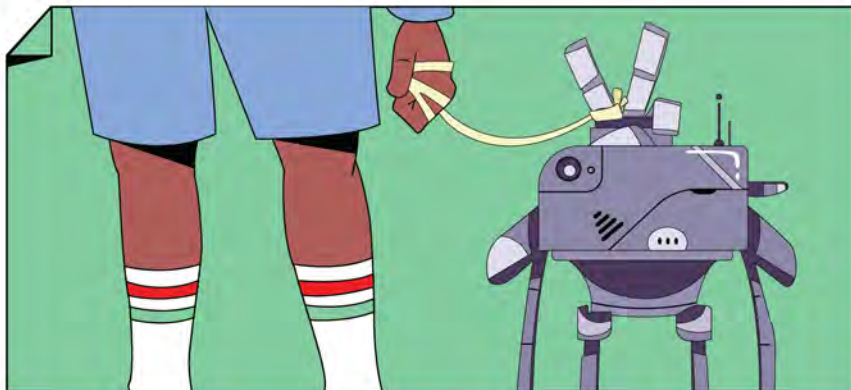
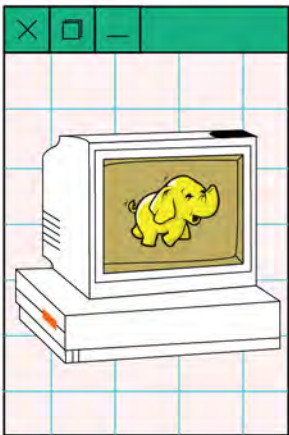
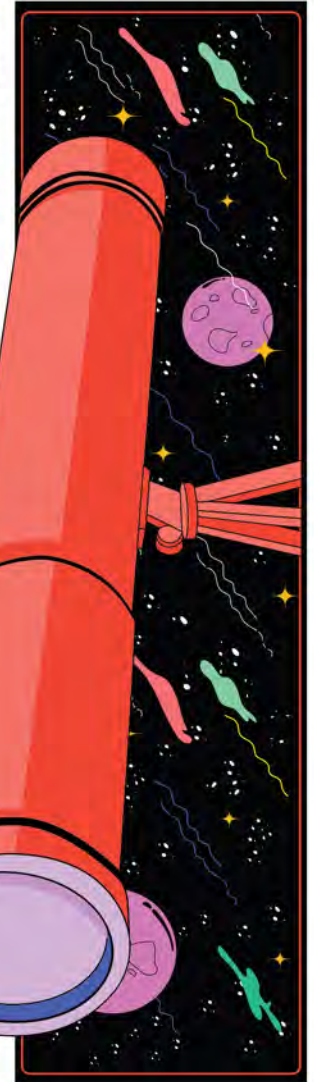
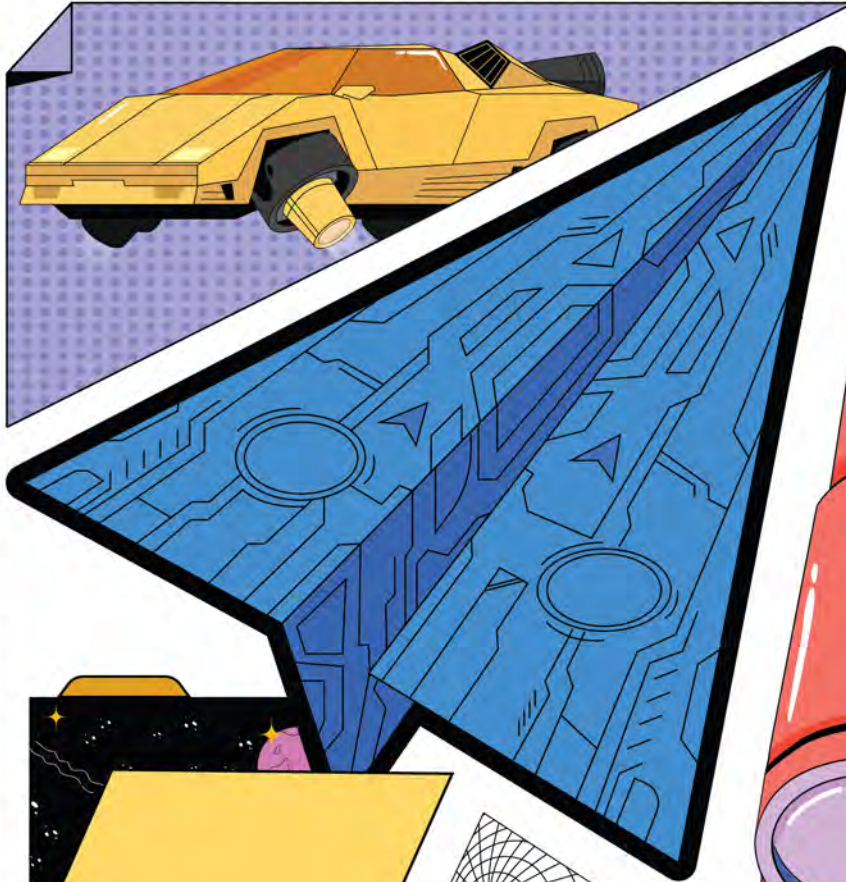
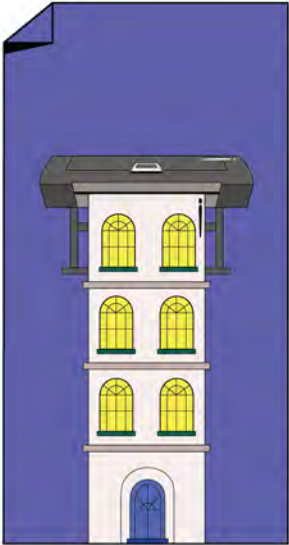
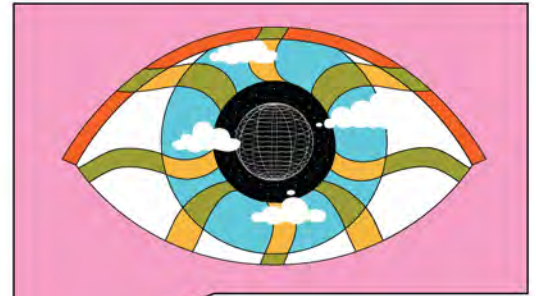


ES&H DEPARTMENT

THE BYTLE



FE INCHARGE

Department of Engineering Science and Humanities plays an extremely crucial role in an engineering college. It firmly believes in the overall holistic development of an individual and does not restrict itself to one domain or branch. Instead, the department profoundly focuses on creating an environment which caters and facilitates learning for all the students across all the branches. It has been successful in organizing various events and activities for all the students which help them in exploring their domains of interest.



This department firmly believes in outcome based learning. Every activity that occurs in our college is for a purpose. Therefore, we have come up with our oldest magazine of TCET-The Byte.

The Byte is one such initiative where the students get a platform to showcase their latent talents and bring them in the limelight. The Byte focuses on informing and describing latest technologies, engaging, and inspiring a diverse set of readers.

I am pleased to see the enthusiastic responses received from the eminent members of the department and take immense pride in publishing this magazine, procured by the dedicated efforts of the first-year students.

The uniqueness of each student is elaborated through the articles they have written. The process of making the magazine made these students to research on various topics enhancing their knowledge and elevating it to a new level of fineness. I am extremely proud that such students are a part of my department and they have transformed into great achievers by committing themselves to work hard.

-Dr. Sunita Pachori

ACTIVITY HEAD

Each day is filled with new experiences through which we often learn valuable lessons and in turn, make our day better. Igniting sparks of creativity, ideas and supporting innovation is also the new way of proceeding with acquiring knowledge. TCET believes in an all-round development of aspirants for research and writing. Not only books, but articles are also a better way to induce imagination in our minds. I am delighted to present you The BYTE Magazine by Engineering Sciences and Humanities, 2021 Edition. It is not only important to showcase your creativity but also to make the



curious and this can be done by expressing their ideas and on-going developments in Technology through Technical articles.

The BYTE purely focuses on development of interdisciplinary and complex problems, to which the solutions must also be found in the same way. Its indeed due to the hard work of The BYTE Team and their true determination that this magazine is growing. Hard work is also the spirit of success and development. TCET provides an opportunity to the students to work hard and scale the extra mile. I congratulate all the members involved in the editorial committee of The Byte for executing such an incredible magazine. I assure you that the mix of curiosity and intellect will bring you a fine article which in turn, would make you wiser than the other engineering graduates. readers curious and this can be done by expressing their ideas and on-going developments in Technology through Technical articles. The BYTE purely focuses on development of interdisciplinary and complex problems, to which the solutions must also be found in the same way.

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-Dr. Rajni Bahuguna

ES&H Department



With the vision "Education is the manifestation of perfection already existing in man", Thakur College of Engineering has established its ES&H department which is nurturing the holistic development of its students. ES&H stands for Engineering Sciences and Humanities which rightly defines the purpose, work, and mission of the department that is "To endeavor to provide a strong base in Engineering and Technology, where students, faculty, and staff work collaboratively to expand knowledge in the basic disciplines by providing a foundation that is appropriate to their career goals, equipping well with knowledge and skills that allow them to function as responsible and contributing members of society."

The department ensures each student is provided with various opportunities to explore themselves not only an academic being but as a candidate fit for decoding any kind of obstruction in their way.

"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 by providing a sound foundation to the undergraduate students."

ES&H department of our college organizes various events all year round with different genres such as technical, creative, performing arts, scientific, vocational, and many more. To develop the skills required to become successful engineering professionals, the introduction of subjects like ABL, PS, has proved to be predominant. To provide an edge to the students, International and National level conferences like MULTICON-W are organized every year. Besides this, the initiatives and activities undertaken by ES&H department give the students every possible opportunity to learn and show that knowledge is unfathomable and that the sky is not the limit.

Editor's Desk

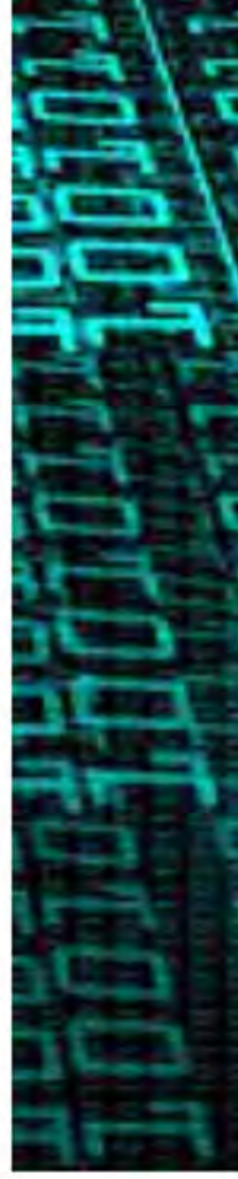
"Alone we can do so little, together we can do so much"



The sixth edition of The Byte is even fresher than the previous editions setting up new milestones for the future editions. Our focus rested on delivering all the research work of our fellow mates in the noblest way possible such that it meets the degree of excellence of The BYTE magazine and reckons to the presupposition of our upper hand, the audience. The BYTE magazine tugged at our heartstrings and we were primed with high spirits and vigor to commence in this journey. This expedition taught us to be more solicitous, modest and our cognizance took a raise as we devoured the ethical and backbreaking research by our peers. There is no such thing as a free lunch and assuredly this breakthrough wasn't easy. The committee faced countless challenges as they forged ahead but that did not nether the buoyant approach of the committee.

It takes two flints to make a fire. The strength of the team is each individual member. Unity is in Adversity. The strength of each member is the team. The magazine is not just a drop in the ocean, it's another milestone for the years down the lane and years to come. As we turn over, this THE BYTE edition is a landmark that perched amidst the hard times of the world. As the Byte magazine passes yet another edition, we rest assure you that we have strived to maintain the dignity and the pride of the magazine, a heart-warming thanks to all the people who bestowed us with their support and proposed changes in the magazine, many authors who gave way to this magazine by yielding their magnificent research work and the roof of it all, our readers for their ceaseless support.

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INTRODUCTION TO LINUX

ALL QUESTIONS ANSWERED



What comes to Your minds when someone mentions the word "Linux"?

What comes to our minds when someone says that he is a Linux engineer? Some of us might get a picture of a black screen with white or green text, with a blinking cursor, similar to that of a Windows utility called CMD. Many of us haven't even played with the Windows command Line or Command Prompt (CMD). Wild interpretations and unworldly questions might start popping in some of our heads, in context to how can we even use it, or what is it in the first place? In this article, I am going to answer some of the most important questions I have been asked in my career span as a Linux Enthuse, Open-Source Advocate, ex-Distro-hopper, and software developer.

FORMAL INTRODUCTION

Beginning with what is Linux, In a layman's words, Linux is an Operating System. Just like Microsoft Windows. If you may ask what is an Operating System, it's a low-level software, which acts as an intermediate interface between the computer's hardware like RAM, ROM, CPU/GPU etc, and your high-level software like web-browsers, office applications (word/excel etc); basically your day to day programs.

COSMIC TELESCOPE



Astronomy is the oldest science of all. Call it stargazing , pondering into heaven or just knowing your place in this vast COSMOS . We all are astronomers to a point, when we were infants, we all used to wonder about our twinkling stars but when we grew up it became just a hobby. But not everyone sees it as a hobby, some of us see it as life itself . Every weird stuff you can think of exists just outside this thin atmospheric shield.

We have astronomers who observe this weirdness, tell us what we are surrounded by and where we are going. We have huge telescopes for this very reason like the Hubble telescope, in the name of Sir Edwin Hubble. This telescope has given us inter galactic images and also beautiful images of nebulas and amazing scientific data on the basis of which we design our theories, but it still is not enough. We still have to observe a lot and we need a giant telescope for it because the bigger the telescope, the more light it will collect. Now to observe deep field objects or the places in space we can't reach such as black holes, neutron stars, pulsars and quasars, we need a telescope as big as our planet itself .

Sounds funny right! How are we going to build a mirror to collect light as big as our planet and where will we keep it? That's why astronomers have come up with the idea of a cosmic telescope. What is a cosmic telescope? In a basic telescope we have a mirror that collects lights from the stars and by using lenses to bend light so that it meets at one point focus and we get an enlarged image of this collected light

.But in a cosmic telescope we don't use an actual lens because that is absurd. Well, no it isn't. The sole use of a mirror is to reflect and collect light and lenses to bend light so that it meets at one point focus. So how will we bend and collect light? We will use gravity.

Some of you might have heard that gravity bends space and thus light . A heavy object in space can bend light around it giving it a lensing effect , this lensing effect is called Gravitational lensing. Astronomers want to harness its spacetime-warping gravity as a lens to image the surface of exoplanets in astonishing detail.



That is true of human-built telescopes, at least. But Nature has gifted us with a powerful magnifying instrument that existed for billions of years before the human race evolved. It's the Sun, whose intense gravity warps spacetime in its immediate neighbourhood , bending the path of light rays passing nearby. In 1919, this light-bending was seen to alter the apparent positions of distant stars during a solar eclipse, vindicating Albert Einstein's recently-published General Theory of Relativity. And in the 1930s, Einstein calculated that if two stars were lined up just right along our line of sight, the light-bending effect would allow the closer star to magnify the image of the more distant one.

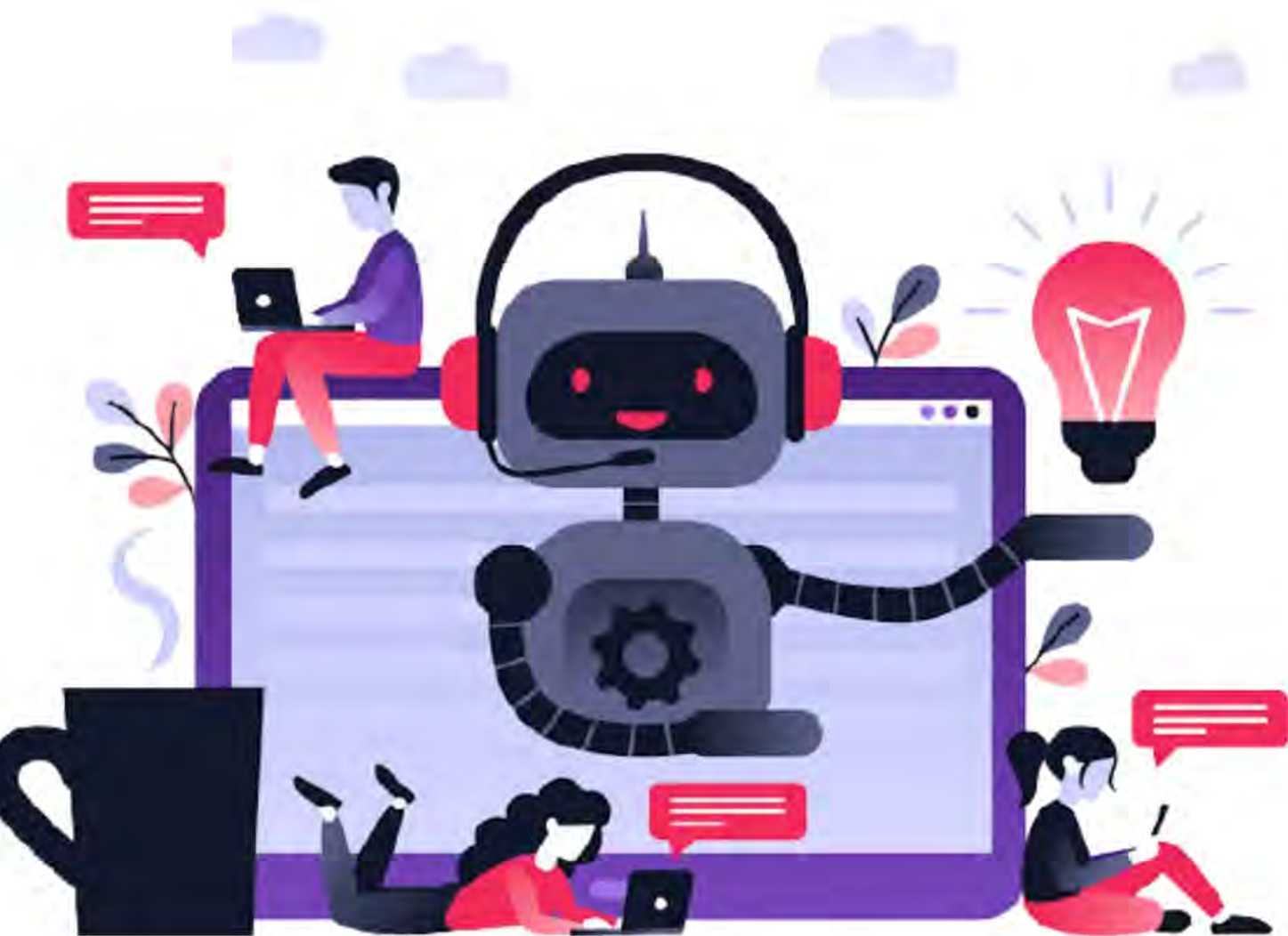


Using galaxies and galaxy clusters rather than stars as the magnifiers, astronomers have used this so-called gravitational lensing effect to observe distant cosmic structures that would otherwise be too faint to see. But to date our Sun's magnifying effects have scarcely been exploited. Soon, that could change. We have calculated that a modest telescope located approximately 50 billion miles from the Sun, at the focus of its lensing effect, could magnify the image of an exoplanet 100 light-years away by a factor of 100 billion. The result would be more than a single pixel—it would be an image a thousand pixels wide. That's vastly more detailed than pictures of Pluto taken with the Hubble Space Telescope prior to the New Horizons mission—detailed enough to see surface features such as continents, oceans, mountain ranges and deserts. To get this resolution without the magnifying power of the Sun, we calculate that you would need a telescope with a diameter of about 75,000 kilometers, or about six times the diameter of the Earth. This is, to put it mildly, impractical. The image seen by our space telescope will not look like a planet, however. It will look like a ring of light surrounding the blotted-out Sun—and that ring (known as an Einstein ring) will contain the reflected light not of the entire planet, but only from a small region on its surface. So imaging the planet's entire starlit surface would be done on a pixel-by-pixel basis, by moving the spacecraft in a spiral fashion as it slowly corkscrews its way around the Sun's far-distant gravitational focus. At each position in the spiral, the telescope would sample slightly different Einstein rings containing amplified images of different areas of the remote planet's surface.

Quite Sci-Fi right?! Well we aren't away to get a tech like this all we need is a scientific rational approach to get the eyes of "GOD" .



-Shaurya Chaturvedi
Mech A



AI FOR ZOOM MEETINGS

Whenever you mention using AI in any sector or industry often people start to become a little jittery but not in this case. Today we will understand how AI can increase our concentration level during important meetings. One sector saw a boom due to COVID-19 pandemic was the online video conferencing, cloud meetings services. Companies like Zoom Video Communications, apps like Google Meetings etc. got popular with in this period. It showed us the glimpse of future meetings. Imagine you have spent weeks in preparing for a pitch. But even though you've planned every tiny detail, you can't control what actually happens once everyone is in the room on the contrary if you are participant It's too difficult to focus on the screen for many long hours and at the same time taking down notes. One of the difficult task when attending online lectures is taking notes and focusing on the speaker or the PowerPoint slides simultaneously. Here AI can help you. How, by taking down notes. Yes! You just have to focus on the meetings and AI will do its job.

These days very few meetings include a dedicated note-taker. Instead, everyone sits there with their laptops, smartphones, tablets or even notebooks and pens. This is so that they can take down any information that they find relevant. But note-taking could actually be harming productivity. How many times have you heard someone say that they take notes in order to help them remember key points? And how many times have you looked over that person's shoulder and simply seen them doodling or writing bullet points containing nothing but stating the obvious? With everyone in the meeting engaging with each other rather than taking notes, you'll find it's easier to focus on the subject at hand. As much as you might have wanted to roll your eyes when your boss who claimed "financial times are tough" when you asked for a raise, walked into the office with a brand new virtual assistant from his favorite tech company, having AI at your fingertips could actually be a lifesaver in a meeting. For example, using simple voice commands, Alexa for Business by Amazon could set up reminders, put in orders or send messages without you having to remember to do it later.

Of course, the real help comes in when you create Custom Skills for the Virtual Assistant. You can pretty much use Alexa to pull up any information regarding the business (like reports, employee information and more), ask financial based questions or even use it to fact-check something a meeting attendee has said. With tech available to give you all the answers you need in a matter of seconds, you can carry on talking about the purpose of the meeting without it being derailed by an unnecessary fact-finding competition. You'll always have the correct information right there in the room with you, which means that fewer mistakes will be made based on outdated information. Massachusetts Institute of technology (MIT) and Microsoft are working together to build a note taking bot. Software like Clarke.AI has already caught a lot of attention. Clarke joins your meetings as just another participant. He either joins off your calendar or you could call him directly. Clarke silently listens, records, and analyses the conversation Clarke outlines your call and next steps in a secure, easy to use dashboard.

- **Compatible:** Works with almost any conferencing provider.
- **Secure:** All data is stored securely, using industry leading encryption
- **Private:** You have full control of your data, with strict internal controls

“AI-bots” use Natural Language Processing (NLP) to understand the intent behind phrases and conversations made by a human. Is the AI Subfield / Technique behind bots. Statistical NLP may consider many answers to a user question or query and determine the best possible answer given the information. As a result, NLP can discern what the user is saying, but also, may determine what he truly needs to know. Most AI Bots works with Intents and Entities.

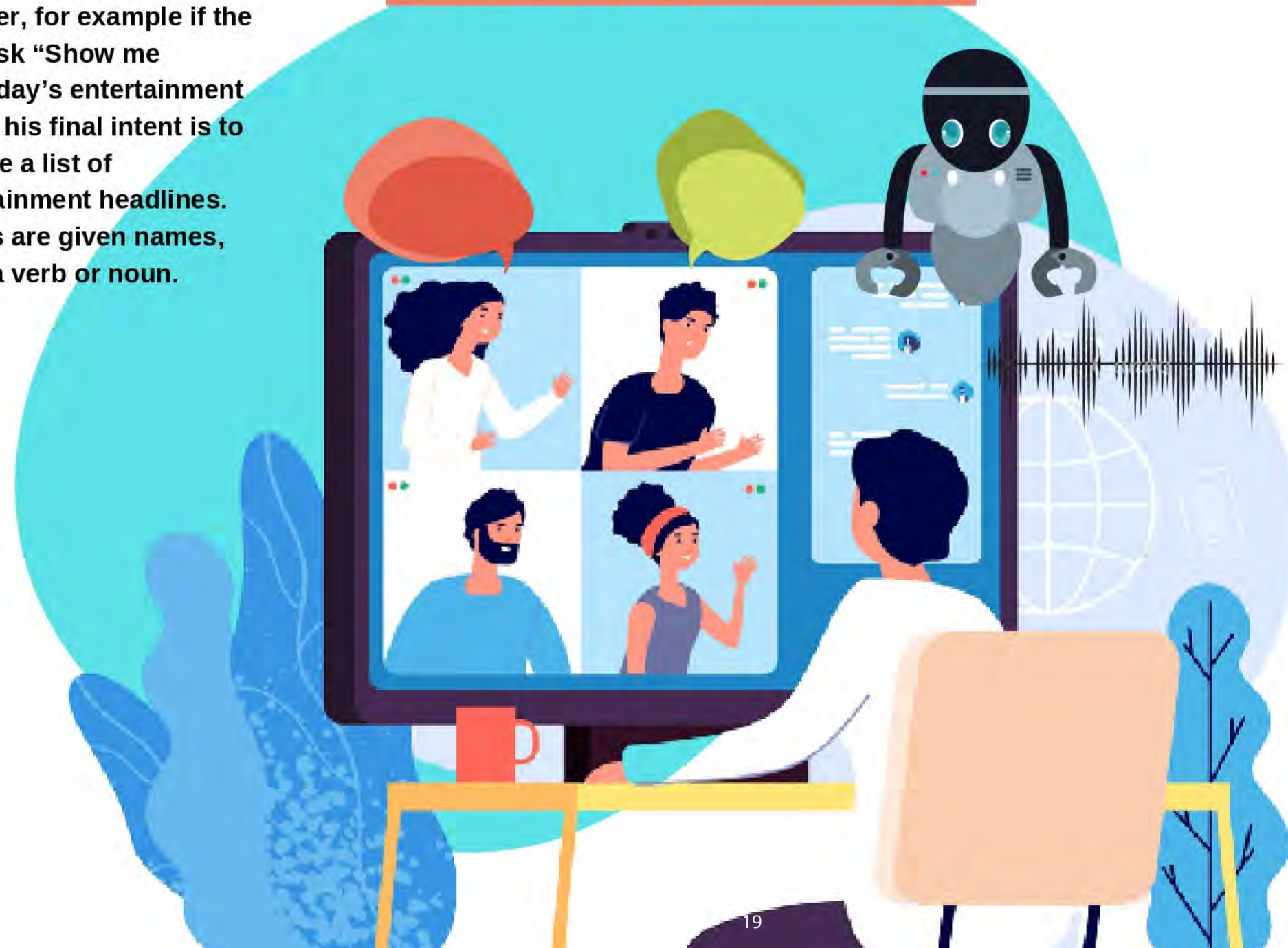


The Intent is the final objective or “intention” of the user, for example if the user ask “Show me yesterday’s entertainment news” his final intent is to retrieve a list of entertainment headlines. Intents are given names, often a verb or noun.

When designing a bots, the designer needs to identify as many intents as possible. Usually this would be the Bot’s capabilities or the services that it will provide end-users. Entities modify the intent, in the previous example, the entities are “Yesterday” and “Entertainment”. These modify the final result. In this case the bots will Show News, filtered by Yesterday and Entertainment.

An AI bots could support text input, audio input (with Speech Recognition), or both. AI Bots are more advanced, however, they also are more costly and require advanced and intensive testing.

An article by Hanik Jain (COMP A)



THE WORLD IN A CELLPHONE

TOP 8 USEFUL APPS FOR STUDENTS

DUOLINGO

It is a handy app for language learners and has lots of language courses available.



TED

It's one of the best educational apps where you can enjoy video content of different genres and issues.



GOOGLE ART AND CULTURE

In this app, explanation of different artworks and literary works to the analysis of those great works is available.



PHOTOMATH

One can find solution of all mathematical problems by scanning the question & uploading them on the app.



COURSERA

In this app you will find tons of exciting subjects and topics to learn from the video courses from different universities worldwide.



Rakuten kobo

KOBO

This app is mainly famous for the huge collection of thousands of ebooks and Audiobooks.

SOLO LEARNING

It is an app with one of the biggest coding communities where you can share your experience and knowledge



EDX

It is an online course-based educational app. Thousands of courses on different topics and subjects are available here.



WHITE HOLES

White Hole is a hypothetical phenomenon, a region of Space-time and Singularity. It is a region in which Light and Energy-Matter can escape, but it cannot be entered from outside. Compared to Black Holes, it's completely opposite, Light and Energy-Matter can't escape, but can be entered from outside. Black holes are formed due to gravitational collapse, but as far as we know, there is no evidence of the physical formation of white holes. According to Einstein Field Equation, there exists a Blackhole region in the future and a White hole region in past.

White Holes have properties like mass, charge, and angular momentum. They attract matter like any other mass but an object falling towards the white hole would never actually reach the White hole horizon, according to Schwarzschild Solution, the White hole event horizon in past becomes a Blackhole horizon in the future, so any object falling towards it will reach Black hole horizon. According to quantum mechanics, Black holes emit Hawking radiation to attain thermal equilibrium with a gas of radiation and this thermal equilibrium is time-reversal invariant. Renowned scientist Stephen

Hawking argued that the time reverse of Blackhole in thermal equilibrium is again a Black hole in thermal equilibrium. This implies that Black holes and White holes are the same objects and this Hawking radiation from Blackhole is identified as White hole emission.

SO GENERALLY HOW WOULD THEY LOOK LIKE?

Well, White holes exactly look like Black holes. They have mass, spin, a ring of gas clouds, and space dust around the event horizon. But if observed, they are not sucking light and other particles inside but instead throwing them into space. Like we explained above, no one can reach the event horizon of White holes, unlike Black holes. The interior of White holes is cut-off from the outside Universe's past: No events taking place in Universe will ever affect the interior of White holes, unlike Black holes where the outside Universe has an effect on the interior.

WHY DON'T WHITE HOLES EXIST?

To explain this, we take the example of Blackhole formation. Black holes are formed when a star or any larger mass collapses into a tiny volume. But reverse

this process and it makes no sense. It's like an egg is unscrambling itself, which is a violation of Universal laws. Entropy or randomness keeps on increasing and this cannot be reversed. If they even existed, they wouldn't last for a long time, as any outgoing matter will collide with the matter in orbit and the system itself will collide into a Blackhole.

WHY WHITE HOLES MIGHT EXIST?

Well, they share the same fate as wormholes: Mathematically possible contortions in space-time likely prohibited by reality. Some scientist state that, "Maybe White holes are the death of Black holes", but they have to violate general relativity equations. On the particle level, quantum randomness takes over the Blackhole and transforms them into a White hole. White holes may hide a large amount of information absorbed by its past life, The Black Holes. Too small to attract orbiting matter, the White hole might remain stable and eventually spit out all the information accumulated by its forerunner. White holes would one day dominate all over the Universe when all the stars have burnt out and all the Black holes have withered away.

The Ultimate White Hole. Alternatively, the aftermath of the White hole may exist everywhere. To Blackhole physicists, the Big Bang's explosion of matter and energy looks at potential White hole behavior. Cosmologists call this picture the "Big Bounce" and some seek characteristic White holes feature Universe's earliest observable light. If violent radio bursts represent theoretical mini Black holes left over from Big Bang as they make an early transition into White holes (although it's an unlikely explanation)

Concluding, White holes are in general opposite to what Black holes are. They are mathematically possible, but there is no physical evidence or formation of a White hole. It can hold a lot of information accumulated by its past, the Blackhole, and emit it out in stable conditions. Relating them to time, if Blackhole is Future, then a White hole is the past. They may even be termed as the death of Black Holes. With studies being carried out, we may even physically able to observe a White hole. But for now, Universal Laws holds it back from happening.

**- DHRUV SHELKE
SE ELEX**

RISC



Semiconductor products like CPU & GPU are the heart & soul of the Modern Day Machines. In smartphones, it's ARM that licenses its product to other companies which then develop their own custom System On Chips (SOCs) with renowned Companies like Qualcomm, Samsung, Apple & Mediatek. On the other Hand, All the Modern Laptops/Computers run on Central Processing Units (CPUs) which are x86-64 (or amd64/x64) architecture based. These CPUs are exclusively designed and developed by two Companies, namely AMD & Intel. Though this market is expected to soon change, as last year Apple started pushing its own in-house developed ARM based SOCs to its Mac line-up following the steps of Microsoft. Therefore a steady lineups of Machines with ARM based SOCs are expected to be launching soon manufactured by other companies.

RISC VS CISC THE LONG-LASTING BATTLE

ARM based chips are family of chips that use Reduced Instruction Set Computer (RISC) Instruction Set Architecture (ISA). While earlier x86-64 are Complex Instruction Set Computer (CISC) based. Though modern day x64 does have some bits of RISC too.

RISC is built to minimize the instruction execution time by optimizing and limiting the number of instructions. It means each instruction cycle requires only one clock cycle. On other hand, CISC approach is to reducing the number of instructions on each program and ignoring the number of cycles per instruction. While 2nd may seem a better approach, but the time it needs to execute One entire Program largely remains same on both. RISC based chips are also much more power efficient than their CISC counterparts, allowing for longer battery life on Mobile/IoT based products, thus making them more useful & viable.

WHAT IS RISC V?

Reduced Instruction Set Computer - V or RISC-V (pronounced as risk-five) is a free and open ISA which enables a new era of processor innovation through open standard collaboration. The project began in 2010 at the University of California, Berkeley along with many volunteer contributors. RISC-V is established on reduced instruction set computer (RISC) principles.

RISC-V was started with a goal to make a practical ISA that was open-sourced, usable academically and in any hardware or software design. The RISC-V ISA is provided under open-source licenses, allowing it to be used without royalties.

RISC-V has broken down many barriers in the semiconductor industry, bringing together different companies, industries, and geographies for open collaboration. RISC-V has a modular design, consisting of alternative base parts, with added optional extensions. Therefore, RISC-V combines a modular technical approach with an open license business model, meaning that anyone, anywhere can leverage the IP contributed and produced by RISC-V International.



THE INDIAN OUTLOOK

Last year, the Indian Government announced a national competition to foster the use of the nation's homegrown RISC-V microprocessor designs in the hope that the tech will eventually replace imported parts, and be used to create products in demand around the world.

Indian Government has also announced \$1 Billion+ in Cash to Chip-maker companies that sets up manufacturing units in the India as part of its "Make in India" Initiative. The Government is hoping to build on its smartphone assembly industry to strengthen its electronics supply chain. The locally manufactured chips will further bring down the cost of a Smartphone & IoT based products. The Chips that will be made locally also be designated as "trusted sources" and will be used in products ranging from CCTV cameras to 5G equipment in future. It will finally help India gain a foothold in Semiconductor Industry as the growing demand for Electronic Smart Device has only exploded since the outbreak of COVID-19.

SHAKTI PROCESSORS- IIT M

The SHAKTI Processor Program, was started as an academic initiative back in 2014 by the Reconfigurable Intelligent Systems Engineering (RISE) group at IIT-Madras. It is completely Open-source Project. The major aim of the Project is to bridge the gap between academia and industry, to provide innovative and customized solutions without the hassles of royalties!



The SHAKTI project is building a family of 6 processors based on RISC-V ISA. The project has currently developed an Embedded class (E-Class) and a Controller class (C-Class) processor. Shakti has been fabricated at 180nm by the Indian government's Semiconductor Laboratory in Chandigarh, and at 22nm by Intel's foundry with FinFET technology. Last Year, Indian defence and strategic sector also started using the 64-bit RISC-V based 100-350 MHz Risecreek processor developed by IIT-M and fabricated by Intel.

C-DAC'S VEGA

Centre for Development of Advanced Computing (C-DAC) is also developing VEGA Processor based on RISC-V ISA. VEGA is a series of 32-bit/64-bit Single/Multi-core Superscalar In-order/Out-of-Order high performance processors integrated with Multi-level Caches, MMU and Coherent Interconnect.

FUTURE PROSPECTS

Many companies like Alibaba Group, SiFive, Western Digital & many more institutes & organizations have forayed into this and are developing products based on it. With such implications, its Open & free nature makes RISC-V a truly attractive deal for everyone.

Recently, Intel announced its plan to Open Its Foundries to fabricate RISC-V & ARM chips as part of new business strategy. This could be very helpful in the long run as companies will have wider sources from where they could fabricate their chips.

RISC-V is already deployed in data centers & many other areas. Since, Development Cycle for Processors are generally long, we should expect a lot more variety as more companies start releasing their own works in future.

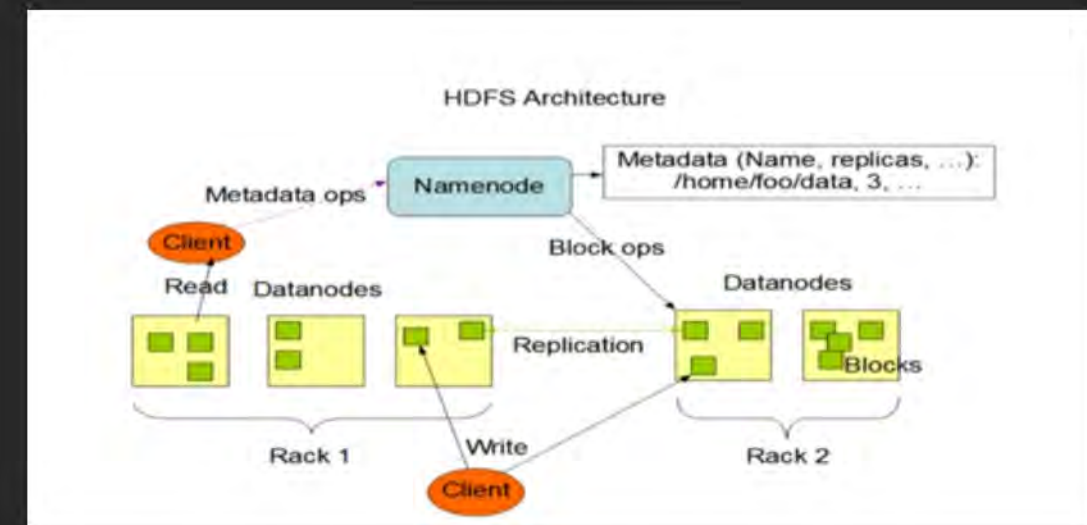
-Kunal Agrawal
FE AI&DS

Apache Hadoop

Hadoop stands for High Availability Distributed Object Oriented Platform. Apache Hadoop is an open source software and used to process large data sets. It is used to store data in the large range of gigabyte to petabyte. Hadoop connects and process multiple computer data in parallel. Hadoop works on big data, and it works on clustering of big data and server which are Parallel.

Apache hadoop frameworks-

- HDFS(Hadoop Distributed file system)-HDFS stores data in commodity machines, provides very high bandwidth to the cluster and stores large files across multiple machines. It is a Distributed file system in which cluster data is analysed in parallel. It is Scalable and portable File system because computers are cheaper and can be clustered together and can analyse the data in parallel. HDFS has node and each node has a single namenode and a cluster of datanode. Datanode gives the block of data over a block protocol. Client uses Remote procedure calls to communicate between them. While storing the large file in HDFS it achieves high reliability by replication of data across multiple hosts, hence doesn't require RAID(Redundant Array of Inexpensive Disks) Storage on hosts. Because of default value 2 data sore in the same rack and one in another rack. The HDFS system also includes secondary namenode, secondary namenode connect with the primary namenode and creates snapshot of primary namenodes directory information.
- Hadoop MapReduce-Hadoop mapreduce is used to make a programming Language for large scale Processing.
- Hadoop YARN(Yet Another Resource Negotiator)- YARN is basically a MapReduce which has undergone overhaul in hadoop and it is generated in Hadoop 2.0 version. It provides more processing platforms than it is not in MapReduce. It is a resource management platform that manages the cluster resources and uses them for users applications. YARN allows the data stores in HDFS to be processed and run by various Data processing engines and YARN increases the efficiency of the Hadoop System.



The main idea for YARN was to split functionality of jobtracker, resource management and job monitoring.yarn uses the resource management and packages them so that they can be used by a new engine and can be run multiple applications on hadoop. Resourcemanager and Nodemanager form the new generic system so they can manage the application. Resourcemanager does scheduling of large clusters and processing power in the data center.

Amrita Gupta
-CMPN A 51

SIXTH SENSE

Sixth sense technology manifested into a sixth sense device is a wearable gesture interface that augments the physical world with the digital world. This technology gifts us the liberty to use natural hand gestures to interact with information. It's the bridging gap between the physical world and the digital world wherein we digitalize the physical world around us helping us to be rooted, but digitally. The technology so far involves a camera, mirror, projector connected to a Bluetooth smartphone in our pockets. Interacting with pixels has never been this real. The whole idea behind this form of technology was proposed by Steve Mann at MIT who had the thought of a wearable computer. The motive is to not confine interaction with pixels only on digital devices.



Humans have largely been inclined to the internet and programmable devices supporting internet availability. Their decision-making skills and other factors depend largely on how things worked for people considering the same choices on the internet and not on themselves. Instead of confining experiences and collected information only to devices like computers, mobiles, laptops, and tablets, we have a live and interactive user interface linked to the practicality of daily life. Five natural senses are required to take information from the world and take decisions and action. This bridges the gap by bringing intangible digital information to tangible form.

APPLICATIONS OF SIXTH SENSE TECHNOLOGY:

Allows navigation in maps via hand gestures, like pinching in or pinching out. Also allows the clicking of photos by mere gestures of clicking it, without any digital devices involved. Any wall or surface or interface can be used as the screen for sixth sense technology. Pranav Mistry in a TED talk practically depicted dialing a number by just clicking buttons showing numbers on the human hand. This technology permits raising the standards of a normal newspaper by changing it into a Sixth Sense newspaper. One could get live weather updates instead of waiting for them to get updated and reaching them. Current implications allow us to edit, write, click, find ratings, check reviews, and a lot more

ADVANTAGES OF SIXTH SENSE TECHNOLOGY:

One of the major advantages is that it's an open-source technology and is portable. These are justified since the main idea was to not keep interaction confined to any devices. It doesn't imply humans understand computer knowledge and adapt to it, instead it makes computers adapt to basic human gestures. It's cheap to build and to connect. The devices used in the making are quite cheap and individual replacement of the damaged parts is possible wherein the probability of replacing individual parts in existing devices that support pixel interaction is very less.

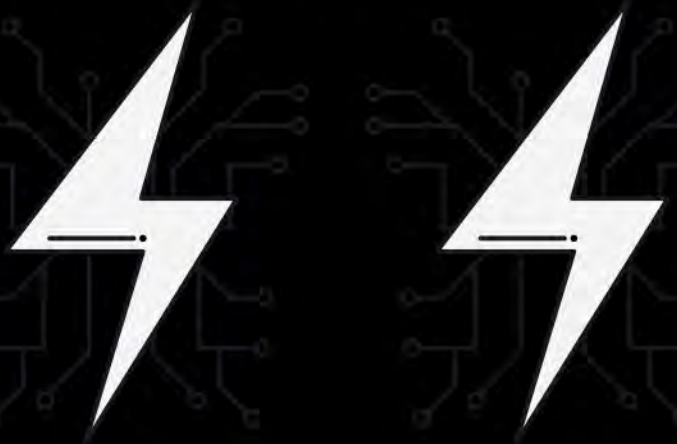


FUTURE OF SIXTH SENSE TECHNOLOGY:

1. By using the Sixth sense with holographic visualization, one can meet people from any part of the world.
2. The camera used in this technology can be used as an eye for blind people and can substitute as their fifth sense.
3. For speech-deprived people, this technology proves itself to be a boon by converting gestures and movements into text making it easier for the other person to understand them.
4. Could be a possible substitute for all wearable digital devices like watches.

-Monica Gullapalli
IT A

DUAL OS SMARTPHONE



Technology has surrounded us and has established itself comfortably in our day to day life. In the current pandemic situation, the use of smartphones and laptops have immensely increased due to the work from home strategy. Right from children to adults, all are getting virtually connected today for day to day activities. However, the use of laptops is preferred for its flexible access and less strain on the eyes. Most importantly, Windows and Linux Operating Systems make things easier. But many who can't afford laptops and PCs have to bear the consequences. Android is of course there to cater users to get PC experience on mobile as apps like Word and Notepad can easily run on it. However, many complex applications can't support android and that poses restrictions to the mobile users.

So, how can we ensure PC operating systems work on our mobile besides mobile operating systems? Our mobiles come preloaded with an operating system. Up to date we are pretty much limited to either iOS or Android. This is versus PCs where users have slightly more options. In fact, on PCs, users have the ability to dual boot operating systems where two OS can accommodate symbiotically on a single device. Dual-booting an OS is not a new concept, though it is a little on the new side for phones but PC's have been dual booting for some time now - PC's that run Linux, Macs, Windows, you name it. So when the concept of phones that would run multiple platforms came out, it seemed like a debate-worthy topic. However, it can be made possible to



boot 2 operating systems simultaneously by ensuring our mobiles have wider hard drives. Cosmos Communications have already implemented the same to create a mobile with dual operating system. With this smartphone, the company claims that it will be capable of dual booting both Android and Linux, or if you want, you can even add Debian. Users will be able to multi-boot from these operating systems without them replacing each other, although the downside is that users will need to know how to partition their storage and know their way around the boot menu, so making it burdensome for some average smartphone user. We can also implement a combination of windows and android as windows are immensely used for running various applications.

Some are not so sure what is so attractive about dual-booting – whether it is a phone or a PC. Hardware is designed for a purpose and as the saying goes putting bunny ears on a donkey is not going to make it hop. It goes like that, right? Anyway. To some it almost seems comical to put a different OS onto a piece of hardware for which it wasn't designed. The thinking is, if you wanted a Windows 8 PC, why didn't you just buy a Windows 8 PC instead of a Macbook. There are some niche cases where having multiple OS on a single box is desirable.

boot But to someone who does not have to do that, rebooting your machine just so you can switch from Keynote to PowerPoint seems to be missing the point. Doing it on a phone seems even worse.



Try imagining a world in which you run Windows Phone most of the time, but reboot the whole device every time you want to use Hangouts. Go ahead and try. Now take an Excedrin and the headache will pass. Doing things that way just doesn't seem like the best way to use a phone. Maybe that's missing the point a bit, but a phone should be bought because it works for you. It should work without having to compromise.

**An article by
Mihir Gharat (COMP B)**



3D PRINTING

3D printing is an additive manufacturing process by which physical objects can be created by depositing material in layers based on a digital model. All 3D printing processes require software, hardware and material to work together.

3D printing technology can be used to create everything from prototypes and simple parts to highly technical final products.

3D printing is used to create airplane parts, eco-friendly buildings, life-saving medical implants and even artificial organs using layers of human cells. Advances are quickly being made to make 3D printing technology reliable for mass manufacturing. Scientists and inventors are finding new ways to apply 3D printing technology every day.

3D printing is emerging as an energy-efficient technology that can provide environmental efficiencies in terms of both the manufacturing process itself, utilizing up to 90% of standard material, and, therefore, creating less waste, but also throughout an additively manufactured product's operating life, by way of lighter and stronger design that imposes a reduced carbon footprint compared to traditionally manufactured products.

-Aroma Sinha
COMP C

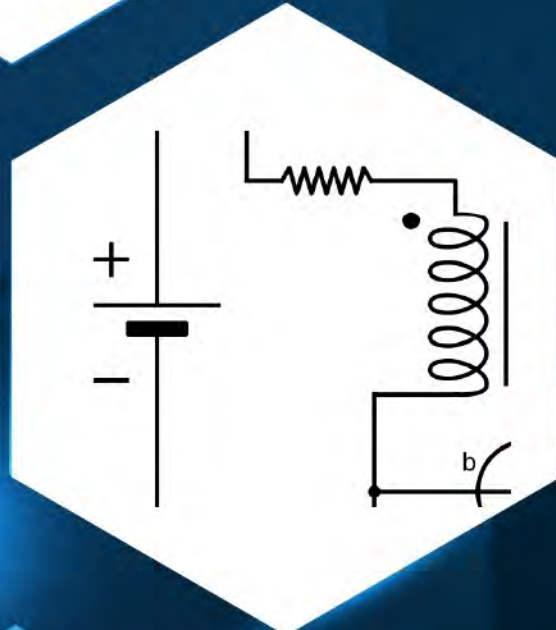
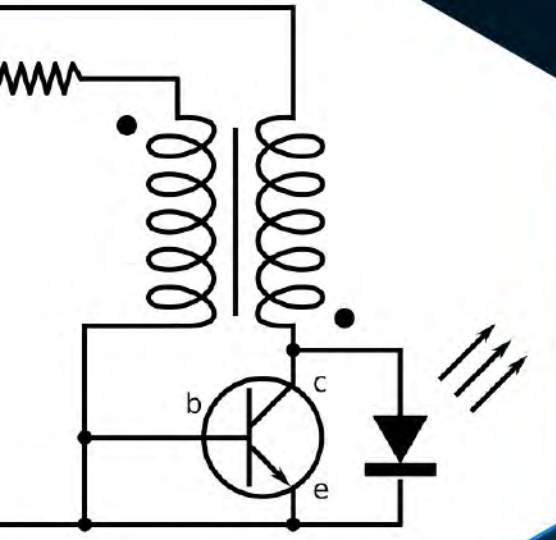


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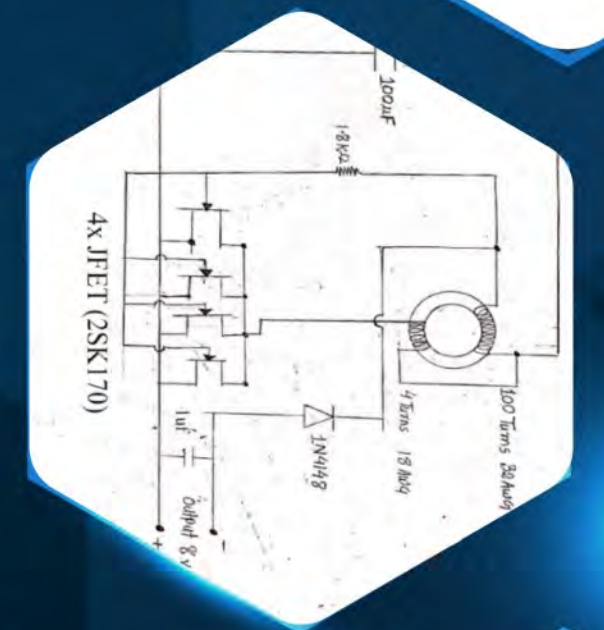
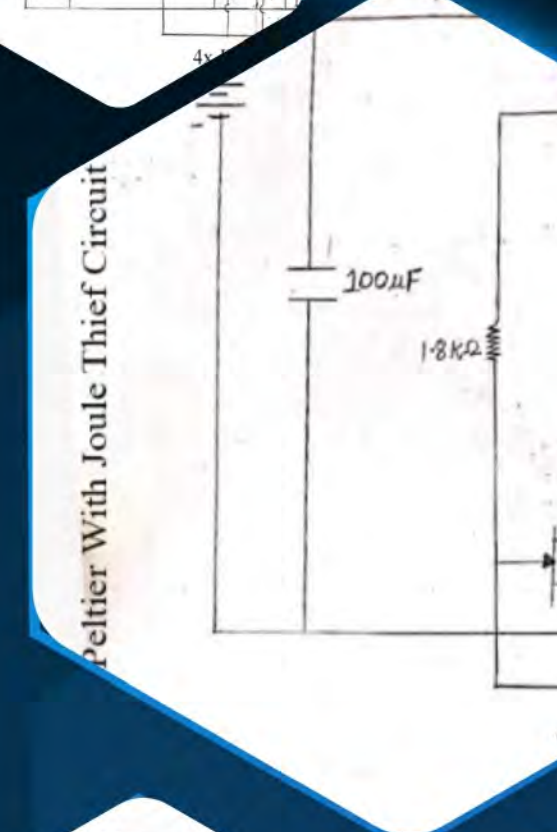
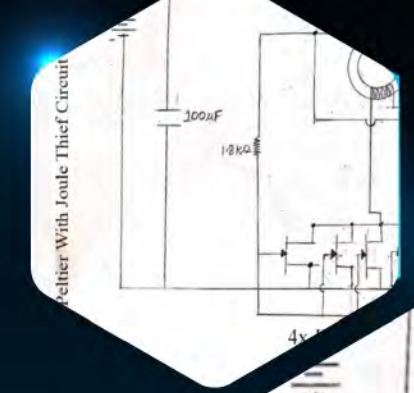


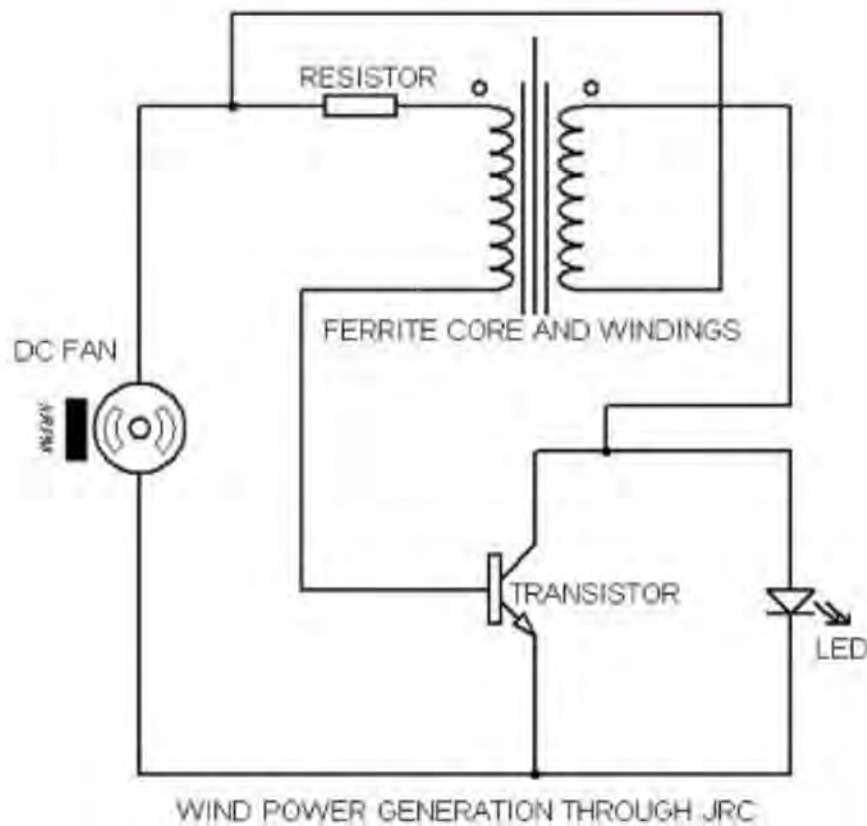
In this rapidly evolving world where the technology is flourishing at an exponentially steady rate, the need and the requirement for various distinct and efficient sources of energy has become a significantly imperative requirement to fuel the technology of the world to come. We as consumers use an extensive array of devices and appliances in our day to day lives which are powered by discrete kinds of batteries and power sources which till date haven't been able to be utilized to their superlative potential. After creating machines and devices that use electricity as a medium to operate, we humans discovered and optimized various natural and unnatural sources of energy to fill the ever proliferating need of fuel and power. All the various sources of energy that have now been refined to some extent are still lacking, since an immense amount of this energy is left unutilized or untapped. Similarly, the various different kinds of cells or batteries (Lithium Ion Polymer, Lithium Ion, Lead Acid, Nickel-Metal Hydride, Nickel Cadmium) that are now used to power our daily use devices can only power them for a brief amount of time since only a particular capacity of the battery is actually utilized to power the device and the rest is wasted when it's replaced as it can no longer be used to operate the device it was designated to power. The battery resurrection circuit can be implemented on a variety of appliances and devices to utilize the complete capacity of the cells and batteries they use. A joule thief is a minimalist self-oscillating voltage booster that is small, low-cost, and easy to build, typically used for driving small loads. It can increase the voltage of a power source by changing the constant low voltage signal into a series of rapid pulses at a higher voltage. It can use nearly all of the energy in a single-cell electric battery, even far below the voltage where other circuits consider the battery fully discharged (or "dead"); hence the name, which suggests the notion that the circuit is stealing energy or "joules" from the source - the term is a pun on "jewel thief". The circuit is a variant of the blocking oscillator that forms an unregulated voltage boost converter. The output voltage is increased at the expense of higher current draw on the input, but the integrated (average) current of the output is lowered and brightness of a luminescence decreased.



APPLICATIONS:

1) Using Joule Thief Circuit with Peltier: Free energy is used in the circuit shown above to generate electricity and use it to power various desired appliances. Free Energy in this case is the body heat which is generated by the body as long as you live to perform various biological processes. The circuit makes use of the Peltier effect (Also called the thermoelectric effect, it is the direct conversion of temperature difference between two metal to electric voltage) to use the temperature difference between the body and the environment (Usually 30c) to generate electricity which in this circuit is used to drive a LED (Light Emitting Diode). An N-channel junction FET: 2SK170 is used to achieve the self-starting oscillation even at a voltage as low as 30mV. The circuit only uses (4.2 mA at 60mV) input. The open circuit voltage is around 8-8.5V with two LED's connected in series it is around 4.3V. The circuit shown above has the ability to function with just a single FET: 2SK170 but 4 FET's connected in a parallel combination are used in this circuit to increase its efficiency which also increases the current draw to 4mA. A toroid ferrite core wound with copper wire of different lengths and thickness (100 turns 32Awg & 4 turns 18Awg) is used in the circuit to store the electromagnetic energy. As output two LEDs in series combination are connected to the output terminals of the circuit. This circuit demonstrates an example cum application of how merely the heat perpetually radiating from one's body can be used as a constant source of energy supply to power devices of the future and lend a helping hand towards diminishing the rising energy crisis. This mechanism could also prove to be profitable and advantageous when applied at places where the wasted energy after the completion of a particular process or processes is in the form of heat radiation, as the greater the temperature difference between two metals the higher is the voltage generated by this circuit.





2) Using Joule thief for wind power Generation

The circuit shown above is an example of how the rotation of a dc fan through passing wind can be used as a power source to drive a LED. We know that a LED requires a minimum input of 3V to light up but the voltage generated by the rotating fan is far less than that, therefore the fan can directly be connected to a joule thief to gain a viable output that will be sufficient enough to light up the LED. Similarly this circuit can also be modified by replacing the led with a rechargeable battery circuit to help store the generated electricity and charge up a battery that can be later used to power other appliances. The low voltage input by the fan in this circuit is amplified to a series of high value DC voltage. The Joule thief circuit can be used in similar applications like these, for example- It can be used in dynamo mechanisms like using the rotational movement of ceiling fans to drive another motor(which will be the input end) between which the joule thief can be connected and at the output end other appliances or cells can be connected as per the user requirement. Similarly this mechanism can be used to harvest energy from the rotational motion of car tyres, water turbines or almost anything that involves rotational motion.

3) Using Piezoelectric discs with Joule Thief to charge up Batteries

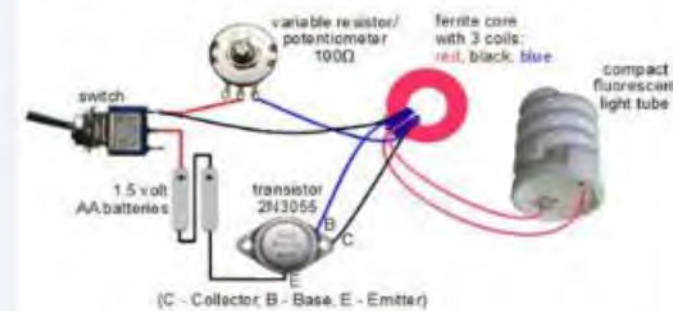
A piezoelectric disc (usually made of Rochelle salt ($KNaC_4H_4O_6 \cdot 4H_2O$), Tourmaline, Topaz etc.) when put under mechanical stress converts this mechanical energy to electrical energy and induces a certain amount of voltage which can be collected, stored and used as a power source to power or charge various devices. The piezoelectric disc being very useful is still lacking since the output it generates is too less to be used as. However if used with a joule thief circuit the output can be amplified and actually be used as a power source for various small scale appliances. Since the actual

construction of the joule thief is very cheap and easy to mass-produce commercially it could be a great alternative to be paired with a set of serially connected piezoelectric discs (connected in a serial combination to increase the EMF generated) and hence used as a power source at places where the wasted energy generated is in the form of mechanical stress or a deforming force to get the most effective use of it.

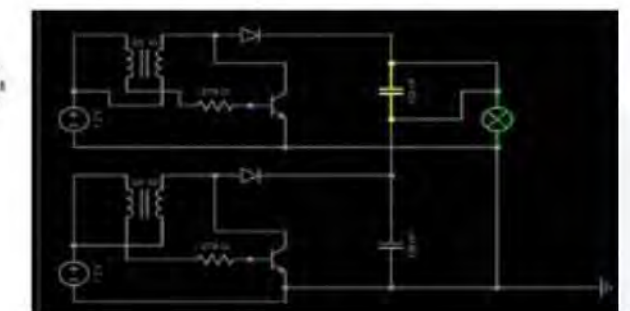
4) Other miscellaneous Applications

Using a joule thief circuit with solar cells (converts solar energy to electric energy) to power appliances and/or charge rechargeable batteries. Using Joule thief circuits in bicycle lights, portable reading lamps, portable heaters, remote controls and other small appliances that are powered by conventional Li-OH batteries. Using the Joule Thief circuit with car batteries, CFLs, power tools, decoration lights, etc. reason joule thief could be easy to implement commercially with a variety of devices is because it is relatively easy and substantially more economical to mass produce since it requires just a few components to function and can be modified appropriately for different applications.

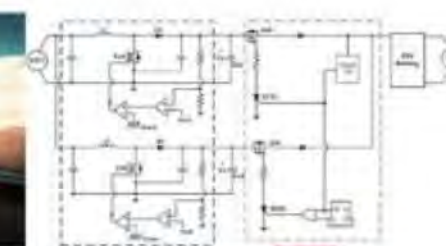
Powering A CFL Using AA batteries & Joule Thief



Using Solar Cells To Charge Batteries



Battery Powered Vehicle Jump Starter Using Joule Thief Circuit



Bicycle Light used with Joule Thief



RISHABH CHOPDA (SE COMPA 25) & ALISHA GUPTA (SE IT A 26)

Quantum Computing



One of the key scientific revolutions of the 20th century was the development of quantum theory. From its period, right until the advancement of the full scientific formalism and the ensuing improvement of the primary wave of applications (for instance, transistors, laser, superconductors, among others) quantum hypothesis has been effective in different settings being affirmed in unprecedented accuracy.

Quantum computing is the use of quantum phenomena such as superposition and entanglement to perform calculations. Computers that perform quantum computations are called quantum computers.

This is not just a better or a faster way of computing – it has a fundamentally different basis. Just as with the candle and the light bulb: while both throw out light, you recognize that the latter is unquestionably not an upgraded version of the former. Quantum computers perform calculations based on the probability of an object's state before it's measured which means they have the potential to process exponentially more data compared to classical computers.

As opposed to store data utilizing bits represented by 0s or 1s as conventional digital computers do, quantum computers use quantum bits, or qubits, to encode information as 0s, 1s, or both at the identical time. This superposition of states—alongside with the other quantum mechanical phenomena of entanglement and tunneling—enables quantum computers to control gigantic combinations of states simultaneously. Instead of having a clear position, unmeasured quantum states occur in a very mixed 'superposition', not unlike a coin spinning through the air before it lands in your hand. These superpositions are entangled with those of other objects, meaning their final outcomes are going to be mathematically related even if we don't know yet what they are.

The complex mathematics behind these unsettled states of entangled 'spinning coins' can be plugged into special algorithms to create short work of problems that might take a classical computer a long time to figure out if they might ever calculate them at all.

Such algorithms would be very valuable in solving complex mathematical problems, creating hard-to-break security codes, or foreseeing numerous molecule interactions in chemical reactions. It's only if you examine the tiniest quantum particles – atoms, electrons, photons, and the like – that you see intriguing things like superposition and entanglement. Superposition is basically the ability of a quantum system to be in multiple states at the identical time — that is, something can be “here” and “there,” or “up” and “down” at the same time.

Entanglement is an extremely strong correlation that exists between quantum particles — so strong that two or more quantum particles may be inextricably linked in perfect unison, even if separated by great distances. The particles are so intrinsically connected, they are said to “dance” in instantaneous, perfect unison, even when placed at opposite ends of the universe. This seemingly impossible connection inspired Einstein to explain entanglement as “spooky action at a distance.” The employment of quantum uncertainty for encryption as one of the most probable applications of quantum computing. It is believed that it might be used for creating private keys for encrypting messages sent from one location to a different one – so that hackers couldn't copy the key perfectly because of quantum uncertainty. T Imagine that level of security with regards to sensitive medical information: electronic health records, genetic and genomic data, or some other private information that the health system generates about our bodies. We believe that quantum computing could provide a significant push to the area: faster sequencing, as well as a more comprehensive and faster analysis of the complete genome, will be possible with it. Plus, predictions are going to be more reliable as quantum computers could take into consideration even more information as traditional computers, and that they could even build every bit of genomic data into health records. Quantum computing could cast off the guesswork from genomics and genetics for ensuring better health for everybody.

Quantum computers represent a paradigm shift in computation. We are entering in an interesting period in the advancement of quantum computers. Quantum frameworks are scaling up in both size and dependability. They are drawing near to indicating a genuine preferred position over traditional computers. As this technology continues to be in such an early phase, it may be that its true impact isn't even fully understood yet. This makes this field considerably all the more captivating to follow.

**-Nipun Agarwal
SE COMP A**





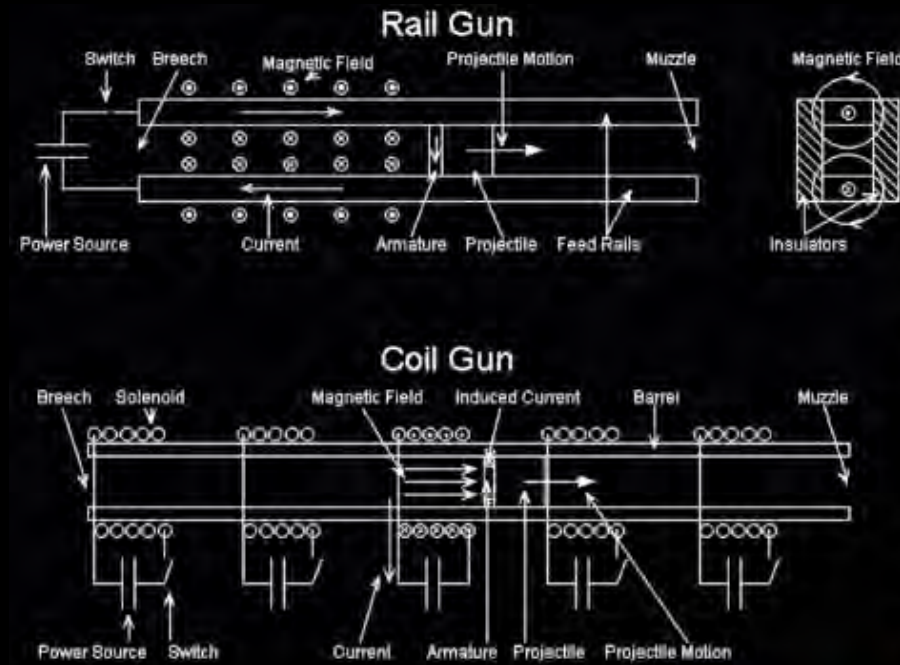
UNFATAL GUN

The guns that are currently being used by policemen or other civilian matters are generally risky for other individuals around the shoot. There is a way to change the hypocrisy of the traditional bullet firing system with new magnetics inspired barrels. The Bullets that are being used have to change with the ones that can only paralyze a person without doing much physical damage or cases of poisoning through gunpowder remains or bullet materials

It is concluded from numerous studies that the bullets with which a person is being shot do matters if calculating risk of deaths and higher caliber guns proved to be fatal in all situations.

The idea of being shot is horrible, and when added, "mistakenly" is a nightmare. The new gun concept includes an EML (Electromagnetic Launcher) mechanism to provide velocity to a body, a velocity far more than that could be acquired by traditional chemical explosion methods

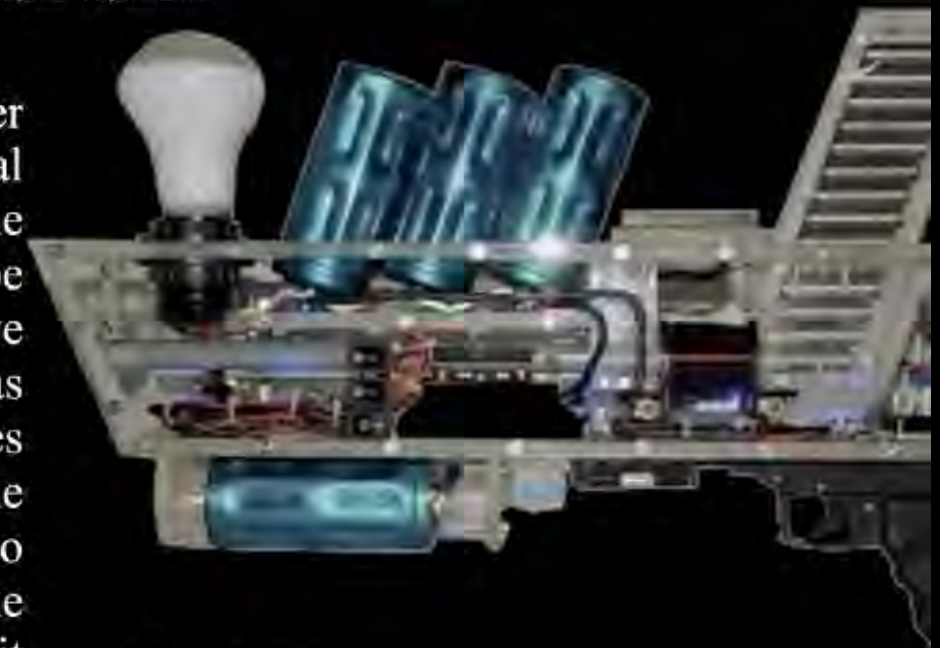
The barrel is made up of a coil wrapped tightly along the barrel pipe to act as linear electric motors or further classified as homopolar, i.e., in which the magnetic field direction does not vary. The mechanism relates much to that of a Coil Gun. To be used in a Hand Gun the Electromagnetic gun so to be designed needs to have a small coil length to suit with the mobility of a handgun, along with providing necessary muzzle velocity for the bullet to get pierced into the body so that the chemical can be injected through the body to get the person temporary paralyzed.



These guns are electromagnetic guns that use the Lorentz to accelerate a particle with a magnetic/conducting projectile. The Switch is controlled in such accordance, causing the bullet to be accelerated along the barrel accordingly via magnetic forces.

The second principal component of the gun is the bullet, which will be used. Since the current gun bullets are made from a lead alloy.

That provides better strength and thermal insulation. The same material bullet cannot be used in this case since we require a material that has better magnetic properties as well as serves the purpose of strength to penetrate through the surface if needed. Also, it needs to contain chemicals to paralyze the person instead of reacting with it. The substance should be such that it doesn't harm the victim. The same is to neutralize any fleeing suspects or threats.



Advantages

- There is considerably less wear in the machinery.
- The victim that is supposed to be shot with the bullet is not harmed a lot.
- This mechanism only tends to disable the person temporarily.
- It is very much more efficient and has a better muzzle speed.
- It prevents any accidental explosions.
- It lowers the possibilities of death for a victim.

Tushar Jhanwar
-MECH A

SMART ROADS

Nowadays, everything is going smart. From our tiny cell phones in our pockets to our big flat TV screens on our walls. But we noticed a major part of our lives which has remain unchanged and problematic from the very beginning, roads. Smart self-driving cars has become a reality, but our roads are still stuck in the era they were invented in. In this article we will see the use of smart concrete slabs for building of roads of tomorrow.

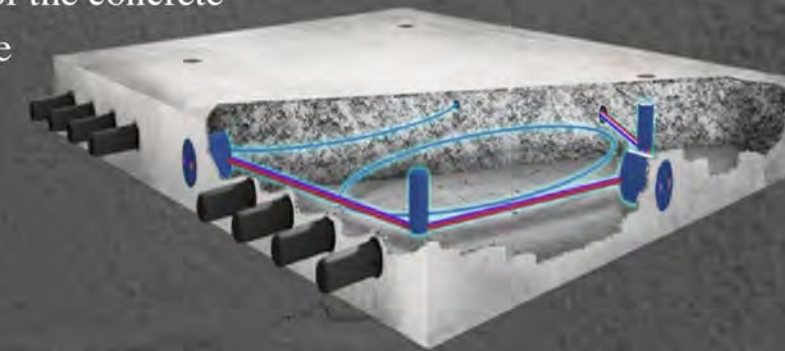
Today, we have smart phones, smart appliances, smart cars and even smart cities, but our roads are still just roads. Criteria like: tracking the car's speed, locating the car, comparing two car's position to avoid accidents, communication between cars, were a dream which is a little bit realized through the introduction of smart cars. Today's self-driving cars depend on lane marking on highways and street to calculate and judge their movement. Lane markings are not always accurate and not always present. But when driving on smart roads, where cars will be able to communicate with each other, lane marking will no longer be a need.

However the road accidents are a big problem even now, with normal cars. The main cause of accidents on road is miscommunication between cars, which smart roads can solve. Some accidents cannot be stopped or prevented as they happen due to new miscellaneous or human errors, and getting SOS vehicles to that spot as quick as possible would be actually possible by smart roads.

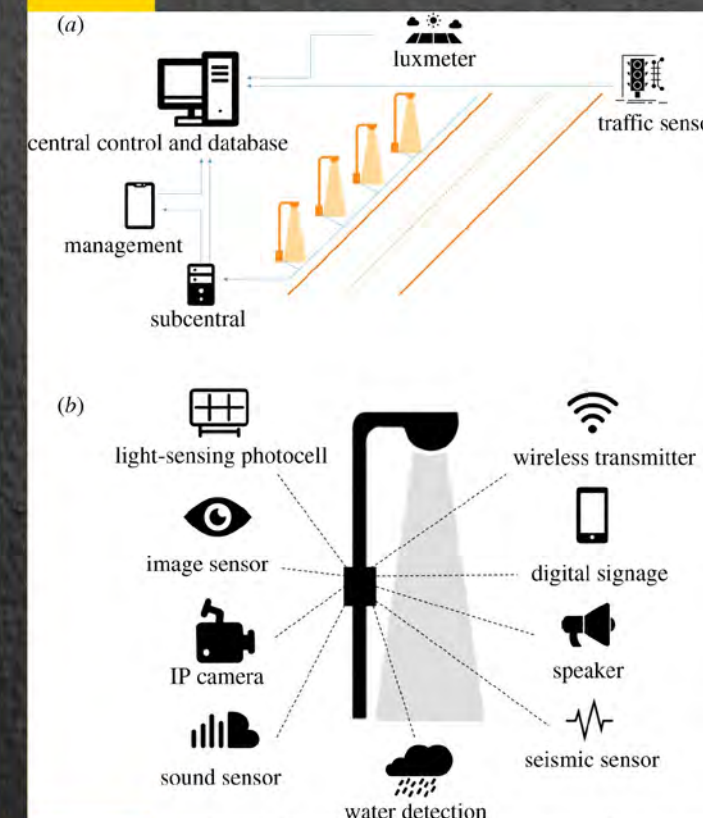
The basic idea is as follows: construction of highways by segments of smart concrete pavement and to create a digital network, connecting drivers with real time information. Each concrete slabs will be factory made with different types of sensors, gauges and Ethernet connection to a network to sense and send the collected data forward to a collection/server centre nearby. This will allow us to know a vehicle's exact position, type and speed it is travelling at. With all the data from the cars on the road, a radar can be built for every vehicle on the road, just like an ASR (airport surveillance radar). LTE/Wi Fi antennas to be installed on side of the road at distances to communicate and give data gathered by the sensors to the smart cars.

SMART PAVEMENT SLAB

Rather than a concrete slab poured on site, these will be factory made slabs which will be assembled on site. To each slab, a three-axis accelerometer is added that measures vibrations to predict a vehicle's path of arrival. A seansing fiber optic cable will detect strain in the pavement by measuring subtle changes in the way light travels through the cable. And a magnetometer will gauge the width of a car's axle to help the system figure out what type of car is driving overhead. Together with two central processing units, these sensors determine the position, size, speed, and trajectory of vehicles in real time. Separately, a gyroscope records the position of the concrete slab itself to determine whether the road has shifted out of place.



NETWORK



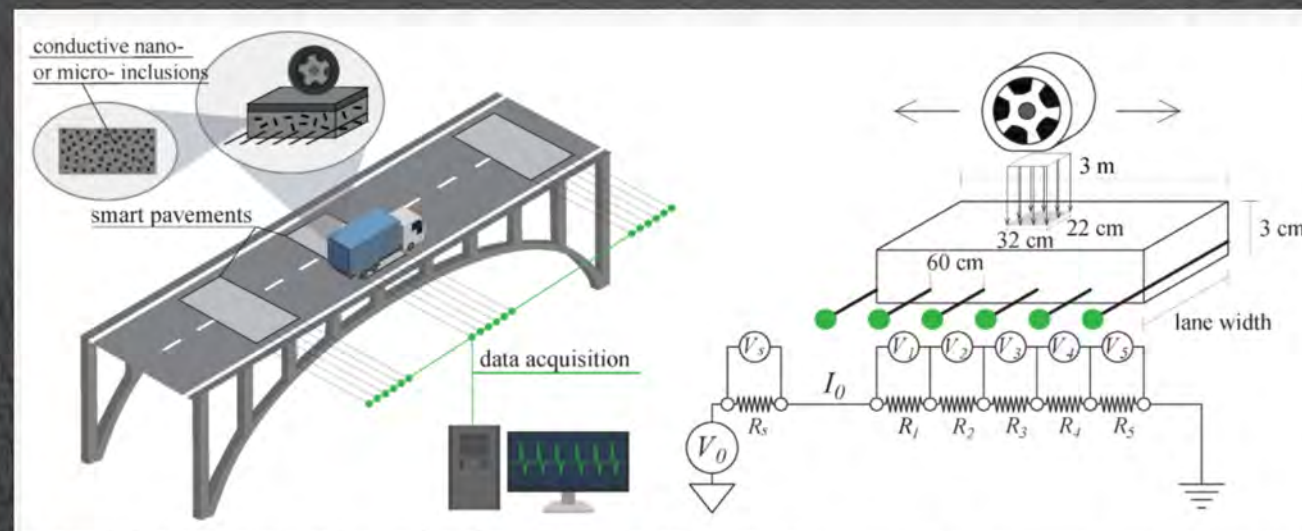
power-over-Ethernet connection (in which both electricity and data travel through the same cable) to control centers along the road. Each control center serves as a mini-data center stuffed with server racks and a wireless base station. The whole system is powered by the grid.

Switches can be used to connect an "x" number of slabs. And "y" number of switches can be connected to "z" number of micro data centres at long distances. ($y < x < z$) A main fiber can run across the road connecting all the Micro Data Centers.

POTENTIAL APPLICATIONS

Drivers will enjoy real time information about traffic road conditions for accidents. In fact, smart pavement technology can automatically call for help if there's an accident or a vehicle leaves the roadway, much like the track-pad on a laptop. Sensors in the pavement can feel the positions, velocity of every vehicle on the road, providing superior navigation for level for autonomous vehicles. In addition to capturing valuable traffic and usage data and like a smartphone, the Smart Pavement platform has unlimited potential for third party applications and services, which means smart roads will actually generate income from value added services. The smart roads of the future will be self-funding and not require tolls or new taxes, enabling us to upgrade public infrastructure without requiring more public money.

It is not a compulsion to use these smart concrete slabs to make a whole highway. It can be used at intersections to help and optimize the automated traffic light system.



The system can also be programmed to sense if there has been an accident (not sensing 4 wheels on road or sensing two cars very close to each other or stopped) and alert the emergency vehicles to that spot on the highway, automatically with the least amount of time possible.

When the sensors sense an excessive amount of pressure, one reason can be damage to the concrete slab. In this way, we can locate damaged part of a road and replace it before it gets too bad or becomes a cause for an accident.

This technology can also help automated lights on the streets to light up when it senses a car approaching from a distance. It can help to cut down power wastage.

CALCULATION

To calculate/estimate the power and money that can be saved by the use of automated street lighting.

An average street light consumes 500 W

Suppose the automated system helps save 1 hour of electricity when it was not needed

Energy that would have been consumed in that 1 hour by that 1 street light:

$$500 * 1 = 500\text{Wh} = 0.5\text{KWh}$$

For a highway stretch of 1 kilometers (lights fixed at 30m to each other), lights are at place:

$$1000 / 30 = 33.33 \approx 33$$

Energy wasted in 1 hour on a stretch of 1 kilometer highway:

$$0.5 \text{ KWh} * 33 = 16.5 \text{ KWh}$$

Energy that would be wasted on a 100 kilometer stretch of highway:

$$16.5 \text{ KWh} * 100 = 1650 \text{ Kwh}$$

BEST sells electricity at ₹ 5.75 per unit to the state highway department

Money that could be saved on 100 kilometer stretch of highway, everyday:

$$1650 \text{ KWh} * ₹5.75 = ₹9,487.50$$

Money that could be saved in a year on a 100km stretch:

$$₹ 9,487.5 * 365 = ₹34,62,937.50 \approx ₹35,00,000$$

Amitabh Dixit
-Comps A

Artificial Immune System

Artificial Immune System (AIS) is an intelligent algorithm derived from the principles inspired by the human immune system. It can also be stated as a class of computationally intelligent, rule-based machine learning systems inspired by the principles and processes of the vertebrate immune system. AIS is based on principle of mimicking the Human Immune System.

Working

Various techniques are inspired by specific immunological theories that explain the function and behaviour of the human adaptive immune system.

a) Clonal sectional Algorithm : It is a class of algorithms inspired by the clonal selection theory of acquired immunity that explains how B and T lymphocytes improve their response to antigens over time called affinity maturation.

b) Negative Selection Algorithm : Negative Selection Algorithm or NSA is an important kind of one-class classification model, but it is limited in the big data era due to its low efficiency.

c) Immune Network Algorithm : Algorithms inspired by the idiotypic network theory proposed by Niels Kaj Jerne that describes the regulation of the immune system by anti-idiotypic antibodies.

d) Dendrite Cells Algorithm : The Dendritic Cell Algorithm (DCA) is inspired by the function of the dendritic cells of the human immune system.

History of Artificial immune System

AIS was originally found in mid 1980s by Farmer, Packard, Perelson in their authored articles. But it came to spotlight in mid 1990s and became a field in its own right. The first paper on AIS was published by Forrest and Kelphart in 1994. Dasgupta carried out extensive studies on the negative selection Algorithm. Dasgupta also published his book in 1999. De Castro & Von Zuben's and Nicosia & Cutello's work became notable in 2002 for their work on Clonal Selection.

-Gaurav Rana
COMP C

ACKNOWLEDGEMENT

We, the editorial committee of The Byte 2021 have worked hard with our heart and soul to bring to you the Annual magazine which includes the technical articles which would inspire and expand the tech-savvy inside you!

We sincerely hope that this year's edition of The Byte 2021, enriches your knowledge and understanding of the technical world. The creation of this edition, however, would not have been possible without the constant the constant support and encouragement of the Chairman, Trustees and the CEOs of Thakur Educational Group and our Principal, Dr. B.K. Mishra.

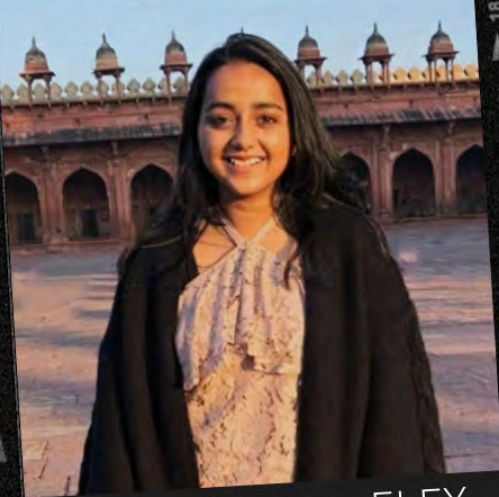
We also would like to extend our heartiest thanks to FE In-Charge-Dr. Sunita Pachori, Deputy FE Incharges, Dr. Rajni Bahuguna, Mr.Amol Dapkekar and Mr. Nivant Kambale for their constant guidance and recommendations. We would like to express deep gratitude to each and everyone who have contributed with their ideas and efforts. We would also like thank the faculty member and the students of TCET for their perseverance and innovative ideas.

Thank You!

Regards,

The Byte Core

THE BYTE CORE



Janani Menon, ELEX



Rohan R. Dalvi, COMP



Mayur Chavan, ELEX



Khushi Bhoj, COMP



Akshata Sharma, ELEX



Parth Agarwal, COMP

A team above all. Above all a team.



Monica Gullapalli, IT



Saket Pradhan, IT



Shruti Gupta, IT

Coming together is the beginning. Staying together is progress. Working together is success.

THE BYTE CORE



Harneet Kaur Dehiya, E&TC



Nabil Khatri, MECH



Akshata Koltharkar, MECH