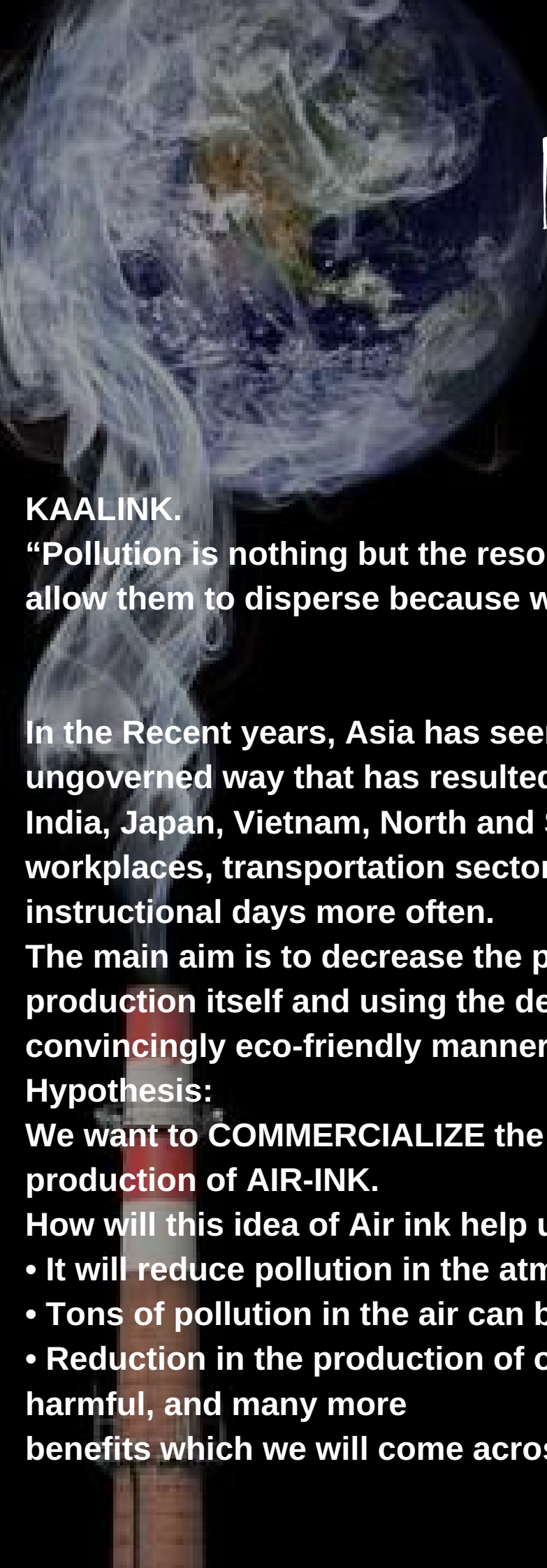
A smart grid is an intelligent, digitized strength network handing over electrical energy in an optimal way from source to consumption.This is carried out with the aid of integrating information, telecommunication, and energy applied sciences with the present electrical energy system. It's creating a community of communications, controls, computer systems, automation and new technologies and tools working collectively to make the grid extra environment- friendly, greater dependable, more tightly closed and greener. This smart grid enables more modern technologies to be integrated such as wind and solar power manufacturing and plug-in electric powered automobile charging. There is an estimated $13 trillion investment required in energy infrastructure over the next 20 years.

A poorly deliberate and completed pilot can set back the adoption of smart grids and negatively have an effect on the public understanding of low-carbon technologies. The grid allows consumers to manage their electricity usage by measuring their home's electricity consumption via smart meter utilities and can grant their customer with a lot of data to control their electrical energy bills inside their smart homes. Smart Grid technologies furnish certain information that enables grid operators to see and manipulate electricity consumption in real time. This higher perception and control reduces outages and lowers the need for peak power across the energy
control rooms. The grid engineers will be capable to precisely and predictably control electricity production, lowering the want to hearth up steeply-priced secondary electricity plant.




The distribution system routes energy from the utility to residential and commercial customers through strength lines; switches and transformers utilities typically are counted on complex energy distribution schemes and manual switching to preserve strength flowing to their customers. Smart Grid applied sciences and patron participation utilities can easily manage the increased demand for power to run the electric powered cars and make sure charging needs are met by adding more plug-in electric cars to the grid. They have a smart grid pilot which provides functions that aid buyers to minimize their electricity invoice and obtain visibility and control. The Government needs to take on board these guidelines to deliver smart grids, a cornerstone for a low-carbon, efficient, and secure energy future. Information science will not solely assist the smart grid to be routinely observable and controlled. More importantly, it will help us to achieve the location of smart grids for everyone. Undertaking smart grid research in India is
critical for protection and stabilization of countrywide energy grid, optimization of countrywide energy shape, etc. The electricity devises improvement as the world's new vogue of change, the smart grid will lead the Indians to repair confidence, revive enterprise and promote sound and quick financial growth.

THANK YOU
- AMIT SINGH (IT B)
- PRIYANKA SHARMA (IT B)



# POLLUTION

## THE UNUSED RESOURCE

*By: Prachi Watkar, Sriya Vaishnav, Aditi Verma*

**KAALINK.**

**“Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we’ve been ignorant of their value.”**

**~ R. Buckminster Fuller**

**In the Recent years, Asia has seen an industrial boom in an ungoverned way that has resulted in air pollution crisis in China, India, Japan, Vietnam, North and South Korea to such a level that workplaces, transportation sector and schools have declared non-instructional days more often.**

**The main aim is to decrease the pollutants at the source of production itself and using the derivatives of polluted air in a more convincingly eco-friendly manner.**

**Hypothesis:**

**We want to COMMERCIALIZE the device KAALINK and up the production of AIR-INK.**

**How will this idea of Air ink help us?**

- **It will reduce pollution in the atmosphere.**
- **Tons of pollution in the air can be used for something.**
- **Reduction in the production of other common inks, which are harmful, and many more**

**benefits which we will come across later.**

**THE FOUNDER OF GRAVIKY**

**Anirudh Sharma, the founder of GRAVIKY dropped out of college and began to build interactive displays on a commercial scale when he was invited by the Imagine Group at Hewlett-Packard for an internship in Bengaluru. In 2010 he made a shoe fitted with the vibrator of a mobile phone that would give the visually impaired people a haptic sense of direction. The idea went viral. He soon saw possibilities for the general population too, and he quit his internship to launch his shoe company called Ducere Technologies in Hyderabad with Krispian Lawrence,friend from Bengaluru. It won him the MIT TR35 'Innovator of Year' award in 2012. From a team of two, Lechal now has 100 employees. His success also got Sharma an offer to pursue a Master's degree at MIT Media Lab in 2012. This gave him the opportunity to learn to build next-generation augmented reality systems using futuristic technologies. After graduating in 2015, instead of opting for a job in San Francisco, he set up a research lab in India. "In India, there are so many problems around you. Either you crib about them or say let's solve them, let's do something about it. There's a big opportunity here," says Sharma.**

**What is kaalink?**
**KAALINK™ is patent pending retrofit technology used to capture air pollution particulate, which is then processed into making AIR-INK. It can, which is then processed to remove heavy metal and carcinogens. The unit captures up to 95% of the particular matter pollution without inducing backpressure on the engines. The end-product from this device is a purified carbon-based pigment..**


**KAALINK™ is presently under certification and commercial pilots, and available for private demonstrations. Kaalink has been tested on cars, trucks, motorcycles and fishing boats in Bangalore and Hong Kong.**
**The unit works hard to capture outgoing pollutants, and is designed with heat and waterproof electronics and materials. KAALINK™ is currently designed to fit diesel generators, small chimney stacks, biogas burning chimneys. It is estimated that the collecting device fixed to an old car will be carbon neutral after 200-300km.**


**The Challenges to commercialize Air-Ink:**

- **Slow production.**
- **Primitive design.**
- **Lack of awareness.**

**Solutions to these:**

**1) To Slow Production rate:**

- **KAALINK should be attached to vehicles in cities.**
- **Special subsidies should be given to people who use KAALINK.**
- **It should be a necessity for Heavy vehicles.**
- **Modified huge structure of KAALINK that purify wind.**

**To Primitive design:**

- **Tie-ups with premiere institutes, scholarships, and cash prizes can be announced to up the innovation level.**
- **Students should be targeted to influence their mind-set in a positive way.**

**3) Creating Awareness:**

- **Using Creative artwork to attract public's attention.**
- **It will be effective if students are introduced to the products of AIR-INK.**
- **Artists can be asked to create using these products.**
- **Pact with the government to consider products obtained from KAALNK under green credit scheme**

**The applications of Air-Ink and its by-products:**

**1) Train and Bus tickets: In-situ produced ink will decrease government expenditure on carcinogenic ink.**

**2) Stationary: AIR-INK based pens and markers agree to our basic moral: to protect and save the environment.**

**3) Printers: Customized printers can use this low-quality ink.**

**4) ATM's: Receipts which are often not required by a customer can use this.**

**5) By-Products: Obtained metals can be bought by companies under green credit's scheme.**

**6) Carcinogens can be given to Research organizations.**

**Advantages of Kaalink:**

- **It runs on low maintenance.**
- **The pollutants are repurposed to the fullest.**
- **It does not hinder the normal functioning of the vehicle.**
- **It stops pollution.**
- **If structures similar to the functioning of KAALINK, air pollution would no longer be a threat.**

**Disadvantages:**

- **Emptying the contents of KAALINK can be irritating.**
- **Fixing KAALINK by inexperienced can cause damage to the vehicle.**

**The concept of air ink is very innovative, eco-friendly, and useful. The filtered pollution collected in kaalink is then treated and made in the form of inks, paints which can be used in place of our normal marker inks and paints. This reduces a lot of harmful pollutants from the air. This kind of pollution collection can be started in the states where pollution limit is much more than it is accepted such as Delhi our national capital.**
**This idea was first brought up 3 years ago and they worked it out and made this air ink and kaalink. Anirudh and his team are further working on it.**

**“Sooner or later, we will have to recognize that the earth has rights too, to live without pollution. What mankind must know is that human beings cannot live without the earth, but the**
**planet can live without humans.”**
**-Evo Morales.**

# PROCRASTINATION

IMPACT ON STUDENTS


## THE QUESTION IS, WHY DO WE PROCRASTINATE? DON'T WE PUT IN EFFORTS? IS THE WORK TOO HARD? DO WE NOT HAVE ENOUGH TIME

Procrastination and a student appear to go as one. At the start of every semester, almost every student builds an objective of completing their work on time, doing his or her best, and making decent evaluations. In reality, most students keep their work pending until last minute.

In spite of this ever-famous pattern of putting off work, most students lament delaying? Procrastination is something that students face in their day to day life. It demonstrates their conduct for postponing the errands which adversely influences them. It is a predominating worry for the student's absence of devotion towards their work. We know that academic weight scales up causing a distraction towards their focusing skills. While almost all students have assignment load and higher-class, some also have part-time employment that takes up a lot of time. Additionally, as students get nearer to

graduation, their classes turn out to be more troublesome thus, bringing about more work. A few students will take on the work and finish it in a convenient way. But for some, this measure of work brings about pressure and possible lingering.

There are two types of Procrastination : Short-term and Long-term Procrastination

Short-Term Procrastination occurs when the people are well acquainted with deadlines. The examples of short-term procrastination include project submission before a specified date, preparing a presentation for an interview or having an assignment due. In all these examples, people find out ways to complete their work on time. Most of the students and employees face this kind of procrastination. The quality of work decreases because the task which was appointed to be completed in a month or so is done in a day. In the end, the desired results are not obtained and it becomes a reason for depression or dissatisfaction among most of the students.

Long-Term Procrastination occurs when there are no deadlines. Tasks like starting a new business or making a documentary don't have any deadline because they haven't even started yet. This is the type of procrastination that affects people in the long term. They fail to reach their goals because they didn't even start chasing them. Losing an opportunity is one thing but not even working for one can have catastrophic effects on one's professional and personal life. No one is aware of this procrastination until there is a danger of carrier disaster or a big financial loss.

The most common reason for procrastination is that the students are too lazy when it comes to completing their work, another reason could be academic pressure. The load of assignments is so much in any college that it also affects their time and the study schedule. Time management becomes a challenge, because after so many hours of continuous lectures and practicals, students are not in a position to study or complete their projects. Also, understanding and liking of the subject is important. Majority of the students don't pay attention in the lectures due to faculty issues. The transition from junior college to professional college brings changes in the student's life, not only the travelling but also the extra coaching classes takes up their time. Other reasons can be compulsion of the attendance for term grant, choice of course, hobbies and passion of other interests, distraction due to involvement in other activities, age factor, impact of advancement in technologies and electronic gadgets, lack of motivation.

As negative as it sounds, procrastination does have a few advantages. It will enhance the student's confidence of doing anything under pressure, which normal person can't do. Benefit of procrastination is to prepare for the real world. At the time of interview, a student is ready to answer on the spot. This delaying makes you more creative, because you become habitual to work on the spot, which makes them to think more & that creates a lot of ideas in their head, it helps them in doing the work faster because they have lack of time. So being a procrastinator they keep things simple, and they know that beauty exists in doing the simple things well.


Its disadvantages include; being a procrastinator all the time leads to poor decision-making capability. It leads to poor time management. Students lose valuable time which is never going to come again. It also affects their health if they adapt to the habit of procrastinating since it leads to anxiety and stress. Academics may create great trouble for career, one might not be getting the job he or she deserves. It will lead to lack of self-confidence and cause low self-esteem, sometimes students might damage their reputation among a group of people

There are ways in which we can avoid procrastinating. Study environment of students should be free from distraction such as TV & use of electronic gadgets. Possible solutions can be provided to convert the non-compliance task into compliance mode. Self-Motivation is the key of success which will help to utilize energy in constructive manner. Focus should be given on self and collaborative learning for boosting up the self confidence among students. Learning behavior should be improved with proper time management. Improving learning behavior:

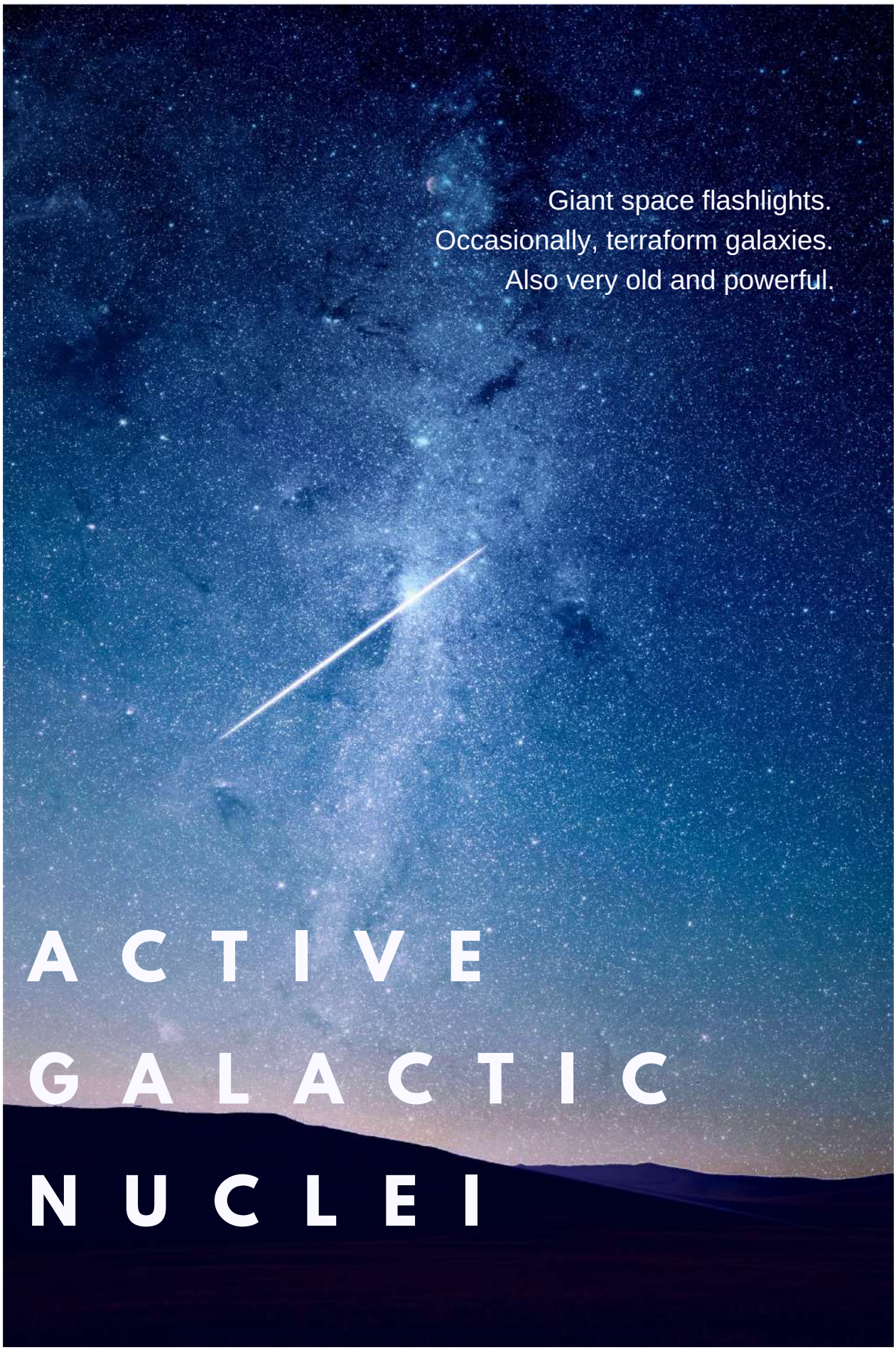
• Focus less on gratification in the presence and focus more on learning for the future. It enhances the behavior in tackling procrastination.

• Don't indulge in fantasies: Stop fantasizing about desired results. "Imagination is the enemy of motivation".

• Being optimistic will help in fast completion of work. Motivate yourself towards achieving goals. Past success will help in building the self-confidence which will lead to completion of project on time.

It appears to be inevitable that all students will procrastinate at some point. Students work, have their social life, and attend numerous classes. Any individual who has been through that phase can identify with it. To stay away from procrastination, students need to expand their assurance to see the master plan. They have to see that they will graduate in some time and these little assignments will help them in future, despite all the trouble. In spite of the way that college teachers relegate a lot of work, it is at last up to the student how to finish the function. It is dependent upon them regardless of whether they will be dynamic slowpokes or simply get the work done.

By
Jigar S. Vaishnav IT B
Tanvi S. Pradhan IT B
Priyanka M. Sharma IT B
Prakash S. UpadhyayIT B


Giant space flashlights.
Occasionally, terraform galaxies.
Also very old and powerful.
ACTIVE
GALACTIC
NUCLEI


# ACTIVE GALACTIC NUCLEI

In the 1970s cosmologists found a dense source which was emanating radio waves in incredible sums. After numerous decades of research and gathering proof, space experts have deduced that the wellspring of these radio emanations was, truth be told, a super massive black hole (SMBH). From that point forward cosmologists have been examining how these SMBHs communicate with and impact their host system. The nuclei of galaxies with such a reduced nucleus of emission in its middle are called an Active galactic Nucleus (AGN).

It has been found, after many decades of star-gazing, that the vast majority of the ordinary galactic systems have a super massive BH in their midst. In an AG system, its SMBH accretes material from the galaxy's thick focal region. The core hauls the cosmic matter towards the centreS with tremendous amounts of force. During this, due to the laws of angular momentum, the matter will curl inwards and get structured into a plate-like structure. This structure is called an accretion disk, and it heats up to millions of degrees Kelvin, due to the gravitational and frictional powers at work.

AGNs are the most iridescent and immovable wellsprings of EM radiation in the universe, thus they can be utilized as a means to find the inaccessible bodies deep in the heavens. AGNs are one of the most Herculean, seemingly perpetual objects. They also show high 'redshift' and this demonstrates that they are separating from the observer with a high speed. Models of AGs furthermore incorporate a region of frosty gas and cosmic dust, in the shape of a giant torus with the BH at the middle and an accretion dish settled in the centre. The luminosity of observed AGNs ranges from 1042 erges/s to 1048 erges/s. typical galaxy luminosity is 1044 erges/s means the brightest AGNs are 10,000 times brighter than all the stars in typical galaxy.

For ordinary cosmic systems, the aggregate of the energy is the whole of the emission from every single one of the stars found in that galaxy, however, in AGs, this does not hold true. There is a significantly more emanated energy in an AG than from a typical one and this overabundance of energy is found all the way from the radio to the X-ray region of the spectrum. The core typically fluctuates a great deal and is very bright when contrasted with whatever remains of the cosmic system.

Since the focal locales of AGNs are solid and spatially uncertain, orientation effects have been the source of much disarray. Truth be told, it has now created the impression that the different types of AGNs are merely the result of orientation with respect to the viewable pathway of the observer.

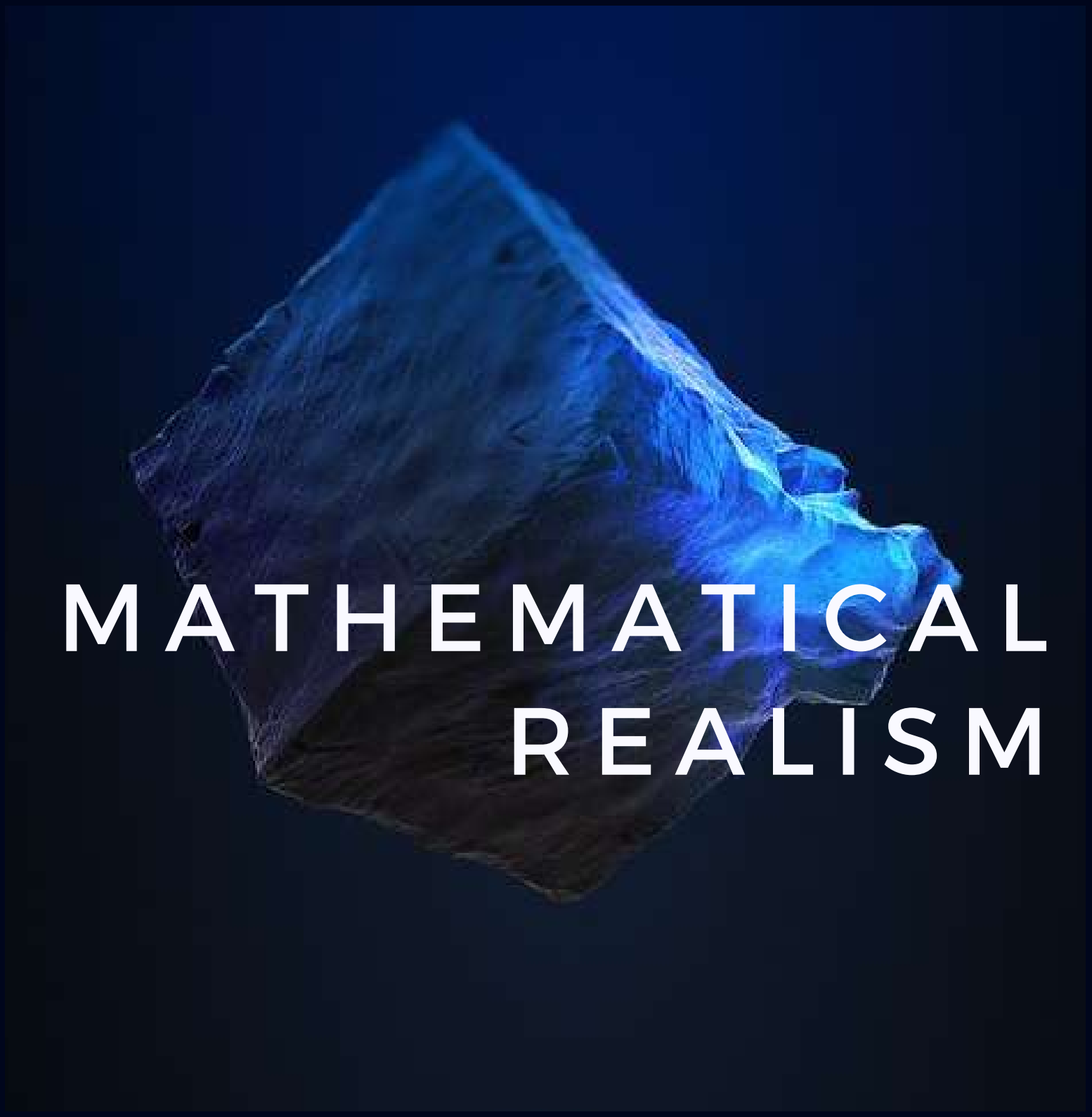
Based on this and some other factors, they have been classified as Radio loud and Radio quiet AGNs. As of now there is still no concrete distinction among its sub types. Over time, some new types emerge out of the depths of the cosmos and as time passes, they turn out to be a part of the previously discovered subgroups. Extensive amounts of research is being conducted on them so that we may have an accurate, complete and clear idea of what they actually are and whether the different types do exist in reality or not.

We have made, but very little progress, towards answering quite a number of the most fundamental questions about AGN. Perhaps the most fundamental of these questions is why AGN should exist at all, because we could easily imagine a universe without any AGN. Several different approaches may soon yield these answers. The central technical problem to overcome is to eliminate the birght point source that is the AGN itself. Starlight in the host can only be seen clearly after the contribution of the AGN is isolated and removed.

The high red shift shown by these massive cosmological beings hints directly towards an expanding universe.  Also the light from them can be used to look further into deep space. And thus it is vital that we answer these questions aout them.

Once we answer these questions we will be a step closer in answering the most fundamental question of all time - HOW DID WE END UP HERE?

*By: Balaji Murthy*


MATHEMATICAL
REALISM


# MATHEMATICAL REALISM

The most ancient philosophical theory, still very much alive today, maintains that there exists a world, different from concrete reality, where mathematical truths properly belong. Plato was the first to propose it, and in his formulation this other world is the universe of Ideas. This point of view, whose origin goes back to Pythagoras, is usually known as Platonism. Others prefer the name mathematical realism, to stress the radical assumption of the existence of a separate reality.

Mathematical realism inspired a passage from Descartes' Fifth Meditation:

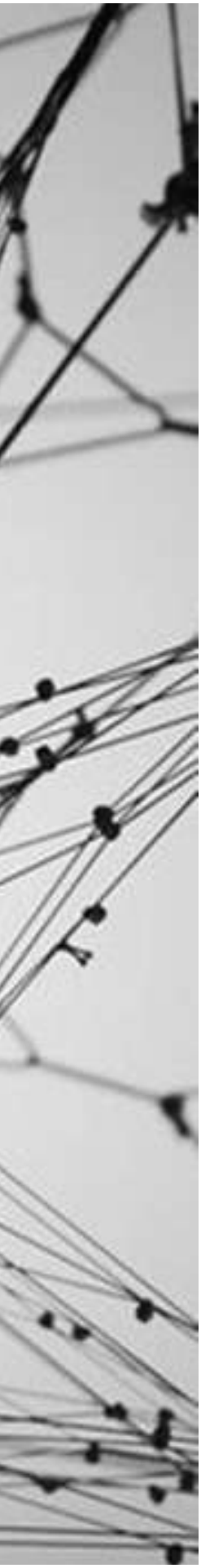
"When I imagine a triangle, even if perhaps such a figure is nowhere in the world to be found except in my own mind, and it has never been, it does nevertheless exhibit a certain nature, or form, or definite essence of this figure, which is immutable and eternal, and which I have not created, and which does not depend upon my mind in any way whatsoever; as appears to be the case since one can demonstrate certain properties of this triangle."

Numbers and functions of analysis are not arbitrary creations of our mind. They exist independently of us with the same kind of necessity as the things of objective reality, and we find them, or discover them, in the same way physicists, chemists, or zoologists do. We do create them, we merely discover them. They have been present since the beginning of time, maybe even before.

There is plenty of evidence supporting the realists' point of view: nearly all of them are creative mathematicians, and they know well the familiar feeling of discovery, constantly renewed, they are talking about. It is the profound coherence found in mathematics that gave birth to the idea of mathematical realism. It is intangible and has a kind of tangled interconnectedness and yet it is coherent. This distinguishes it from any other art form: mathematics in its entirety, from Pythagoras' theorem to the proof of the most recent result, possesses an almost complete unity, it is more like a single piece of work than a myriad of parts put together. This coherence can also take the form of a perfect harmony between the questions that one poses and the answer one expects to find; or that of a generalization that transforms an innocuous theorem into a powerful theory; or even the presence everywhere in the edifice of analogies that repeat and reinforce themselves in one thousand different ways.

Coherence also manifests itself when, from a multitude of seemingly arbitrary inventions, new structures suddenly take form, structures that prove amazingly fertile: distributions, metric spaces, Hilbert or Banach spaces. These examples also show, unfortunately, the difficulty for mathematicians in communicating what they see: only they can really know the wonders that delight them so much; others, the non initiated, must make do with the pale and simplified image glimpsed from the mathematician's description.

The realists never doubt that they are advancing on solid ground that has always existed, and which they are merely exploring. Their approach resembles in some ways the exploration of a virgin forest, wild and thick. Occasionally, the explorers may run into a large clearing in this jungle, but progress is usually made only through demonstration, in a slow, almost creeping fashion, demanding a safe footing for each step. The mathematician at work advances with eyes fixed on the ground, knowing that some supreme truths will only be reached after a long journey, and that from the top of these truths the view,



magnificent, extends all the way to the horizon. However, we may say that mathematicians all agree in recognizing the same features of the explored territory, independently of the paths they have followed.
These are the reasons why mathematical realism is so often dismissed by the skeptics as a mild form of illuminism. At the time between 17th and 19th century, a large number of truly amazing results were available, but the frailty of their foundations had rendered many mathematicians uneasy. A vast program of revision and criticism was then undertaken, unparalleled in the history of ideas. The violent attacks brought against theology after the end of Scholasticism had been innocent taps on the wrist compared to the fury that mathematicians displayed against their own dwelling—the whole building should have collapsed, leaving but the desolation of scattered ruins. What happened instead? The edifice gained in strength and majesty, rising even higher and more spacious than before, the old cracks sealed, the weaknesses repaired. And yet, in a certain sense, everything had changed, axiomatics had replaced intuition, and the structure now reflected a novel order; the methods of reasoning had changed, but the consistency of the results, old and new, came out enhanced and better secured.
Mathematicians constantly run into this kind of lesson in the course of their research work. They get the impression that what they find is not necessarily what they expected, but rather what the force of circumstances imposes, with all the necessity of a world that exists on its own. The objections against mathematical realism are primarily due to preconceived ideas about the nature of reality. But these preconceptions appear less convincing when confronted with the image of reality conveyed by modern physics.

In his book Matière à pensée, written jointly with Alain Connes in dialogue form, Jean-Pierre Changeux presents the point of view of a naturalist and specialist of the brain. He notes that brain structures for perception and for the organization of functions exhibit an internal predisposition, conscious or unconscious, to handle symbols. Our brain invents symbols because it itself operates by processing concrete symbols: its own signals. When it marvels at the discoveries it makes through the power of thought alone, it might only be admiring itself, as the marvel of nature that it is. The coherence we encounter in the products of our brain could be the reflection of the amazing internal harmony of our
thinking machine. This objection has an even greater impact because it strikes right at the heart of what mathematicians cherish most. The marvel of mathematics is reduced to another marvel, that of our own brain. This wonder of nature, like everything alive, is the result of billions of years of evolution, which should explain its near-perfection. But there is more. For what reason has evolution endowed the brain with such properties if not because they are useful for survival, which presupposes a corresponding order proper to the external world: an order immanent in reality? When science explores this order and ends up discovering the principles of physics, it bumps into mathematics once again, but this time as a necessity associated with reality, and no longer as a product of the independent activity of the brain.

Summing up, we have been running around in circles. However, no serious discussion of mathematical realism can be carried out independently of an examination of the laws of the physical world, that is, the nature of mathematics is inseparable from the nature of those laws. Their strange characters are intimately interconnected, and no one can reject in principle the existence of an intangible reality in the name of common sense when this very common sense is being attacked by physics.
It would be a mistake today to build a philosophy of mathematics independently of a philosophy of the physical sciences. Mathematical realism accommodates beauty, coherence, fertility, and it does that while being agreement with the laws of physical reality.

The only problem with realism, and not a minor one, is getting people to accept the existence of something intangible, something one cannot point at and say, “There, it is that”; the existence, in short, of a reality that could be neither immediate nor perceptible.

**By Yash Choughule, Vivek Gurav**
**FE ETRX**

# AUGMENTED REALITY FOR CRIME-SCENE INVESTIGATION

Augmented Reality(AR) is a live simulation of reality where indirect or direct views of physical objects at an area in the real-world environment are augmented using computer-generated superimposed images to obtain a view, thus broadening the perception of reality.

Crimes require a plot and a place. A place may be a room, garden, building, lake-anything that inhibits some kind of authenticity and is situated right here, unmediated, as it can be perceived and experienced. A crime scene is a place which happens to be in a specific state at an instant of time when criminal activity is taking place. It has been encoded by marks and traces which can be analyzed, hence revealing the train of events leading to the crime. This place carries a plot which is scattered and covered up and must be assembled and analyzed. Important pieces of evidence such as hair, nails which contain DNA, traces of blood, gunshot residue, etc. can all be analyzed and interpreted.

Hence, it is of utmost importance that these places be left uncontaminated and untouched. However keeping the crime scene intact as it happened, becomes a painstakingly difficult task as the time passed since the criminal activity increases. Because, if nothing else, then even the change in temperature and humidity can have a great impact over time.

The first officer to arrive on the scene has a very vital role as all the evidence, at that point is uncontaminated and uncompromised. So, the first person should be the most qualified to explore and observe the scene with the same unmatched precision one might see in the Sherlock Holmes movies.

This is not always necessarily possible due to time, cost and geographical constraints. Augmented reality is a technology that works on computer vision based on recognition algorithms to augment sound, video, graphics and other sensor-based inputs on real world objects using the camera of your device. It is a good way to render real world information and present it in an interactive way so that virtual elements become part of the real world. Augmented reality displays superimposed information in your field of view and can take you into a new world where the real and virtual worlds are combined. Crime Scene which as it is a tricky field can thus be represented as layers of information superimposed one over the other.

The first officer on the scene is provided with prototypes using which they can view the AR version and explore the crime scene using devices and it can be recorded and sent over at different locations hundreds of kilometers away to people with finest minds in crime scene investigation such as forensic scientists, specialists, and experts who can guide the officers on site and actively contribute in analyzing the scene.

To construct a narrative for a case, there are four main parameters used:

● The environment: It provides a particular perception for examination.

● Objects within the environment: These require certain interpretation as evidence.

● Methods that govern the investigative process: The way in which the process is carried out.

● Construction of narratives during the course of the investigation: Primarily includes the formation of a hypothesis and explanatory models of the incident

Considering these parameters, the investigator builds a case that can be presented. Therefore, their role is to retrieve important information via the evidence collected and interpret the crime.

Thus, using the AR technologies, a narrative on the same can be constructed by applying them as a development of systems to present valid information and implementation of system tools to assist in the crime scene inspection. There are numerous devices which can be used for evidence retrieval. Cameras, along with trackers, distance calculators, ultrasonic transmitters which store the coordinates along with photographs of the scene before evidence collection takes place so that a 3D model can be reconstructed.

Few devices that can be used are:

● LIDAR(Light Detection and Ranging)

● Stereo Camera

● Ultrasonic transmitters

● Magnetic trackers

Augmented Reality aims to enhance a users perception of and interaction with the real world. Typically, this is achieved through the use of a head mounted display which provides a medium to augment virtual data to and register it accurately from the user's point of view. However, handheld mobile displays are also utilized which are compact and easy to use.Formulation of an all-inclusive and intuitively comprehensive device has not taken place, yet great strides in the same have already taken place. Following are a few existing AR technologies:

1.HoloLens

One of the Microsoft's Partner agencies, Black Marble, has been working on an award-winning application-tuServ has allowed the users to explore the crime scene, placing virtual markers and collecting evidence without disturbing and compromising the integrity of the evidence. It can even work long after a crime scene has been cleaned.  By the utilization of this application, investigators can return virtually to the scene of the crime, referring to the virtual markers that had been placed Video proof can also be obtained, with the cops able to playback and reconstruct the footage. It uses the Microsoft HoloLens to aid officers by real-time mapping of the scenic surroundings and then building a digital recreation using 3D objects, virtual markers, as well as other multimedia such as video and audio—all while eliminating any risk of the physical evidence at the scene being contaminated or altered. The officers could record and live-stream crime scene with the evidence, then the cases files can be shared remotely so that others on the case can access it right away, creating a more efficient, beneficial, productive and collaborative workflow among law officers and investigators. This helps with time which is of great urgency for some investigations, as well it is cost effective

2.Google glass

It is a compact, head-mounted framework that superimposes graphics and information over the user's field of view. The wearable gadget consists of a small computer screen can take photos, record videos and play sound. The screen is mounted in the corner of an eyeglass frame and These innovative glasses, which consolidate an automated interface into the user's field of vision, could enable the officers to quickly observe the essential data.

3.Smart lenses

The lenses are equipped with inbuilt sensors and a camera that can be regulated by simply blinking.

Data is sent to a smartphone through embedded antennas, where the information is handled. Just like the devices described above, these lenses also can help record and deliver information about a crime scene.

I. POSSIBLE CHALLENGES FACED

Enabling the AR technology has made significant progress. In order for online AR annotations to work, there are a few technical issues like Perceptual and Positioning issues that need to be considered. Perceptual issues include inaccurate depth perception and ordering, object matching, blurred visibility due to displays, etc. There is a possibility of instances when the user fails to match the overlaid information with the real world. When considered for professional domains, this is a serious risk when user acceptance is considered. Also, another factor that influences perceptual issues is whether hand-held or head-mounted device(HMD) is used. While the HMD leaves the user's hands-free for other tasks, it can cause motion sickness or visual discomfort as the field of view gets restricted. The user's view of the world is constrained to a limited field of view and prohibited by a fixed degree of freedom that only allows for movement of the head and body while ignoring movements of the eye. Forcing the user to see the world through cameras disassociates the users' autonomy with the real- world. AR annotation systems rely on GPS for positional or orientational information as far as the location is concerned. But this information does not include indoors so that remains a challenge. This issue can be solved by a proposed vision-based positioning system wherein a preconstructed image set is used. The drawback of the AR technology is mainly the immobility of the system and its user.

The AR systems do not have capabilities for the local user to interact with the AR content. In future, we could enable the interaction with the AR content for the local user via free-hand gestures.

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# LIGHT FIDELITY

## INTRODUCTION

We all use the internet daily for various purposes. The mode we use for internet access is the 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 significantly when multiple users are connected to it. We all know that nobody likes their internet slow. We live in a world where speed matters the most. There are a lot of transactions or various works which demand our punctuality. To overcome these problems, we have come across a new technology known as LIGHT-FIDELITY or Li-Fi. LiFi the improved or optical version of Wi-Fi. The term was given to us by German physicist Hass Harald. LiFi uses the light spectrum for transmission in place of traditional radio transmission. The light spectrum is 105 times larger than the radio spectrum which is also crowded. LiFi provides a cheap alternative to internet access. It is much for times faster than regular broadband. The tests conducted gave the results that it can reach a speed of 224 gb/s. LiFi is safer 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 laptops, smartphones, etc.

CONSTRUCTION and WORKING:

LIFI uses light of wavelength lying in visible range as optical carriers for transmission. The two parts used for transmission and receiving are:-
a) Bright LED with white light works as transmitter.
b) A photodiode made up of silicon is used as receiver as it is photosensitive.

A string of data is generated by pulsed emission of light through the LED. This pulsed emission of LED light seems constant source of light as it its flickering rate is very high and it can't be capture by normal eye of a human.

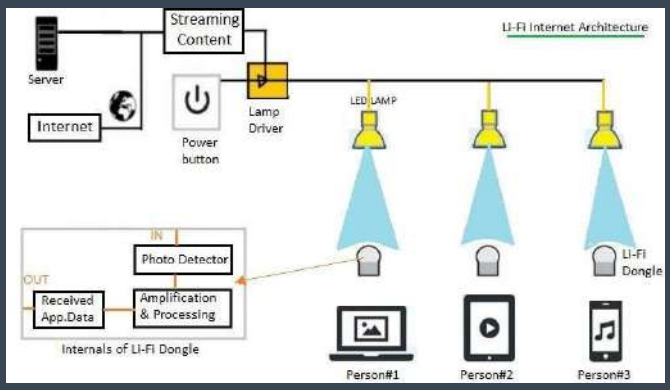
For setting up LiFi we need basic four things:-
1. LED bulb (white)
2. Power amplification device
3. Printed circuit board.
4. Case to enclose the parts

Input and output of the lamp is controlled by circuit board while its different functions are handled by microprocessor. A signal is formed which is sent to the LED. The plasma created due to high energy concentration leads to generation of high energy and strong light all of this are contained in aluminium case.

The bulb is basic requirement for data emission. It decides the direction of propagation of light i.e. data. It concentrates the field inside the bulb creating large amount of energy in it. This energy heats material, thus emitting light.

The advantages of this procedure are high brightness, superb colour quality and high luminous efficiency of the light emitter.

The working of Li-Fi is quiet simple. There is a light detector (light sensor) on ther. The photo detector stores a binary one when the LED is on; and a binary zero if the LED is off.This creates a string of data which is decoded to our message sent by transmitter. This can also be done by using various colours of LEDs to get a wider range of data encryption options




APPLICATIONS

- LiFi has very high-speed for data transmission. In various research institutes 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 various 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. Wi-Fi is not used in planes as Wi-Fi signals may interfere with the signals of control stations. LiFi provides fast internet through light lamp overhead the passenger.
- There are various underwater expedition carried out to find what lies beneath. The machines that are submerged use long cables to send and receive data from the controller. Cables limit the area covered by the
- Headlights and Tail-lights of vehicle can be replace with a LiFi setup, thus this can create an anti-collision technology by inter vehicle communications just with the lights.

ADVANTAGES

- It is much more times cost efficient then Wi-Fi.
- It has very high-speed and 100 times faster than Wi-Fi.
- LiFi is easy to install and doesn't require costly instruments.
- It is more secured than any other network as the data transmission is through light. Light cannot pass through wall.

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 the internet we need to be in straight line with the transmitting light source

CONCLUSION

By this technology every bulb will be a data providing device. LiFi is green technology as it uses led which is energy efficient. The research in field of LiFi is developing really fast and can replace existing Wi-Fi in coming years. It has a very high potential to replace the Wi-Fi because as with increasing population use of wireless internet is increasing, the radio spectrum is becoming increasingly congested thus making it really difficult to get a good dependable speed. LiFi is a promising solution to overcome disadvantages of Wi-Fi. The future of humans with LiFi is all set to break a lot of barriers. Hope we get to see another industrial revolution, but at a very fast speed.

By
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# PHOTOACOUSTIC TOMOGRAPHY

**BY-DEEKSHA SHARMA**

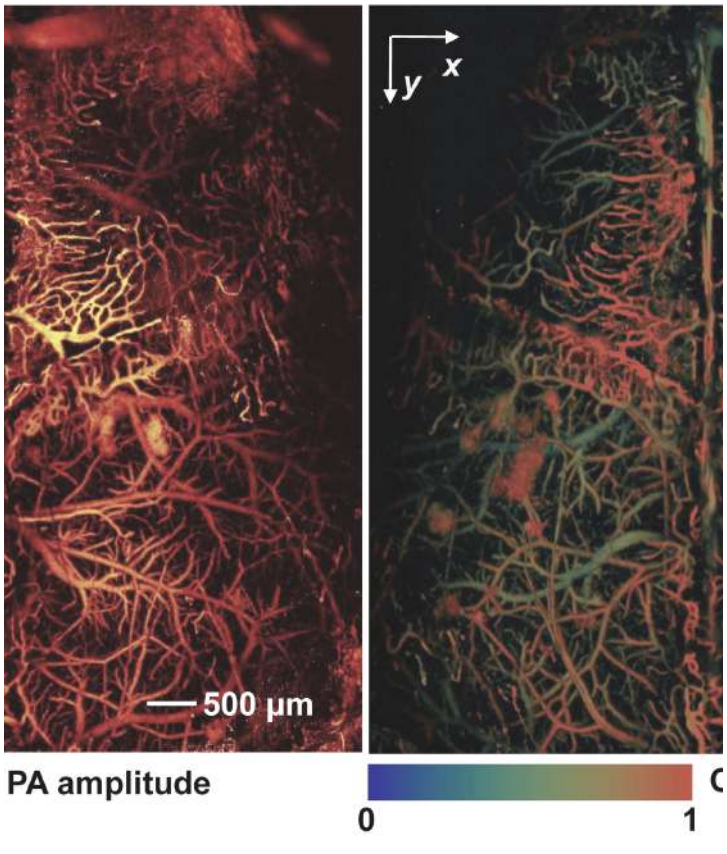
We have been using various techniques for detection of cancer, like Computed Tomography scan (CT scan), Magnetic Resonance Imaging (MRI), Endoscopic examination, etc. Here is another technique which is very helpful for the detection of cancer in today's world. It is PHOTOACOUSTIC TOMOGRAPHY (PAT).

Photoacoustic Tomography is also termed as Optoacoustic Tomography. It is a promising biomedical sensing and imaging modality that integrates rich optical contracts with high ultraviolet spatial resolution in deep tissues for breast cancer imaging, neuroimaging, tumor angiogenesis, blood oxygenation, total hemoglobin concentration, infections like malaria, etc. based on photoacoustic effect.

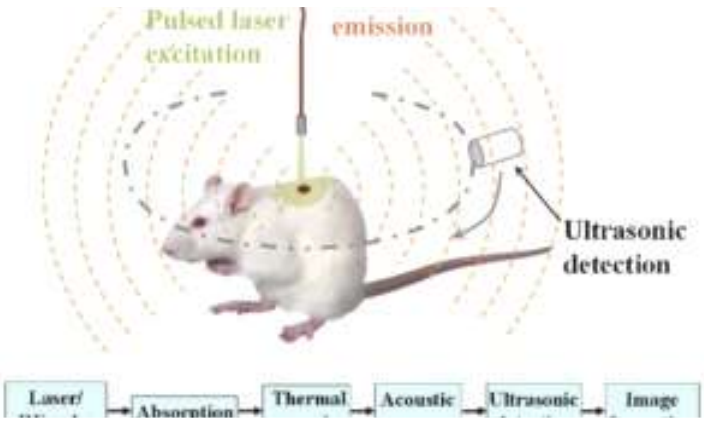
This technique can give deeper images of tissues as scattered photons are utilized also suitable for functional and molecular imaging.

In PAT, a short laser pulse is irradiated on a soft tissue. The energy that is deposited may result in a tissue expansion. This expansion results in subsequent contraction that gives rise to an acoustic pressure wave..

The time-dependent pressure waves are recorded which helps in the construction of map for the distribution of radiation absorption within the tissues, this is called Photoacoustic Tomography. Photoacoustic tomography is an effective non-invasive technique for imaging of early diagnoses of cancer, has now become a popular subject for research.




| | | | |
|---|---|---|---|
| **Confocal microscopy** | Fluorescence/scattering | ~0.2 mm | ~1-2 microns |
| **Two-photon microscopy** | Fluorescence | ~0.5 mm | ~1-2 microns |
| **Optical coherence tomography** | Optical scattering | ~1-2 mm | ~10 microns |
| **Ultrasonography (5 MHz)** | Ultrasonic scattering | ~60 mm | ~300 microns |
| **Photoacoustic microscopy (50 MHz)** | Optical absorption | ~3 mm | ~15 microns |



Photoacoustic Computed Tomography:

The subject is placed in water by providing it with oxygen. Nd-YAG laser is used in this process which is reflected by a mirror and is then passed through the lens on the subject. The signals reflected are received by the transducer which is connected to an amplifier.

The transducer then converts the received ultrasonic signals to digital signals. The ultrasonic detector must have high sensitivity as well as wide detection. For reconstruction of initial photoacoustic absorption distributed signals, inverse spherical Radon transformation is used. This gives exact ballpark and numerical reconstruction algorithms.

Cancer can be detected using photoacoustic tomography and it is a better technique than other techniques like x-rays and ultrasonography.

Photoacoustic Microscopy:

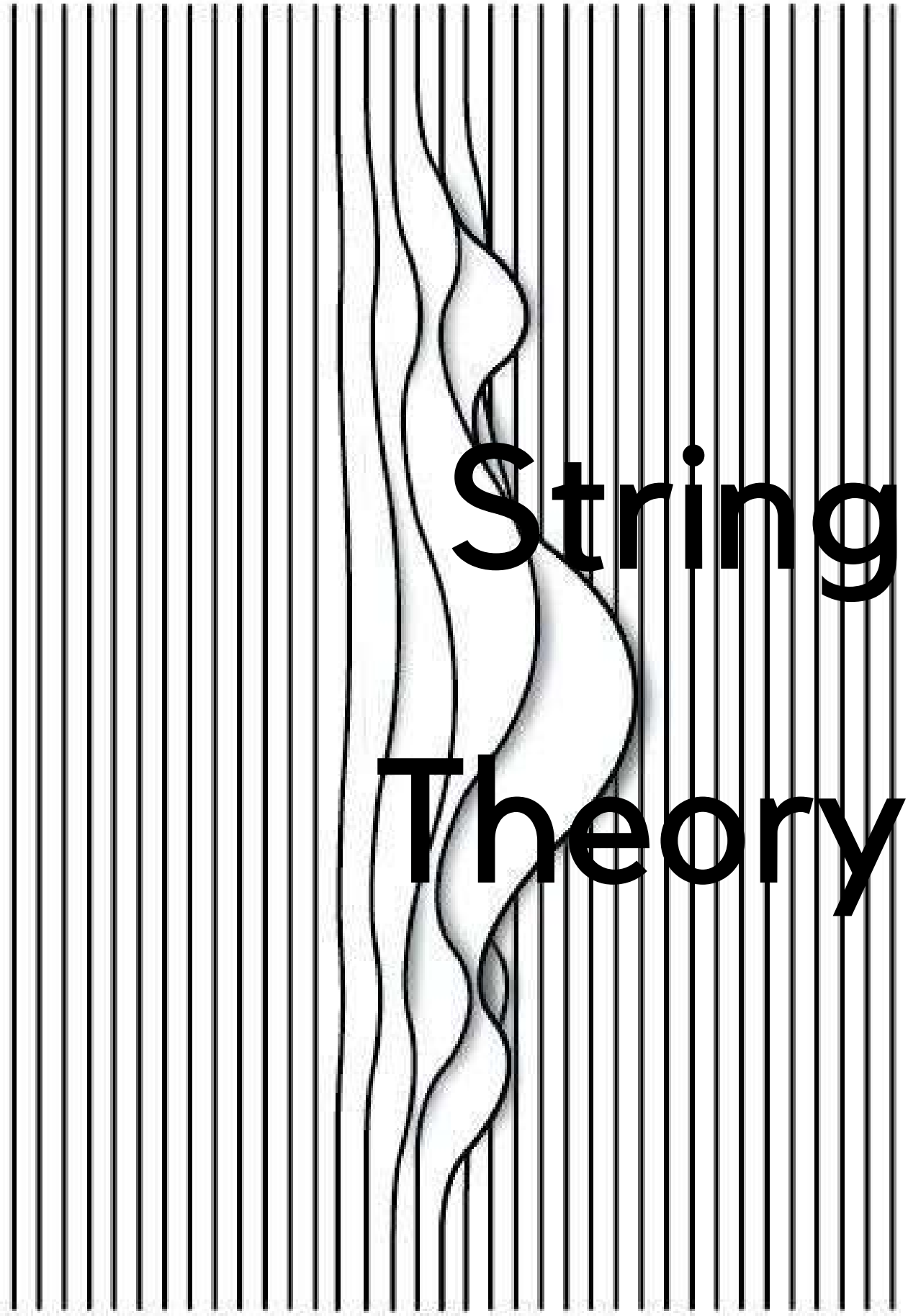
Signals are detected by using positively focused ultrasound transducers. It is much easier to focus ultrasound instead of focusing light on tissues deep inside. There is direct imaging of tissues, no reconstruction. The scanning in photoacoustic microscopy can be done in 2 or 3 dimensions.

Acoustic Resolution Photoacoustic Microscopy Dark Field PAM Ultrasonic reverberations from near the surface are to be avoided. Lateral resolution is done at the focus of 45 µm and a vertical resolution of 15 µm for an 8 x 8 mm FOV.

Limitations of photoacoustic tomography:
Resolution starts degrading rapidly away from the focus.

Optical Resolution Photoacoustic Microscopy
The lateral resolution determines the light focusing on the subject. It is more like optical microscope which measures absorption. It is less penetrating than acoustic resolution in photoacoustic microscopy. It gives a very superficial imaging.

The results indicate the technique's usefulness to differentiate the absorption in the tissues and thus overcoming some of the drawbacks of other cancer detecting techniques.



# String Theory

“When you apply string theory to point-particle physics, the wild undulating jittery properties are diluted and calmed, allowing the math to come together and work. ” - Brian Greene

# STRING THEORY

We can unlock the secrets of the big bang. You see Einstein's equation break down at the centre of a black hole. The two most intrinsic places in the universe are beyond our reach using Einstein's equation and so we need a higher theory and that is where string theory comes in. String Theory takes you before the big bang. And what string theory says? It says that, "There is a multiverse of universes".

Where did the big bang come from? Well, Einstein's equation gives us a compiling picture, where we are like insects in a gigantic soap bubble. A soap bubble which is expanding and we are trapped in it and cannot escape and this is the big bang theory. String theory says there should be another bubble in a multiverse of bubbles. Universes are formed when two of them collide or when a universe splits in half and that we think is the big bang. The big bang is either caused by the collision or fissioning of universes.

If there are other dimensions or universes, then can we go between universes? Well this is obviously very hard. However Alice in Wonderland gives us the possibility that maybe one day we might create a wormhole between universes. Take a paper put two dots on it, the shortest distance between two points is a straight line, but if we can fold the paper then perhaps we can create a shortcut. A shortcut through space and time which we call the wormhole.

Now we don't know how practical this is to go through this hole. Even today many scientists are jumping into this game. We need to figure out if it is physically possible to go all the way through a wormhole. Because if we could we might be able to use it as a time machine. So a string theory is a theory of everything. It is also a theory of time. And time machines are allowed in Einstein's equation, but to build one is extremely difficult, far more energy is required to do so.

Why seek other universes? Trillions of years from now universe will get awfully cold. The universe will head for the big freeze, all the stars will blink out, stars will seize twinkle but the universe will be so big that it will become very cold.

At that point, all intelligent life and universe will die. The laws of physics can be proved to be a death warrant to our lives. There's only one way to escape the death of the universe and i.e. to leave the universe. And so we have the equations of String Theory which will at least help us to calculate to go through a wormhole, to go to another universe where it's warmer and perhaps we can start all over again.

By: Tanvi Pradhan FE-IT-B

# Acknowledgement.

Its our immense pleasure to acknowledge the members who have strived hard to put forth this incredible magazine of H&S department. A heartfelt gratitude to our influential Principal Dr. BK Mishra, Vice Principal Dr. Devan Shah, FE In Charge Dr.Vivek Mishra, Activity Head and Co-curricular In Charge Dr. Rajni Bahuguna , Faculty In Charges Mr. Amol Dapkekar, Mr. Bhim Kunte, Mr. Nivant Kamble, Ms. Jyoti Vanawe and Mr. Tulshiram Kudale as they have guided throughout the making and process of producing this masterpiece which is an exclusive blend of young and intellectual minds. 'The Byte' has raised its status this year by remarkably including a high range of articles related to vast area of concepts and project based researches which leaves us to cherish our hard work and ideas.

"We must learn to live together as brothers or we will perish together as fools" - Martin Luther King

The consensus & cooperation of our editorial team was prodigious in itself and we are obliged to everyone who have contributed in the making of this amazing magazine.
Thank you !


‘Humanities and science’ department is no doubt one of the crucial part of the pillars of our college, as it turns the mud turn into clay with hard work and devotion for the utmost betterment of the students. The activities and addresses provided by the department are commendable and alleviate the students certainly as it ameliorates their aptitude and makes them excel in their domains. This semester students got a privilege to explore industries from its core by visiting their; through the platform of industrial visits. ABL, TBL, PBL, GEPT sessions are providing an in-depth experience of improving the minute detailing which are required to raise their standards and personality. MULTICON-W, international and national level conference and workshop, has been introduced to FE students by our FE in charge and it is made mandatory for students so that at a primitive stage we are ready to face the world of research and development, and also explore our insights by realizing our natural interests of research work. Initiatives taken by H&S department are dedicated towards the development of their students and their hardship is very well appreciable.

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THERE IS SOMETHING GREAT IN BRAVING THE UNKNOWN.