



## THE MALNAD TECHNICAL CLUB



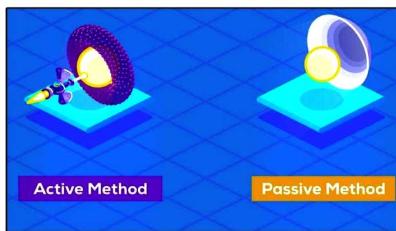
# TECHSANDHYA

5TH EDITION

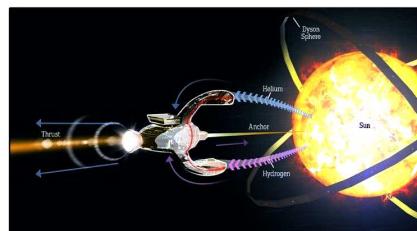
## THE CAPLAN THRUSTER

### What is a Stellar Engine?

A gigantic contraption built with a purpose of transporting our solar system somewhere, if we ever need to move to a different cosmic neighbor, this might sound like an idea from a sci-fi movie. Let's know why we need a Stellar Engine. Nothing in our universe is static. Let us assume our galaxy since our civilization is not advanced enough, we are still a type-01 civilization. Sun orbits 30,000 light years away around the galactic center completing an orbit around 230mn years. So are we safe here? The answer is not 100% safe; the solar neighborhood is constantly changing with stars moving with speed of kilometers per second. There might be a cosmic burst or a Super Nova explosion whose cosmic rays are surely going to affect the earth. So we should move to a safer place not in the near future, but we should surely consider it to happen in the far future. So how do we move our solar system? Answer is we just should move our Sun, the gravitational force does the rest. When the sun moves, everything that's under sun's gravitational force shifts with it. For this we need an engine called Stellar Engine. If an astronaut turned on a flashlight in space it would push him backwards at a considerable speed. Matthew Caplan from Illinois State University designed the stellar engine called the "Caplan Thruster". This concept has been introduced by Badescu and Cathcart. Some variants use this energy to produce thrust, and thus accelerate a star and anything orbiting it, in a given direction.



Active Method



Passive Method

It works similar to a rocket thrusts from one end. It shoots out very large jets of particles at nearly 1% the speed of light and the second jet pushes the sun to the safer place in the Milky Way galaxy. The Caplan thruster needs a lot of fuel, it requires around millions of tons per second. Caplan of Illinois State University has proposed a variant of the Dyson swarm of mirrors that uses concentrated stellar energy to excite certain regions of the outer surface of the star and create beams of solar wind for collection by a multi-Bussard ramjet assembly, producing directed plasma to stabilize its orbit and jets of oxygen-14 to push the star. Using rudimentary calculations that assume maximum efficiency, Caplan estimates the Bussard engine would use 1015 grams per second of solar material to produce maximum acceleration of 10-9m/s<sup>2</sup>, yielding a velocity of 200km/s after 5 million years, and a distance of 10 parsecs over 1 Million years. While theoretically the Bussard engine would work for 100 million years given the mass loss rate of the Sun. Caplan deems 10 million years to be sufficient for stellar collision avoidance. The best source would be the sun to gather the fuel; the thrusters use a very strong electromagnetic field to capture the Hydrogen and Helium from the solar wind into the funnels, but this amount isn't sufficient. That's where the Dyson sphere come, a donut shaped sphere around the sun which helps to take mass out of the sun and concentrating the mass at one point heating up to millions of temperatures, then the Helium and Hydrogen gas are separated and Helium undergoes nuclear fusion emitting a jet of radioactive Oxygen at nearly a billion degrees becomes primary source for our Stellar Engine. The other thruster shoots the Hydrogen jet which is accelerated using a particle called accelerator to the other end of the Stellar Engine preventing the engine from hitting the sun. At full throttle it could completely change the sun's galactic orbit of around 10 light years enough to avoid serious consequences of a Super Nova explosion. You might be contemplating that won't the sun lose its mass? NO, actually it increases the lifetime of our Sun, since the lower mass stars burns at slower rate keeping the solar system inhabitable for many more billions of years. The stellar engine could be used to even escape the gravitational field of a galaxy, enabling inter-galactic space travels in the very far future; not hundreds or thousands of years, we are talking about millions of years and very advanced civilization which could withstand the harsh debris out there in our Galaxy. That means the Caplan Thruster would be speedy enough to get the sun out of harm's way. And thanks to gravity, wherever the Sun goes, the Earth and the rest of the planets will follow.

Amogh D P, 1st year Computer Science Engg.

### Tech Fact

- Emoticons were reportedly first used on September 19, 1982, by Scott Fahlman, a computer scientist at Carnegie Mellon University. He created a happy face and a sad face with a colon, a hyphen and parentheses.

### Editorial Column

*"Exploration is the engine that drives innovation."*

Since its inception, The Malnad Technical Club has been the centre of technical activities and projects in the college and has played a key role in enhancing students' intrigue in technology.

During the 2016 edition of ENIGMA; the annual state-level technical fest of the club, our alumni envisioned and launched the first ever technical newsletter of the college - TECHSANDHYA.

The earlier editions of Techsandhya paved the way for students to put forth their ideas and discussions on a technical facet. Each subsequent edition has seen addition of fresh columns. This year the club is all set to launch the 5th edition of the newsletter. The latest edition features articles on newest technology, amazing tech-hacks, DIYs and much more.

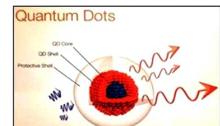
With Techsandhya 5.0, we aim to explore the boundless and fascinating domain of technology through the eyes of students whose ideas could potentially change the world. Each column is an attempt to provide avid readers a deeper insight at technology and its implications on society.

The Malnad Technical Club is eternally grateful to all the students, staff and tech-enthusiasts who have been a part of this publication and we are delighted at the prospect of many more becoming a part of this wonderful journey.

-Editorial board

## "Transparent Solar Panels"

Solar panels pretty much only come in one colour: dark. That is because they use dark sheets of silicon crystals to absorb the Sun's rays and then turn them into electrical energy. Also, solar panels are becoming so cheap and efficient, that all the cities could run on sunlight. However, almost all the sun-catching areas in cities are on the sides of tall buildings, which are usually designed to let light in. We could plaster solar panels all over the sides of buildings, but that would be miserable for the people inside. However, there might be another way.



Scientists recently invented a solar panel that looks like a window. In fact, it is a window except that it is embedded with a thin layer of tiny silicon particles called quantum dots that absorb some of the shorter wavelengths of incoming light while letting the rest pass through. The dots then re-emit the energy in longer wavelengths which bounce along the windowpane rather than escaping because of total internal reflection. Since, the quantum dots only absorb shorter wavelengths, those re-emitted waves travel through the pane without being re-absorbed by other dots. When they reach the edge, they hit tiny solar cells that convert them into electricity. As these solar windows capture some light, they're not 100% transparent, but actually neither are normal skyscraper windows; they're usually coated with reflective material to keep some of the sun's energy out.

Solar windows aren't yet as efficient as typical solar panels, and engineers are still working out some of the technical kinks, so optimistic estimates put transparent quantum-dot solar windows at least several years out. Whenever they do roll out, you might not even notice, because you'll be looking right through them!

Reon Rodrigues, 1st year Mechanical Engg.

- Although GPS is free for the world to use, it costs \$2 million per day to operate. The money comes from American tax revenue.

## Quantum Computing-Is it the Future?

Quantum Computers could spur the development of new breakthroughs in science, medication to save lives, machine learning methods to diagnose illnesses sooner, materials to make more efficient devices and structures, financial strategies to live well in retirement, and algorithms to quickly direct resources such as ambulances.

A quantum computer is a wholly different order of mechanism than anything the human species has ever constructed. The goal of quantum computing research is to discover a means of expediting the execution of long waves of instructions. Such a means would exploit an observed phenomenon of quantum mechanics that, when you write it down on paper, doesn't appear to make sense.

### Why Quantum?

If this goal is achieved, if everything that physicists are certain works theoretically, ends up working in the real world, then mathematical problems that require days' worth of calculation even on today's supercomputers, and some that are not solvable even now, may be solved instantaneously. Climate change models, estimates of the likelihood of Earth-type planets in the observable galaxy, models of the immune system's capability to destroy cancer cells, the most difficult and challenging problems we face today may suddenly yield results within no longer than an hour after launching the program.

### The Quantum tradeoffs:

To be very clear: It would be inaccurate to say that a quantum computer runs programs faster than a PC or an x86 server. A "program" for a quantum computer is a very different order of beast than anything ever produced for a binary processor.

There are several fundamental compromises when you move into the realm of quantum computing. Here's one that's daunting just by itself: Solutions will rarely be exact or definitive. A quantum computer is not a deterministic machine; in other words, there is no singular solution for which any other result would be an error. Instead, a quantum computer will tend to render sets of answers with their respective probabilities.

### What will a quantum computer be good for?

Are there real-world applications of quantum computing technology, or some derivative of it, that people are putting to good use right now? Putting it in another way, what does quantum actually do, and whom does it serve?

### Navigation:

A GPS system cannot work everywhere on the planet, particularly underwater. But, with Quantum computers we can achieve that.

**Seismology:** The extreme sensitivity will be exploited to detect the presence of oil and gas deposits, as well as potential seismic activity, in places where conventional sensors have to date been unable to explore.

**Pharmaceuticals:** At the leading edge of research into tackling diseases such as Alzheimer's and multiple sclerosis, scientists have been utilizing software that models the behavior of artificial antibodies at the molecular level. One methodology developed by 1QB it's researchers involves translating traditional molecular diagrams into graphs full of dots, lines, and curves that, while seemingly more confusing on the surface, map more directly to a quantum model of vectors and relationships.

### What a quantum computer probably is

Think of a computer the way Charles Babbage or John von Neumann considered it: As a mechanism guaranteed to deliver a certain output given a specific set of inputs and a defined configuration. At the deepest microscopic levels of a modern microprocessor, one logic unit is what these fellows would have called a computer.

### Bits and qubits:

In a quantum computer, the structure is radically different. Its basic unit of registering state is the qubit, which at one level also stores a 0 or 1 state (actually 0 and/or 1, which I'll confuse you with in a moment). Instead of transistors, a quantum computer obtains its qubits by bombarding atoms with electrical fields at perpendicular angles to one another, the result being to line up the ions but also keep them conveniently and equivalently separated. When these ions are separated by just enough space,

their orbiting electrons become the home addresses, if you will, for qubits.

### Spin, one way or the other:

While a conventional computer focuses on voltage, a quantum system is (passively) concerned with one aspect of electrons at the quantum level, called spin. Yes, this has to do with the electron's angular momentum. Spin is one of these delightfully indivisible components, representing the angular momentum of an electron as it orbits the nucleus of an atom. The spin of an electron is always, as physicists calculate it, 1/2; the only difference here is polarity, which very simply may be either "up" or "down." The "up" or "down" state of electron spin that corresponds to the "1" and "0" of the typical binary digit.

### What will the first quantum programs will look like?

The trick in writing a quantum algorithm is to imagine that you could actually see, or measure, qubits in their superposition states, so that you can instruct them as to what happens next and cause adjustments to those states. In reality, the very act of attempting to witness superposition results in decoherence -- the reversion of qubits to their classical 0 or 1 states. Decoherence always happens eventually to a quantum system, often after a few minutes, or if you're lucky, in under an hour. The whole point of a quantum program becomes to take full advantage of the ability to manipulate which way all these billiard balls are pointing while no one is looking, prior to their decoherence.

Universal Quantum computers is said to be more power efficient than the modern computing through the use of quantum tunneling. They are expected to reduce power consumption from 100 to 1000 times. Quantum Computers could speed up the learning process of AI, reducing thousands of years of learning to mere seconds.

## BRAIN FINGERPRINTING TECHNOLOGY

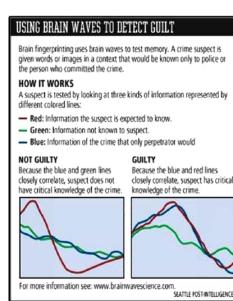
In the field of criminology, a new lie detector has been developed in the United States of America. This is called "brain fingerprinting". This invention is supposed to be the best lie detector available as on date and is said to detect even smooth criminals who pass the polygraph test (the conventional lie detector test) with ease. The new method employs brain waves, which are useful in detecting whether the person subjected to the test, remembers finer details of the crime. Even if the person willingly suppresses the necessary information, the brain wave is sure to trap him, according to the experts, who are very excited about the new kidon the block.

### How does it Work?

When a crime is committed, a record is stored in the brain of the perpetrator. Brain fingerprinting provides a means to objectively and scientifically connect evidence from the crime scene with evidence stored in the brain. This is similar to the process of connecting DNA samples from the perpetrator with biological evidence found at the scene of the crime; only the evidence evaluated by Brain Fingerprinting is evidence stored in the brain. Brain Fingerprinting measures electrical brain activity in response to crime-relevant words or pictures presented on a computer screen, and reveals a brain MERMER (Memory and Encoding Related Multifaceted Electroencephalographic Response) when the evidence stored in the brain matches the evidence from the crime scene. Thus, the guilty can be identified and the innocent can be cleared in an accurate, scientific, objective, non-invasive, non-stressful, and non-testimonial manner.

### How is this tested?

The person to be tested wears a special headband with electronic sensors that measure the electroencephalography from several locations on the scalp. In order to calibrate the brain fingerprinting system, the test is presented with a series of irrelevant stimuli, words, and pictures, and a series of relevant stimuli, words, and pictures. The test subject's brain response to these two different types of stimuli allow the tester to determine if the measured brain responses to test stimuli, called probes, are more similar to the relevant or irrelevant responses.



polygraph testing, it does not attempt to determine whether or not the subject is lying or telling the truth.

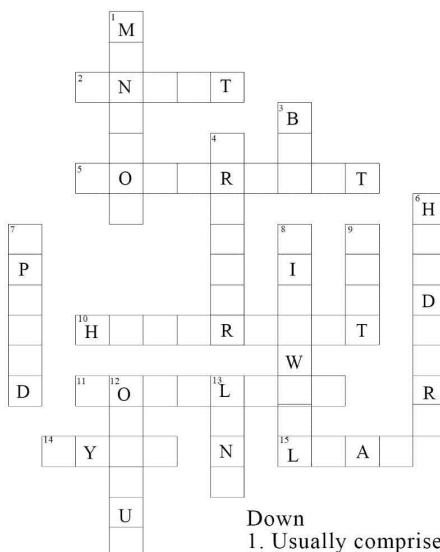
Brain fingerprinting, albeit a controversial procedure, can revolutionize criminal justice and can be instrumental in national security, medical diagnosis and to counter terrorism. The technology fulfills an urgent need for governments, law enforcement agencies, corporations, investigators, crime victims, and falsely accused innocent suspects.

-Stuthi Iyer, 1st Year Computer Science Engg

### Tech Fact

- The earth's deepest known point equals to 24.5 Empire State Buildings end to end.

## Technology Crossword Puzzle



### Across

2. A device that feeds data into a computer, such as a keyboard or mouse.
5. The exclusive right, as recognized separately in each country, to publish and sell literary, artistic, or musical materials.
10. A software system that links topics on the screen to related information and graphics, which are typically accessed by a point-and-click method.
11. copy (data) from one computer system to another, typically over the Internet.
14. Usually consists of eight bits.
15. A measure of the amount of computational work that a computer system performs.

### Down

1. Usually comprises the display device, circuitry, casing, and power supply.
3. An error, flaw, failure, or fault in a computer program or system that causes it to produce an incorrect or unexpected result or to behave in unintended ways.
4. A client software program that runs against a Web server or other Internet server and enables a user to navigate the World Wide Web (WWW) to access and display data.
6. The collection of physical parts of a computer system.
7. Sending an email, posting photos on a social media site and using your webcam.
8. A part of a computer system or network that is designed to block unauthorized access while permitting outward communication.
9. The combination of typeface and other qualities, such as size, pitch, and spacing.
12. Any computer-generated information displayed on screen, printed on paper or in machine readable form, such as disk and tape.
13. A word or group of words that act as a way to cross reference to other documents or files on the computer.

## Paper Battery

A paper battery is a device which can act both as a capacitor and as a battery. It is a flexible, light weight device made up of carbon nano tubes emboldened on paper (cellulose). A paper battery is basically an electric battery engineered to use a spacer formed largely of cellulose. It incorporates nanoscopic structures to act as high surface-area electrodes to improve conductivity. It consists of infusion of carbon nanotubes with paper consisting of an iconic liquid as an electrolyte.

In December 2009 at Stanford University, Yi Cui and his research team successfully invented the paper battery. His research team successfully invented the original working prototype that provides 1.5 V as terminal voltage. The main components of a paper battery are carbon nanotubes having thickness one millionth of a centimeter. Carbon is the reason for the thick black colour for the battery. These nanotube films act as the electrodes which are embedded in cellulose based paper, soaked in ionic electrolytic liquid. The electrolyte does not contain any water content. So as there is nothing to freeze or evaporate, it can be used in any environmental conditions. The battery can produce power even if it is folded or cut.

In addition to being unusually thin, paper batteries are flexible and environmentally-friendly, allowing integration into a wide range of products. Their functioning is similar to conventional chemical batteries with the important difference that they are non-corrosive and do not require extensive housing. Using paper gives the battery a great degree of flexibility. The battery can be bent or wrapped around objects instead of requiring a fixed casing. Also, being a thin, flat sheet, the paper battery can easily fit into tight places, reducing the size and weight of the device it powers.



The use of paper increases the electron flow which is well suited for high performance applications. Paper allows for capillary action so fluids in batteries, such as electrolytes, can be moved without the use of an external pump. The paper used in paper batteries can be supplemented to improve its performance characteristics. Patterning techniques such as photolithography, wax printing, and laser micromachining are used to create hydrophobic and hydrophilic sections on the paper to create a pathway to direct the capillary action of the fluids used in batteries. Similar techniques can be used to create electrical path-ways on paper to create paper electrical devices and can integrate paper energy storage.

Paper battery can be used as both battery and capacitor. It is flexible and is ultra thin energy storage device. The composition of these batteries is what sets them apart from traditional batteries. Paper is abundant and self-sustaining, which makes paper cheap. Disposing of paper is also inexpensive since paper is combustible as well as biodegradable. Using paper gives the battery a great degree of flexibility. The battery can be bent or wrapped around objects instead of requiring a fixed casing. Also, being a thin-flat sheet, the paper battery can easily fit into tight places, reducing the size and weight of the device it powers.

-Vinamra H G, 2nd year Computer Science Engg.

### Tech Fact

- Ubuntu is one of the more popular distributions of Linux. The word Ubuntu comes from an African word meaning "I am because of you".

## LARGE HADRON COLLIDER

The Large Hadron Collider is the world's most powerful particle accelerator. It was first started on 10th September 2008 and remains the latest addition to CERN's accelerator complex. The LHC consists of a 27-kilometre ring of super-conducting magnets with a number of accelerating structures to boost the energy of the particle along the way. The Large Hadron Collider (LHC) is a marvel of modern particle physics that has enabled researchers to plumb the depths of reality. Its origins stretch all the way back to 1977, when Sir John Adams, the former director of the European Organization for Nuclear Research (CERN), suggested building an underground tunnel that could accommodate a particle accelerator capable of reaching extraordinary high energies, according to a 2015 history paper by physicist Thomas Schorner-Sadenius. A large hadron collider is one of the largest machines in the world, where particles are collided nearly at the speed of light.

This large hadron collider is located in Geneva at the border of France and Switzerland 175m beneath the surface. The project was officially approved twenty years later, in 1997, and construction began on a 16.5 mile long (27 kilometre) ring that passed beneath the French-Swiss border capable of accelerating particles up to 99.99 percent the speed of light and smashing them together. Within the ring, 9,300 magnets guide packets of charged particles in two opposite directions at a rate of 11,245 times a second, finally bringing them together for a head-on collision. The facility is capable of creating around 600 million collisions every second, spewing out incredible amounts of energy and every once in a while, an exotic and never-before-seen heavy particle. The LHC operates at energies 6.5 times higher than the previous record-holding particle accelerator, Fermilab's decommissioned Tevatron in the U.S.

### How does a Large Hadron Collider work?

The term Hadron refers to subatomic composite particles composed of quarks held together by a strong force. The LHC consists of several working stages. It typically takes place in 5 stages. In the First stage, gas of hydrogen is taken and fed in a precisely controlled way into the accelerator called Linac 2 where electrons are stripped off, leaving behind the nuclei of hydrogen atom which is the proton. Further they are accelerated using an electric field. By the time these particles leave Linac 2, it would be travelling with 1/3rd the speed of light, and then it is introduced to the stage 2.



In order to maximize the intensity of the beam, the packet is divided into 4 divisions in the booster rings, now protons travel in a linear fashion but here in order to bend the proton beam, magnets are introduced at right angles to the direction of motion.

Booster accelerates protons to 91.6% the speed of light, these 4 rings of protons are recombined and flung to the proton synchrotron.

In the third stage of LHC, it has reached to 628m in circumference; here proton reaches 99.9% the speed of light.

Further increase in rotation will not increase the speed of proton but increase mass of proton. Now the proton is having energy of 25 giga electron volts and weighs 25 times heavier than the proton at rest.

It is next sent into the stage 4 where a super proton synchrotron 7km in circumference is used, the job of this is to increase proton energy to 450 giga electron volts, which is sufficient enough to launch the electron to the orbit of the LHC, it is the largest ring having a circumference of 27km.

There are 2 vacuum pipes where the protons are circulated in opposite direction, one in clockwise and one in anticlockwise. Further they are made to collide here; the energy of proton will be 7 tera electron volts and are 7000 times heavier than protons at rest. To achieve such enormous speed and motion of proton, enormous magnetic field is required which is achieved by making LHC colder than outer space so that the magnets become superconductors. When the protons are collided there will be detectors which record the traces of particles. This is how a LHC works and by learning the behaviour of the particles, the fundamental mysteries of universe can be solved.

-Pramath P, 2nd year Computer Science Engg.

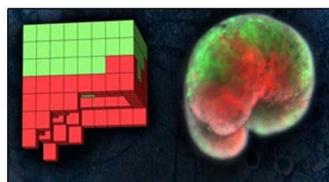
## XENOBOTS-World's first living Robots

One of the most remarkable breakthroughs in the field of artificial intelligence and biology contrived by a researcher team of roboticists and scientists published their recipe for procreating a new life form. Scientists have created living robots called 'Xenobots' from cells scraped from frogs.

As the rise of artificial intelligence continues, scientists have created that which can be described as the world's first living robots.

Xenobots - as they are illustrated were created by using living cells scraped from frogs. Scientists from the University of Vermont and Tufts University have created this living machine that can safely deliver drugs into the human body and to understand the regeneration of organs.

The name Xenobots is in fact derived from an African frog, from which researchers were able to derive stem cells. Xenobots are absolutely tiny, measuring less than a millimeter, and are small enough to travel within the human body.



These living entities can both walk and swim. They are able to survive for several weeks without any sustenance and work together in groups in order to achieve certain goals. Researchers at the University of Vermont involved in conducting the research and described them as entirely new life forms.

Stem cells are used as these are the cells with no speciality, which then have the ability to morph into various forms. Researchers were able to acquire living cells from frog embryos via a scraping process, before leaving them to incubate over a period of time.

Once this process was completed, cells could then evolve into various anatomical forms, all of which were designed with the help of

supercomputers. And scientists from the University of Vermont stated that the forms created have never previously been seen in the natural world.

Xenobots have been able to demonstrate cells working of their own volition with skin cells bonding in order to form an unusual anatomical structure. Meanwhile, pulsing heart muscle cells enabled the Nanobots to move on their own. The Xenobot entities even have the ability to heal themselves; when scientists sliced one of the robots, it ameliorated itself, and were able to keep moving as a consequence.

"These are novel living machines. They're neither a traditional robot nor a known species of animal. It's a new class of artifact: a living, programmable organism," Joshua Bongard, one of the lead researchers at the University of Vermont commented.

Scientists at the University of Vermont deliberately designed Xenobots to be significantly different from traditional robots, meaning that they do not feature robotic arms or the sort of metallic and shiny appearance that we associate with robotic technology. Xenobots resemble blobs of pink flesh - with the biological machine created, it is able to participate and achieve in activities, which are not possible with typical robots manufactured from steel and plastic.

Another advantage of Xenobots is that they are highly resistant to environmental damage. "Traditional robots degrade over time and can produce harmful ecological and health side effects," the study associated with the research noted.

It is hoped that Xenobots can be involved in a variety of useful tasks in future, with the research having been partially funded by the Defense Advanced Research Projects Agency. In particular, it is hoped that Xenobots can help researchers delve into the world of cell biology, opening the door to future advancements in human health and longevity.

-Shreya S Kumar, Computer science Engg.

## NASA'S MARTIAN HELICOPTER

Going where no helicopter has gone before! The Martian helicopter developed by NASA has entered its final stage of testing and has proven to be humanity's maiden. The goal is to prove the rather difficult feat that a heavier-than-air vehicle can fly in the red planets' extremely thin atmosphere. Engineers attached NASA's Mars Helicopter which will be the first aircraft to fly on another planet to the belly of the Mars 2020 rover today in the High Bay 1 clean-room at the Jet Propulsion Laboratory in Pasadena, California.

NASA is planning to lift off this helicopter into the red planet by 2020 July if everything goes well, making first everfeat of flight on Mars in July 2021. MiMi Aung, project director said "Nobody built a Mars helicopter before, so we are continuously entering new territory." The model has cleared many important tests, confirms the director. The Mars Helicopter is considered a high-risk, high-reward technology demonstration. If the small craft encounters difficulties, the science-gathering of the Mars 2020 mission won't be impacted. If the helicopter does take flight as designed, future Mars missions could enlist second-generation helicopters to add an aerial dimension to their explorations.

From January to May the team conducted flight tests, testing with the flight mode in a simulated Martian environment at JPL compatibility with the Mars Helicopter delivery system at Lockheed Martin space in Denver. "In 2021, the small, autonomous helicopter will be the first vehicle in the history to attempt to establish the viability of heavier-than-air vehicle flying on another planet", says NASA. The twin-rotor solar-powered helicopter is connected along with the Mars Helicopter Delivery System to a plate on the rover's belly that includes a cover to shield the helicopter from debris during entry, descent and landing. The helicopter will remain encapsulated after landing, deploying to the surface once a suitable area to conduct test flights is found at Jezero Crater, the rover's destination.

### AUGMENTED REALITY

Augmented reality is an interactive experience of a real-world environment where the objects that reside in the real-world are enhanced by computer-generated perceptual information. AR works by employing computerized simulation and techniques such as image and speech recognition, animation, head-mounted and hand-held devices and powered display environments to add a virtual display on top of real images and surroundings. In this way, augmented reality alters one's ongoing perception of a real-world environment, whereas virtual reality completely replaces the user's real-world environment with a simulated one.

The primary value of augmented reality is the manner in which components of the digital world blend into a person's perception of the real world through the integration of immersive sensations, which are perceived as natural parts of an environment. The earliest functional AR systems that provided immersive mixed reality experience for users were invented in the early 1990s, starting with the Virtual Fixture system developed at the U.S. Air Force's Armstrong Laboratory in 1992. Commercial augmented reality experiences were first introduced in entertainment and gaming business. Subsequently, augmented reality applications are seen in commercial industries such as education, communications, medicine, and entertainments. An example relevant to the construction industry is an AR helmet for construction workers which display information about construction sites.

AR devices like the Microsoft HoloLens and various enterprise-level "smart glasses" are transparent, letting you see everything in front of you as if you are wearing a weak pair of sunglasses. The technology is designed for completely free movement while projecting images over whatever you look at. The concept extends to smartphones with AR apps and games like Pokémon Go, which use your phones camera to track your surroundings and overlay additional information on top of it i.e. on the screen.

Augmentation techniques are typically performed in real time and in semantic contexts with environmental elements. Immersive perceptual information is sometimes combined with supplemental information like scores, overall live video feed of a sporting event etc. This combines the benefits of both augmented reality technology and heads up display technology (HUD).

Augmented Reality is used to enhance natural environments or situations and offer perceptually enriched experiences. With the help of advanced AR technologies (e.g. adding computer vision and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulated. Augmented Reality is just starting to break out of its infancy; because of this the possible applications in the future are tremendous. It is an important piece in a larger technological landscape and it will be interesting to continue to watch it grow and mature.

-Vinamra H G, 2nd year Computer Science Engg.



From January to May the team conducted flight tests, testing with the flight mode in a simulated Martian environment at JPL compatibility with the Mars Helicopter delivery system at Lockheed Martin space in Denver. "In 2021, the small, autonomous

helicopter will be the first vehicle in the history to attempt to establish the viability of heavier-than-air vehicle flying on another planet", says NASA. The twin-rotor solar-powered helicopter is connected along with the Mars Helicopter Delivery System to a plate on the rover's belly that includes a cover to shield the helicopter from debris during entry, descent and landing. The helicopter will remain encapsulated after landing, deploying to the surface once a suitable area to conduct test flights is found at Jezero Crater, the rover's destination.

It carries no science instruments since it is a technological demonstration experiment but it will be equipped with a high resolution camera to scout the local alien terrain. If it successfully flies on Mars, the scientist team will use the chopper to help assess which route the rover will be routed to as it journeys across the red planet. The Mars 2020 rover with the Mars Helicopter aboard will launch on a United Launch Alliance Atlas V rocket in July 2020 from Space Launch Complex 41 at Cape Canaveral Air Force Station in Florida. When it lands at Jezero Crater on

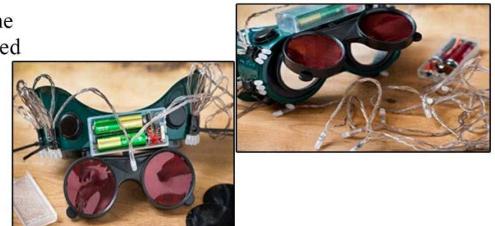
Feb. 18, 2021, the rover will be the first spacecraft in the history of planetary exploration with the ability to accurately re-target its point of touchdown during the landing sequence.

-Hemanth S, 2nd year Mechanical Engg.

### DIY- THERMAL GOGGLES

#### Materials Required

- Sunglasses with frame
- Congo blue gel and red gel filter sheet,
- Infrared LED,
- Wires,
- Battery ,
- Glue and tape



#### Step 1

Take a pair of regular sunglasses that have a sturdy frame. Remove the lenses and trace their shape onto sheets of Congo blue and primary red theatrical gels, which are made for stage lighting. Ensure that you have two pieces for each color and cut all four pieces out using the X-Acto knife. Glue the blue gels first and then the red ones, by touching the outer rim of the gels all the way around with super glue. Make sure that you put one of each colored gel on each lens of the glasses so you end up with each eye filtering red and blue light. Gently lay the lenses inside the glasses one at a time and wait for them to dry.

#### Step 2

Glue the eight high-intensity infrared LEDs four on each side to the outside of the goggles and on the outer edge of the lenses so they are to the left of the left lens and to the right of the right lens. The LEDs create the illumination needed to filter the light through the colored gels. Secure the wires of the lights to the outer edge of the goggles using electrical tape.

#### Step 3

Wire the lights to the 3-volt, button-cell battery and glue the battery to the side of the goggles. Ensure there is a battery on each side of the goggles so each set of lights has a battery. Leave the plus wire short so it does not touch or tape it down so it isn't able to make contact. You may also want to wire a switch from the wire to the battery so the goggles can be turned on and off. However, you can simply tape the wire to the battery when in use.

#### Step 4

Take your goggles outside to test them. If the image is weak or not well-illuminated, you may need to add more LEDs or another layer of gels.

-Vinamra H G, 2nd year Computer Science Engg.

## “DESIGNING AND FABRICATION OF WI-FI CONTROLLED CLEANING AND MOPPING DEVICE”

Nowadays, human and machine interaction with each other is moving away from only pen and computer and is becoming much more pervasive and more congruous with the physical world. As the day progress, the gap between human and machines have been reduced by their interactions because of artificial intelligence. Manual controlling work is taken over by the robot technology and many of connected appliances have been used extensively. The present work represents the technologies that intend the working of floor cleaning robot in any of two modes that is automatic and manual.

In this model, using of semi-automatic technology will be user friendly, using Wi-Fi as primary protocol and android platform helps to operate model in an easy way. ARM610 microcontroller controls all the software and hardware operations. The robot is incorporated with Ultrasonic Sensors for obstacle detection and automatic water spray pump. To visual guidance, ZB-IPBM22 model camera is used. Battery is used for power supply for motors of vacuum cleaner and power bank is used for the power supply for the Raspberry pi board and for relay. Four motors are used in this model; one for brushes, one for mopping brush and two for wheels.

Android uses various programming language; getting started with the Android API is easy and API is open and allows easy access to the hardware components. Android device provides numerous communication interfaces like USB, Wi-Fi, Bluetooth that can be used to connect the device.

Wi-Fi controlled cleaning and mopping device is semi automated and it will work on any platform and can easily transfer to various places. Wi-Fi connectivity ranges between 10-15 meters. Use of Android platform helps for the user friendly operation and the device reduces labour cost by 30%. The robot can perform sweeping and mopping task.

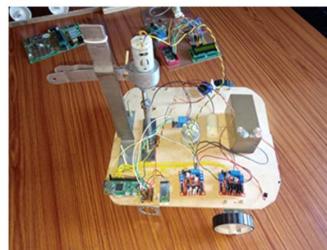
**Keywords:** Human, Machine, Artificial Intelligence, Robot, Sensors

-Anusha H I Sagar B H  
 Priya S V Sindhu  
 -Guided by,  
 Dr. M. S. Srinath  
 Department of Industrial and Production Engineering

### “Multifunctional Robotic Vehicle for Agricultural applications”

The primary aim of our project is to develop a multitasking agricultural robot, which can be used for agricultural processes like digging the soil, seed sowing, crop cutting (harvesting) and irrigation system by keeping in mind low cost and more efficiency.

This robot will derive its power from a 12V battery making it energy efficient. The base frame of the robot is made of MDF board (Medium Density Fiber board) with four wheels. We are using MDF board instead of metal base to reduce weight and cost. MDF board also adds to the strength of the robot. The wheels are driven by DC geared motor with specification of 12V and 100RPM DC motor. This specification has been used so as to vary the speed of the robot.



-Arun Kumar D M  
 Bhavana K L  
 Bindushree H N  
 Harish B Y  
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### “Design and fabrication of multipurpose 3-axis vise for re-sharpening single point cutting tool and light milling works”

Single-point tools are used in turning, shaping, planning and similar operations, and remove material by means of one cutting edge. The grinding of the tool to its perfect geometry plays a major role in cutting of the material and it also improves effectiveness, efficiency and overall economy of machining.

This project aims at re-sharpening and grinding of single-point cutting tool considering the parameters such as Rake angle, Clearance angle and nose radius.

It is highly impossible to achieve the geometry of the single-point cutting tool by manual grinding, though it depends on the skill of the operator, which may lead to the variation in the geometric features like Rake surface, Principal flank surface and Auxiliary flank surface. The Three-axis fixture is designed and fabricated such that it can be used to hold the single point cutting tool and grind it until the arrival of required geometry; usually Normal Rake System (NRS) is preferred.

-Ashwin Kumar R Mithun Dinesh Kodse  
 Bharath K B Praveen SC  
 -Guided by,  
 Dr. K. A. Venugopal Mr. M. S. Prathap, Assistant Professor  
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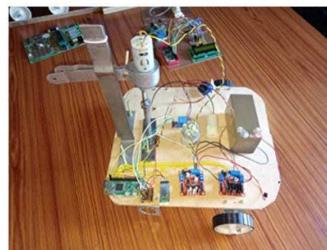
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## "PATIENT DIAGNOSIS SYSTEM WITH AUGMENTED REALITY"

Augmented Reality (AR) is an interactive experience of a real-world environment whereby the objects that reside in the real world are augmented by computer generated perceptual information; sometimes across multiple sensory modalities, including visual, auditory and haptic interface. Because of its usefulness, AR has found its applications in various fields like medicine, visual art, commerce, game development, navigation and military applications.

Patient Diagnosis system in hospitals is a very important aspect because a hospital can have hundreds of patients visiting every day and maintaining records of such patients is cumbersome for the hospitals also and this difficulty is not just on the hospital side, it also extends to the patients. So, an efficient system is to be built using AR to manage such difficulty on both the sides so that the whole system can be made efficient. Apart from the previously mentioned advantage there are several other services that can make the whole process of diagnosing the patient easier, like the availability of the data on demand even outside the hospital which removes the data centralization constraints. Provisions to know about the previous consultancy of the patient help the doctor to think of the next procedures without wasting much time. An efficient way to suggest the next appointment for the patient using the advanced scheduler service makes the whole process of issuing an appointment much easier.

-Anirudh Iyengar Shashank M G

Nishanth B.M Vijay Kothari

-Guided by,

Dr. J. Chandrika,

Head of the department

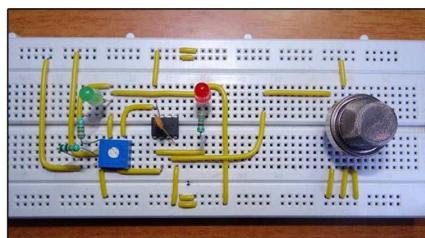
Department of Computer Science Engineering



## "DIY - SMOKE DETECTOR ALARM CIRCUIT"

### Components Required

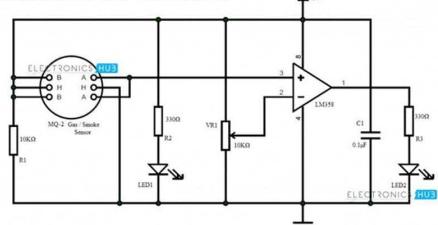
- MQ-2 Sensor
- LM358
- 10K $\Omega$
- 330 $\Omega$
- LED
- 0.1 $\mu$ F
- 10K $\Omega$  POT



### Working

Smoke Detectors are amazing devices as they are small, cheap yet very useful. In this project, we implement a simple Smoke Detector Circuit with adjustable sensitivity. We use a Smoke Sensor MQ-2 as the main sensory device. The working of the circuit is simple and is explained below. LM358 acts as a comparator in this circuit. The inverting terminal of LM358 is connected to POT so that the sensitivity of the circuit can be adjusted. The output of LM358 is given to an LED as indicator although a buzzer can be used as an alarm. The non-inverting terminal of LM358 is connected with output of smoke sensor. Initially when the air is clean, the conductivity between the electrodes is less, as the resistance is in the order of 50K $\Omega$ . The inverting terminal input of comparator is higher than the non-inverting terminal input. The indicator LED is OFF. In the event of fire, when the sensor is filled

with smoke, the resistance of the sensor falls to 5K $\Omega$  and the conductivity between the electrodes increases. This provides a higher input at the non-inverting terminal of comparator than the inverting terminal and the output of comparator is high. The alarming LED is turned ON as an indication of presence of smoke.



### Note:

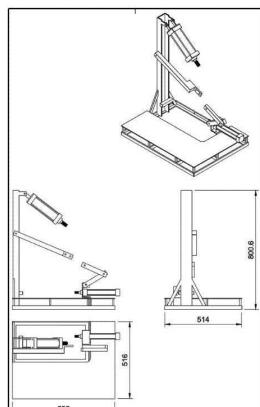
- The heating element in the Smoke Sensor must be pre-heated before it can sense any smoke or gas.
- The sensor gets hot because of the heating coil and it is advised not to touch the sensor while it is switched on.
- The sensitivity of the circuit to different concentrations of smoke can be adjusted by using the POT.
- The output LED can be replaced with a loud buzzer for effective alarm.

## "AUTOMATION OF PIPE CUTTING MACHINE"

This paper gives a detailed information about the design and development of automatic pipe cutting machine which solves the problems faced by conventional methods of pipe cutting. In this approach the settings regarding size of workpiece and the number of pieces to be cut is fed into the system and the task is automatically completed.



Detachable frame of fabricated frame



Drafting

It considers strength, durability, easy to use, safe, save time and ergonomic factor. For mass production purpose in small scale industries the chop-saw is automated which does not require workmen for giving continuous feed.

The sequence of operation is controlled by a program, which is a set of instructions coded so that they can be read and interpreted by the system.

The accuracy achieved by this approach is far greater than that of conventional method which is also tiresome.

Therefore the practical objective of the machine is to minimize human interference and increase production rate apart from the machine frame being portable and simple in construction.

-Manoj Kumar S K      Koushik P,  
Chandan K                  Faiz UR Rahman  
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Dr. Amarendra H J  
Department of Mechanical Engineering

### Fun facts:

The first mouse was invented by Douglas Engelbart in 1963; it consisted of a hard wooden shell and two clunky metal wheels.

### Technical Hack:

Looking to save excel files more effectively?  
Saving an Excel file as an .XLSB will shrink the size by half or 75%

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