SAHYADRI
COLLEGE OF ENGINEERING & MANAGEMENT

WAVES

ASSOCIATION OF E&C ENGINEERING STUDENTS

ELECTRONICS & COMMUNICATION TECHNICAL MAGAZINE

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VISION:

To establish the department as a center of excellence in creating globally competitive, socially responsible engineers to excel in the field of Electronics and Communication by transforming future challenges to sustainable opportunities.

MISSION:

- Inculcating a distinctive teaching learning process to provide extensive knowledge of principles to provide solutions to challenges in the relevant domain.
- Nurturing the growth of every individual through inventive, dynamic and conducive learning environment using modern education techniques and industry oriented pedagogy.
- Imparting leadership qualities with ethical values among students to cater societal and environmental needs.

PROGRAM EDUCATIONAL OBJECTIVES:

- Applying the concepts of mathematics, science and engineering for solving problems relevant to environment and society.
- Inculcating lifelong learning skills to adapt to dynamic global economics and technological trends.
- Inducing ethics, communication skills and leadership qualities with the application of innovative tools and techniques for the betterment of mankind.

PROGRAM SPECIFIC OUTCOME:

- Exhibit competency in Embedded system and VLSI Design.
- Capability to comprehend the technological advancement in Signal processing and Communication.

"Education is the passport to the future, for tomorrow belongs to those who prepare for it today."
-Malcolm X

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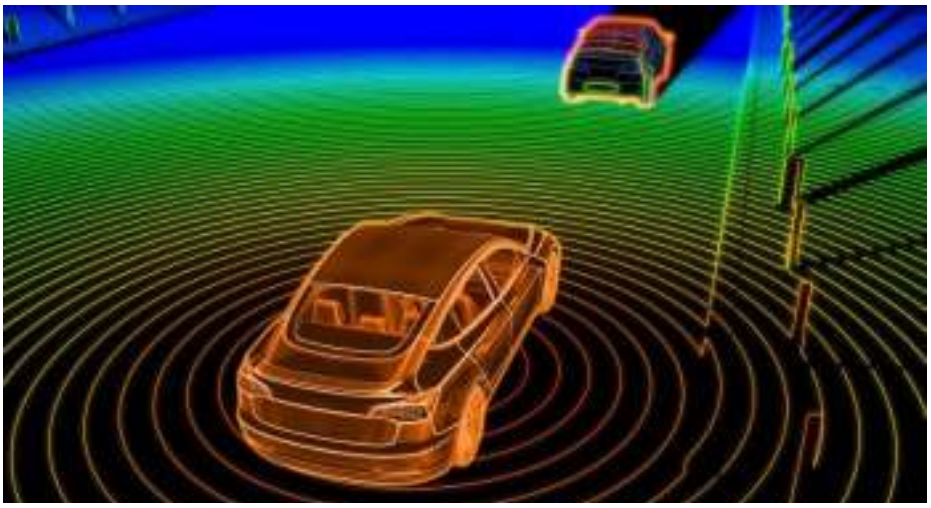
ARTIFICIAL INTELLIGENCE ON SELF DRIVING CARS



Leading books define Artificial Intelligence as an autonomous entity which acts directing its activity towards achieving the required objectives. The term artificial intelligence is often used to describe a system that obeys the functions associated with the human minds such as learning, thinking, problem solving, reasoning, knowledge representation, natural language processing, ability to move and manipulate objects etc.

Self-driving cars are one of the most promising prospects for near term Artificial Intelligence research. After all, it is impossible to program every single possible situation that could occur on the road, including the appropriate solution, onto the vehicles in advance. Instead, cars are being developed with cognitive ability similar to that of a human brain so that they can make decisions that are not included in their code.

A self-driving car is capable of sensing its environment and navigating without human input. Each vehicle is usually outfitted with a GPS unit, an inertial navigation system and a range of sensors that can create a dynamic 3D map of a vehicle and its surrounding. The main sensor technology behind the

automation of the vehicle mainly includes LiDAR, RADAR and cameras.The vehicles use the positional information from the GPS to localize itself and sensor data to refine its position to create a three-dimensional image of its environment. Data from each sensor is filtered to remove noise and often fused with other data sources to augment the original image.

Subsequently, the control system determines how this data is used. These control systems are part of a suite of sensors that work with an on board computer to map the local environment and steer the vehicle through a dynamic situation that contains traffic signals, pedestrians, other cars, tractor trailers, weather conditions and even wild animals. The ultimate goal is a robotic system that drives better than error prone humans.

RADAR can measure distance and relative velocity of objects at distances of up to 200m in all lighting and environmental conditions, but due to the long wavelengths of radio waves and the broad beams used, is incapable of differentiating and resolving the details of the objects that are detected (such as the direction a motorcycle is facing or whether a person is walking towards or away from the path of a vehicle). Radars have quick reaction time and wide ranging in all environmental conditions.

Optical Cameras mounted on self-driving cars are the most cost-efficient of the technologies. These omni directional systems provide a 360-degree field of view in a horizontal plane (a visual field that is spherically or hemi-spherically shaped). Optical cameras can provide accurate images of a scene but have limited range, they do not provide distance and relative velocity information, and are limited to functioning in well-lit conditions with good visibility.The vision provided by cameras most closely replicates that of human drivers but is still unsatisfactory and

not deemed road safe.LiDAR i.e., Light Imaging Detection and Ranging, is a surveying technology using laser light pulses. Small object detection and 3D monochromatic imaging is relatively simpler, though its effectivity in low light might be limited. In the area of Applied Autonomy, the speed of the vehicles is not usually the problem.

Large vehicles ploughing a field or moving in a restricted construction site will not have to worry about pedestrians, racing drivers or traffic lights. For this area LIDAR would in most cases be a better option over RADAR, though the technology is still expensive to use on a larger scale.

Conclusively, the future of self-driving cars when they finally become ubiquitous is yet extremely unpredictable. All that can be said at this moment is that this technology will consequently change the way of transportation.

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DRONES AND THEIR FUTURE IN INDIA

"Brutality and injustice made us raise our hands towards the sky for years; God didn't respond us, but drones came to our rescue".

From the Internet to electric vehicles, we might be in a golden age of technology advancement. The world of unmanned aerial vehicles (UAVs) or drones is no exception.The UAVs or drones have proven their utility in the fields of agriculture, healthcare, delivery of products, inspection of infrastructure, etc. With the wider adoption and further innovation, the technology can be game changers in these fields.

One of the most promising areas for drones is agriculture where drones are expected to help meet a number of big challenges. Drones are being used in agriculture for soil analysis, inspection, planting and irrigation. In some states of India, drones are already in use for spraying pesticides. At present, estimating credit risk of farmers is uncertainty because farming is highly dependent on monsoons. Thus, adopting the usage of drones enables banks and insurance companies to capture data like soil quality and production capacity. Further, enables near accurate prediction of the credit risk of farmers and improve financial support to the farmers. The drone space

reached its inflection point in 2013 when Amazon announced that it would seek to experiment with drones to make deliveries. Since then, we have seen an explosion in the usage of drones and drone-based services in the retail and commercial space. Drones are being explored extensively across an array of industries, including, but not limited to, construction, real estate, e-commerce, agriculture, utilities and energy, financial services, and media and entertainment.Consumer andservices in the retail and commercial space. Drones are being explored extensively across an array of industries, including, but not limited to, construction, real estate, e-commerce, agriculture, utilities and energy, financial services, and media and entertainment.

Consumer and commercial drones have grown exponentially thanks to merger and rapid advancement in two completely different technologies: radio communication and smartphones. It is elementary that radio communication help in controlling the aircraft, whereas more interestingly, the advent of smartphones has led to a steep reduction in the prices of various equipment like microcontrollers, chips, accelerometers, cameras and other sensors. These have enabled capturing of data, the utility of which is being amplified by the availability of better computing capabilities. Regulatory impact is currently one of the most important factors affecting the pace of adoption of drone-powered solutions by business and government entities. Drone regulations have changed in recent years from being treated as a niche hobby to becoming part of regular aviation operations, to a point where national authorities have started developing special regulatory frameworks to address the most urgent issues. The first country to implement all necessary sets of regulations was Poland in 2013. Thanks to the combined efforts of the civilian aviation authorities, the UAV community and

insurance companies, Poland allows both visual-line-of-sight (VLOS) and beyond-visual-line-of-sight (BVLOS) operations of commercial drones in a secure and user-friendly way. At the global level, the International Civil Aviation Organization (ICAO), a specialised agency of the United Nations, prepares the standards and recommended practices for national and international air navigation to ensure safe and orderly growth. Of the 191 ICAO members, 63 have some regulations for drones already in place; 9 states have pending regulations and 5 have temporarily banned the use of drones.

By 2050, India is expected to account for more than 18% of the global working-age population, with more than 100 million newcomers expected to enter the workforce by 2022. India has at least 50 drone start-ups operating with increasing room for growth and innovation. To date, Indian drone start-ups have demonstrated their ability to detect mosquito breeding grounds to help eradicate blood-borne illnesses, assist city planners in mapping urban environments with cost-effectiveness and precision and even deliver fast food to local communities in a safe and reliable way. Driven by a societal motivation to address big challenges, supported by a workforce ready to lead and a government open to new solutions in the public interest, India may just become the global home for the next generation of drone technologies.

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ECOmber – A step towards the future

a. Project Abstract

Energy is the most important factor on which the entire country runs. In the era of 21st century, the demand for energy has raised significantly. Between 2007 and 2017, the global energy consumption grew at an annual rate of 1.5%. A developing nation requires large amounts of energy. As India is a developing nation and houses a large number of people, the energy demand also increases.

Keeping this in mind, we have come up with an idea 'To convert wave energy to electrical energy' in an easy and cost-effective way along with collection of plastic waste. As more than 50% of India's boundary is with sea, ocean etc, this innovative idea has a huge potential to revolutionize energy generation.

This SOURCE to SOURCE technology will increase the amount of energy generated which in- turn increases the country's economy leading to its development.

b. Innovativeness of the Proposed Solution

Basic principle of tidal power plant:

A dam is constructed in such a way that a basin gets separated from the sea and a difference in the water level is obtained between the basin and sea. But we on the other hand create a simple design with which the flap coverts the linear motion into rotational motion and thus the cost and maintenance of the device is very less than that of the traditional used ones. The first part contains a flap which has been designed as per the requirement and responds to the slightest wave affected onto it. Then we have a crank mechanism that coverts linear movement into mechanical into rotatory movement thus enabling collection of energy by the generator The generator then stores energy and then energy can be used for further use.

Size: Our tidal plant uses just small place thus it can be used in any water source.
Functionality: As tidal wave power plant is of small size it can be used by ships for power generation.
Some Important features:

- It can be operated continuously for months together without any break even at night.
- It can be operated under all weather conditions.
- It can not only be used on the seashore, but can also be used in ships, boats etc.
- Easy to maintain and cost-effective.
- It does not cause pollution.
- Can collect waste from the water bodies

c. Impact of the proposed solution

According to the estimates of the Indian government, the country has a potential of 8,000 MW of tidal energy. This includes about 7,000 MW in the Gulf of Cambay in Gujarat, 1,200 MW in the Gulf of Kutch and 100 MW in the Gangetic delta in the Sunderbans region of West Bengal. Having huge potential, India is developing many policies on tidal energy. Bringing this project into reality would help in reducing the demand for energy present in the society and proper utilization of resources in the country.

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LIDAR : Light Detection and Ranging

Introduction:

In the present generation computers and other advanced technologies are being used widely. Digital photogrammetry is one of the well-developed fields. However there are defects in photogrammetry. Some of the limitations of analytical photogrammetry are, they have high photographic resolution and low scanning resolution, there is a need of stereo coverage for stereo photogrammetry, accuracy is less, camera hardware is large in size, and the unavailability of algorithms and the quality of the GCPs are low.

LIDAR is one of the revolutionary technologies in the field of analytical photogrammetry. It is faster than photogrammetric technology and offers advantages in many other fields. LIDAR is a very efficient tool for monitoring targets or objects.

60s and 70s - First laser remote sensing instrument was developed

80s and 90s - First laser altimetry system was developed

1995 - First commercial airborne LIDAR system was developed

1994 - This technology was used in SHOLS

1996 - Mars Orbiter Laser Altimeter

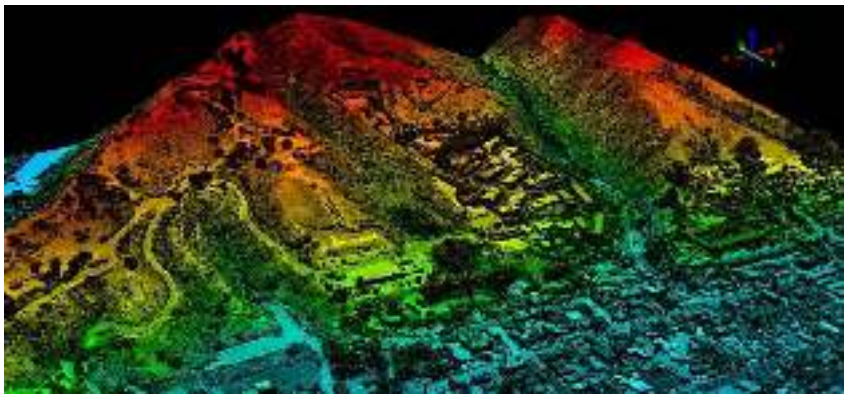
1997 - Shuttle Laser Altimeter

LIDAR uses a focused light and sensor to detect range and reflectivity of objects. It is mainly used in survey applications to create high resolution maps and also are used in self driving vehicles. Principle involves emission of a pulse of focused light and the reflected light is measured. The distance is measured by the time taken by the pulse to transmit and receive. Reflectivity is determined by the beam intensity.

LIDAR system:

The LIDAR system consists of 4 main components Laser, GPS, IMU and computer.

Laser: Laser is acronym for Light Amplification by Stimulated Emission of Radiation. LIDAR uses laser for these following characteristics. Wavelength, Coherence, Duration of Emission, Output, Output power: (energy released * time duration of energy released), Power requirements: Laser uses electricity and it converts electricity to light. The efficiency of a laser source is the ratio of output to the input. Maximum efficiency is 30% and min efficiency is 0.001%. GPS Receiver: Tracks the x, y, z position. Where, z gives the altitude and x, y gives the position. GPS is used to determine where the location of the reflection is coming from exactly. IMU unit: Inertial Measurement Unit tracks the position of the vehicle which the sensor is mounted on. But detecting the movements like tilts for planes etc.



Computer: This a very important part of the LIDAR system. Without computer there is no data. To store all the data from the sensor there is a requirement of a computer system. The fig above shows the LIDAR data obtained in a PC.

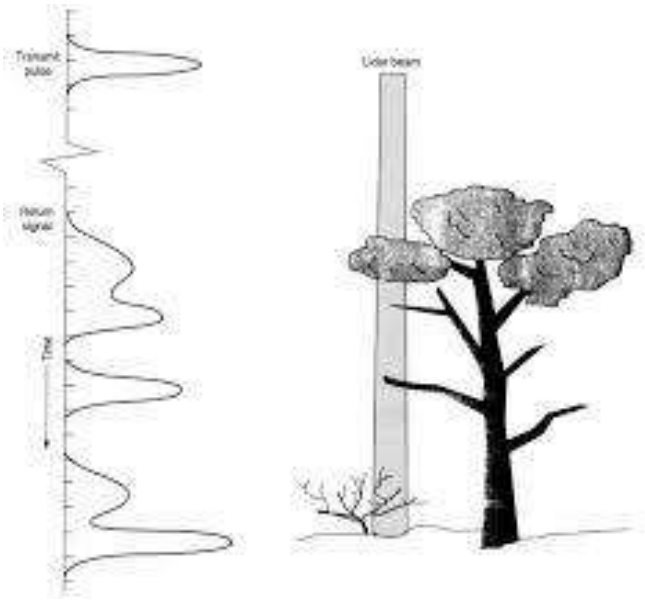
To calculate the distance time of flight principle is used ,If a pulse is triggered at a time t1 secs then if the received signal is at t2 secs then for a given threshold if the signal intensity for eg: if 50% more than the PT then the received signal can be considered all the other signals are ignored.

Therefore, TOF= t2 – t1 = t,

Range= c t / 2

Resolution=(accuracy of t) / 2

Multiple returns, that is if the there are two or more objects in the same path of the light beam we get information from many sources. This is possible only because of the shape of these objects or voids in it. Because of this we can obtain a 3D structure of a tree. The below fig shows how exactly it is done.



here are 2 different types of LIDAR: Airborne LIDAR and terrestrial .Airborne, with airborne LIDAR, the system is installed in a fixed-wing aircraft or helicopter. The infrared laser light is emitted to the ground and returned to the moving airborne LIDAR receiver. There are two types of Airborne sensors: Topographic and Bathymetric.

Topographic LIDAR: can be used to derive surface model for use in applications, such as forestry, urban planning, landscape, coastal engineering, survey assessment etc.

Bathymetric LIDAR: It has the property of water penetration. Most of these LIDAR systems acquires the elevation and water depth at the same time, which provides an airborne LIDAR survey of the land-water interface.

Terrestrial LIDAR: There are 2 main types of terrestrial LIDAR: mobile and static. Mobile: Mobile LIDAR is the collects the data of LIDAR point clouds from a moving platform. Mobile LIDAR data can be used to analyse road infrastructure and locate encroaching overhead wires, light poles, and road signs near roadways or rail lines. Static: Static LIDAR is the way of collection of LIDAR point clouds from a static location or position. These collect LIDAR point clouds inside buildings and exteriors.

Some LIDAR sensors

TF mini LIDAR:

RP LIDAR:

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AGRICULTURAL UAVs

Agricultural drones let farmers see their fields from the sky. It helps the farmers in monitoring the crop growth, infection and pesticide issues. Nowadays the drone technology is used to spray pesticides to the crops too. This technique has not only reduced the time consumption but also the labour work. Adapting to these technologies, farmers can do their work efficiently and gain more yield.

Additional to these applications the drones are used for seed bursting method which is a leap towards afforestation. This technique uses a box which contains seeds to be planted which is being mounted on the drone and it is programmed to cover a certain area as mentioned in the mission. When the drone is at a particular altitude the seeds are dropped and then again at another location the process is repeated, thus dispersing the seeds in a given area. Drones can help to monitor the irrigation in very large fields which cannot be done manually. They check the soil moisture content in various regions of the field and analyse the data. Drones with hyper-spectral, multispectral, or thermal sensors can identify which parts of a field are dry or need improvements. Additionally, once the crop is growing,

drones allow the calculation of the vegetation index, which describes the relative density and health of the crop, and show the heat signature, the amount of energy or heat the crop emits.

For the most part, drones make sense where they can replace labour-intensive and potentially harmful use of backpack sprayers and similar equipment, in situations where terrain and/or ground conditions rule out the use of conventional or even specialist vehicles.
Drones can scan the ground and spray the correct amount of liquid, modulating distance from the ground and spraying in real time for even coverage. The result: increased efficiency with a reduction in the amount of chemicals penetrating into groundwater. In fact, experts estimate that aerial spraying can be completed up to five times faster with drones than with traditional machinery.

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"The human brain is an incredible pattern-matching machine." -Jeff Bezos

HYPER LOOP

You might have heard the phrase fast as a bullet,but have you ever wondered if it is ever possible to travel like one?
Well! In a few years it is going to become a reality!!
It's not a superfast car or a thundering supersonic jet but a train like design called the hyperloop.
Yeah! You read it right. its hyper and it can get you from point a to b at speeds of over 1200 kmph, yup that's more than double the speed of a bullet train.
It was first proposed by a joint team from Tesla and Spacex which designed the system as a sealed tube or a system of tubes through which a pod may travel free of air resistance or friction conveying people or cargo at high speeds while being very efficient, there by drastically reducing the travel time over medium range distances.The design was proposed as early as 2012,a truly revolutionary and remarkable design at the time, which worked on the principle of propelling the capsules in the low friction or near vacuum sealed tubes at near supersonic speeds. The pressurized capsules ride on air bearings driven by linear induction motors and axial compressors.
And a fun fact is that the first functional hyperloop system might be installed right here in India. In February 2018, Richard Branson of Virgin hyperloop one announced that he had a preliminary agreement with the government of India to build the Mumbai-Pune hyper loop. It is indeed a moment of pride for us Indians.
Well, until it's completed we might have to just stick to the rails and the airways for the fast travels

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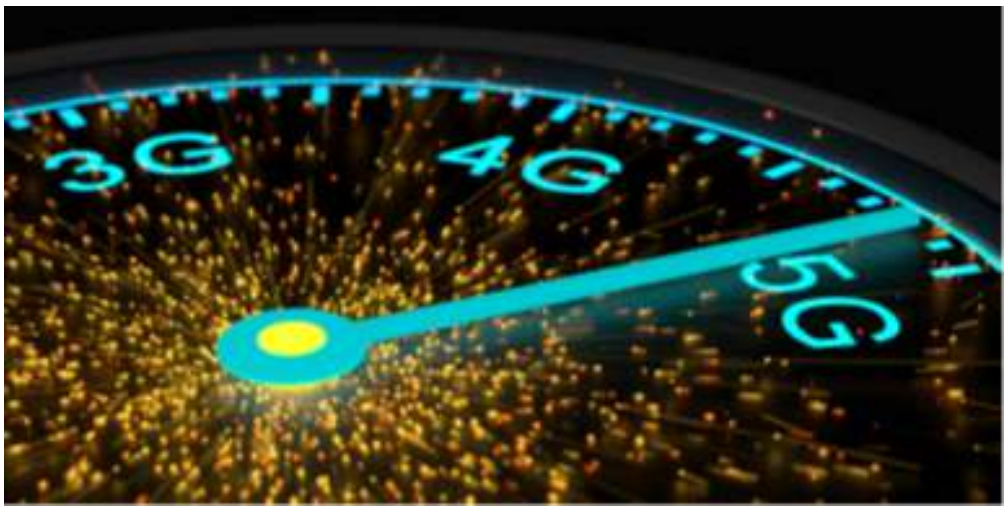
5G TECHNOLOGY : THE FUTURE OF COMMUNICATION



I am sure that, by now, everyone has heard about 5G (the fifth-generation of mobile phone and data communication standards). First, you may want to familiarize yourself with what came with the first four generations and what they have given us over the last 30–35 years.

First, 5G simply means fifth-generation mobile networks. The best way to understand what 5G is to understand all the other Gs, like 3G and 4G (we rarely hear about the early Gs!). The analogy I understand best for mobile communications is this:

1G : analog (voice only)
2G : digital (includes text and pictures)
3G : video calling and data
4G : internet and video streaming
5G : everything connected to everything (4G on mega steroids and 1000x faster)

Generations of Mobile Communication Networks

Mobile communication networks are grouped into generations. The first-generation (1G, although not named as such) was an analog system introduced in the early 1980s. The second-generation (2G, for example, GSM) was digital and

made short messages (or short message service, SMS) available for the wide public in the 1990s. It originally intended to support phone calls but was later augmented to also allow data transmission. In addition, it greatly increased security, making your calls much more difficult to hack. The third-generation (3G) was aimed at both telephony and data transmission in its design and became widely deployed in the early 2000s. The fourth-generation (4G and 4G LTE, or long-term evolution, and improvements to the original 4G have continued to become available) dating to the 2010s was built for data transmission and supports telephony only through data packets (voice-over-LTE and voice-over-internet protocol, or VoIP). Each new generation introduced higher data rates and new features to the public.

5G Technology:

Let's get "techy" for a little bit with some commentary regarding the bandwidth that makes 5G function and the differences from 4G. 5G uses bands in the 30–300 GHz range, which are rarely used today, while current 4G networks operate on frequencies below 6 GHz. Range testing of 5G has shown results approximately 500+ meters from the tower. Using small cells, carriers using the millimeter- wave band for transmission using 5G can improve the overall coverage area. With beam forming, and by using small cells to focus the signal, it has been reported that there will be improved coverage with the expected 5G low latency. Remember, low latency is one of 5G's most important features (more on this later). This makes the technology suitable for applications that require rapid responsiveness and no lag, such as those mentioned earlier. 5G technology can demonstrate latency as low as one millisecond with reported realistic estimates in the range of 1–10 milliseconds. 5G is reported to be 60 times faster or

more, and perhaps up to 120 times faster, than present average 4G latency. While researching data for this update, and looking at the new standards defining 5G, it seems that, theoretically, data rates can hit 20 Gbps download and 10 Gbps upload; in other words, those are very fast data speeds. Now, remember that these impressive numbers are theoretical rates. We can expect that the specifications of 100 Mbps download and uploads of 50 Mbps are being expected, but we will see.

The Future of 5G:

Overall, we can expect that 5G in the real world will give us the aforementioned low latency, be efficient, and reportedly be able to switch to a low-energy state within milliseconds of detecting a lack of use. 5G networks will be able to communicate with devices moving at very high speeds reportedly up to over 300 mph between the base station and the moving device. 5G will be able to support many more devices than 4G in the same area without overload. It is reported that 5G will be able to support up to one million devices per square kilometer. You might think that there would never be that many people on their cellphone in a single square kilometer, but we are not just talking cellphones when talking 5G; we are talking about the myriad of devices of all types such as transportation, entertainment, military, medical, etc,.—that will be communicating with each other in the next quarter of a century. For those of you who were around at the time, think back to the devices that communicated with each other back in the 70s, look at where we have come, and then imagine what is to come.

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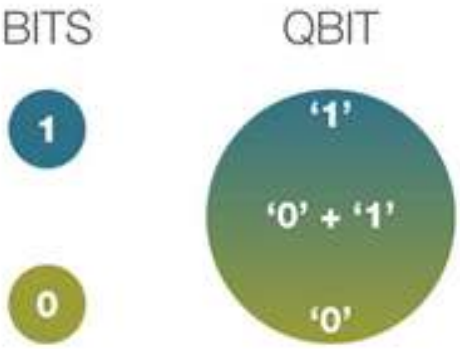
QUANTUM COMPUTING - A NEW ERA OF COMPUTING

Today we use smartphones which has the same computing power as of a military computer from 50 years ago which occupied a size of an entire room.However as the transistor gates are getting smaller and smaller the classical transistors have already hit minimum threshold of 5nm before the effects of quantum tunneling starts to kick in. The classical transistors gates cannot get smaller than that. So essentially, we need a new mechanism (electronics) to compute. That's where quantum computing comes in.



Quantum computing is an area of computing focused on developing computer technology based on the principles of quantum theory, which explains the behavior of energy and material on the atomic and subatomic levels.Instead of bits, which conventional computers use, a quantum computer uses quantum bits known as qubits.Traditional computers which use two states 0s and 1s to store,compute data. Qubits also represent 0 and 1 but the crazy thing is, qubits can also achieve a mixed state, called a “superposition” where they are both 1 and 0 at the same time. So, this means that a computer using qubits can store an enormous amount of information and uses less energy doing so than a classical computer. With the help of quantum computing we will be able to create processors that are significantly faster (a million or more times) than the ones we use today.

"Technology is the campfire around which we tell our stories." –Laurie Anderson

Quantum computing could contribute greatly in the fields of finance, military affairs, intelligence, drug design and discovery, aerospace designing, utilities (nuclear fusion), polymer design, Artificial Intelligence (AI) and Big Data search, and digital manufacturing. Though quantum computing has many advantages there are few disadvantages of it. One such disadvantage is breaking security protocols that are based on cryptographic algorithms. A blockchain is particularly at risk from this as well as anyone with a quantum computer could use Shor's algorithm to forge any digital signature.Fortunately, quantum technologies also offer opportunities to enhance the security and performance of blockchains.

A quantum computer developed by Google named Sycamore comprising 54 qubits achieved quantum supremacy after taking 200 seconds to solve a complex problem that the company says would take a supercomputer 10,000 years to solve. IBM launched Q, which offers 5 qubit quantum computing services via cloud in 2016. Last year it upgraded to 20 qubits of quantum processing power. Quantum Computing is a milestone in computing comparable in importance to the Wright brothers' first flights.

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MATERIAL TO IMPROVE HYDRODESULPHURIZATION

A new sponge-like material that is black, brittle and freeze-dried can pull off some pretty impressive feats. Designed by Northwestern University chemists, it can remove mercury from polluted water, easily separate hydrogen from other gases and, perhaps most impressive of all, is a more effective catalyst than the one currently used to pull sulfur out of crude oil.

Hydrodesulphurization might be a mouthful, but it is also a widely used catalytic chemical process that removes sulfur from natural gas and refined petroleum products, such as gasoline and diesel and jet fuels. Without the process, which is highly optimized, we'd be burning sulfur, which contributes to acid rain.

Scientists have tried to improve hydrodesulphurization, or HDS, but have made no progress. Many consider it an optimized process. The Northwestern researchers, in collaboration with colleagues at Western Washington University, report that their material is twice as active as the conventional catalyst used in HDS while at the same time being made of the same parts.

The material is a gel made of cobalt, nickel, molybdenum and sulfur that then is freeze-dried, producing a sponge-like material with a very high surface area. (One cubic centimeter has approximately 10,000 square feet of surface area, or about half a football field.) It is this high surface area and the material's stability under catalytic conditions that make the cobalt-molybdenum-sulfur chalcogel so active.

The researchers also demonstrated that the new chalcogel soaks up toxic heavy metals from polluted water like no other material. The chalcogel removed nearly 99 percent of the

mercury from contaminated water containing several parts per million. Mercury likes to bind to sulfur, and thechalcogel is full of sulfur atoms.

In addition to being a better HDS catalyst and a mercury sponge, the chalcogel also is very effective at gas separation. The researchers showed that the material easily removes carbon dioxide from hydrogen, an application that could be useful in the hydrogen economy.

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"Even when you take a holiday from technology, technology doesn't take a break from you."
— Douglas Coupland

ANALOG TO DIGITAL CONVERTERS

Advancing universe of Integrated Circuit (IC) demands enhanced design of Analog to Digital converter (ADC) execution with respect to speed, chip area and power consumption. Digital systems has dominance in terms of less sensitivity to noise and being more vigorous against process and supply variations in contrast to analog systems. Hence in modern ADCs and cutting edge electronic systems, storage and processing of data is performed in digital domain which is essential for integrating digital processors with analog signals in real world. Over the previous decade innovation and fast development of digital integrated circuit have prompted to even more advanced systems performing signal processing operations. These systems work on extensive assortment of continuous time signals comprising of speech, image processing, medical electronics, radar & satellite communication, electronic warfare and telecommunication systems. One of the keys to accomplishment of these systems has been progresses in the advancement of ADCs which change over persistent continuous time signals to discrete time format. Moreover with the fast shrinking of CMOS process and rapid advance of digital integrated circuit technologies, high-performance, low-cost and low area ADCs are needed in many mixed-signal applications [1]. An ADC is therefore used to map a continuous-time signal to a digital number that represents its discrete amplitude. The design of ADC is regarded as complex task since it demands incorporation of both analog and digital functionalities. Analog circuits are more than sufficient for straightforward handling capacities, for example, filtering and amplification. With the quality of advanced electronic systems, implementing them with pure analog solutions becomes too

expensive or perhaps infeasible. Digital signal processing (DSP) offers crucial extensions to these needed functionalities as DSP provides perfect storage of digitized signals, unlimited signal-to-noise ratio and choices to hold out advanced algorithms to alter new features with the DSP's remarkable computation power [2-4]. To require advantage of such capabilities, analog signals need to be translated to digital signals within the early stage of the process chain, creating the data converter an important block. Moore's law continues to predict the scaling and levels of integration fairly well and therefore the rate of scaling even outperforms the prediction in recent years [5]. This scaling improvement in system performance has driven the need for improvement in data converters. Figure 1.1 shows the Logic area scaling report by International roadmap for devices and systems [7]. The trend is to continue enhancement and development in converter design whereas at the same time reducing ADC power consumption. Another trend is to shift the A-to-D conversions "upstream" to allow additional signal process to be carried out in the digital domain so as to require full advantage of digital scaling and to eliminate unwanted interferes and noise. The number of ADC applications is additionally increasing. The appliance is as numerous as process controls, communication infrastructure, automotive controllers, audio/video functions and medical devices among varied others. Moving the data conversion upstream in these applications usually needs a lot of higher sampling rate and resolution. For top performance applications, like wireless communication devices, software package radio, and millimeter-wave imaging systems, among others, moving the ADC upstream would need higher resolutions and sampling rates of a number of tens of Mega-

creates variety of challenges to realize high performance, high resolution and low power within the same approach, particularly in the deeply scaled CMOS technologies.

Challenges in ADC Design:

Despite the fact that we may feel as though we live in a computerized driven world, in the domain of chip design, analog circuits continues to play a critical role. It is especially fundamental with the ascent of Internet of Things (IOT) and portable applications that cooperate with the real world which is analogue. In any case, to support these high end designs while designing with analog intellectual property (IP) accompanies limitlessly distinctive difficulties when contrasted with supporting low-end applications. Our associated world is set apart by a plenitude of versatile IOT and wireless applications comprising of temperature sensor to touch screens that depend on mixed-signal systems. This creates numerous challenges to design engineers while interpreting analog data and frames a question on how to utilize it for everyday applications? The appropriate response lies in productively designing data converters. Varied key-points to consider when designing these data converters are sampling speed, bit resolution, noise ratio, effective number of bits (ENOB), chip area and power. More practical insight of ADC design challenges can be found in [8-9].

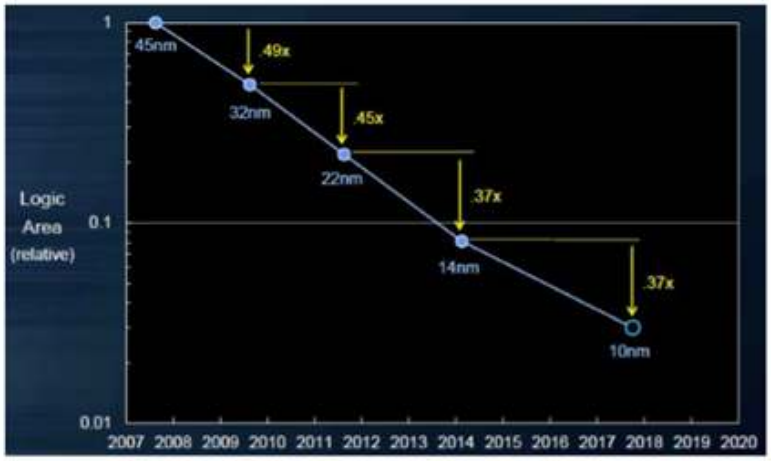

Fig. 1.1: Logic area scaling report by International roadmap for devices and systems.

Generic steps of ADC:

The specific time called 'sampling rate' decides the number of conversion that ADC is needed to convert continuous-time signal to discrete code [10]. Figure 1.2 shows the basic steps involved in the ADC process. The maximum frequency component a sampled data system can accurately handle is its Nyquist limit. The sample rate must be greater than or equal to two times the highest frequency component in the input signal. When this rule is violated, unwanted or undesirable signals appear in the frequency band of interest. This is called "aliasing" [11]. In order to suppress effects of aliasing, sometimes a low pass filter is also incorporated before the sample/hold (S/H) circuit. An S/H circuit converts the continuous analog signal into different discrete levels which are then quantized. The task of quantizer is to divide the reference voltage into several sub ranges. An ADC is also given a reference signal; it may be a constant voltage or current, against which the analog input is compared. The digital output word from the ADC relates amount fraction of reference voltage (or current) to the input voltage (or current). Finally, a digital processor encodes to give digital output.

The two main types of ADCs are Nyquist rate converters and Oversampling converters.

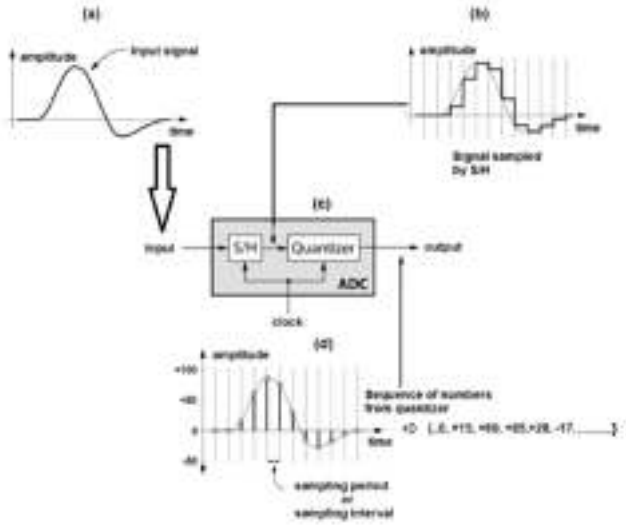

Fig.1.2: Generic steps of analog-to-digital conversion process.

These two types of ADCs compares the difference between the following approaches of subjecting the input that occupies large portion of the available bandwidth or utilize the input to relatively smaller portion of the Nyquist range. The relation between Nyquist limit and signal band (fs/2fs; fs is the sampling frequency) is called sampling rates. The converters with large sampling rate are called Oversampling converters (OSR) whereas with small sampling rate are called Nyquist rate converters. The Nyquist rate data converters include Flash, Pipeline, Binary Search (BS) and Successive Approximation Register (SAR) ADCs and follow sampling rates of at-least 1.5 to 10 times of input signal Nyquist rate in order to have a reliable anti-aliasing and reconstruction of the input signal. Oversampling data converters such as Delta-Sigma ADC typically operates 20 to 512 times the input signal Nyquist rate. Figure 1.3 shows several ADC architectures for different sampling rates, resolutions and comparison of Nyquist and oversampling strategies [12].

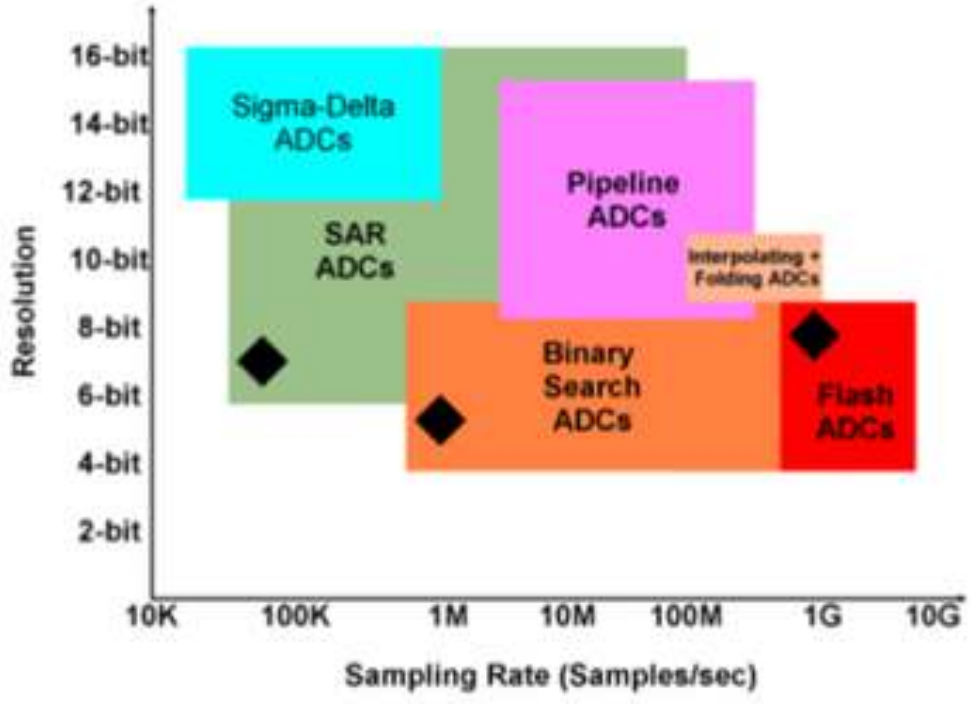

Fig.1.3: Different ADC architectures comparison.

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GLOBAL FIBER NETWORK SURVIVABILITY SCENARIO

In optical communication networks, survivability is a vital role in fiber demand distribution, fiber restoration, fiber assortment method, fiber integration method, fiber physical logical connectivity, node graph, flow graph, FSCR, fiber throughput and fiber bandwidth which describes the design of network with node and switch architecture. In these, several partial mesh and hierarchical topologies provide a most scalable solution for satisfying design constraint. Also, two network architecture are presented viz. Physical layer and logical layer and network elements which shares the sources and resources between end to end communications. It also facilitates the different network services hence network transparency should mitigate the security vulnerabilities that differ from conventional failures hence global fiber network survivability scenario. Optical network design in logical layer is hence forth provide multipath propagation of pacts by using transmission flow which consists of two queues slot and packet. Furthermore, it provides minimum fair channel allocation bandwidth; obtain maximum spatial channel reuse and maximum fairness throughput by using centralized packet scheduling algorithm. It also computes node mobility and scalability by using spatial channel reuse concept. Additionally, it also provides global topology model through which maximum distributed fair queuing throughput is achieved.

1. Develop models of optical-broadband access networks and trunk networks based on projected traffic growth.
2. Evaluate the impact of emerging technologies on network architecture design.

3. Develop routing algorithms for optical layered networks.
4. Investigates protection/restoration coordination schemes in the optical layer, i.e. physical layer topology.
5. Investigate the potential for packet switching procedures and burst switching in optical networks, i.e. Logical Layer Topology.

The Performance and Evaluation of Optical networks take into consideration the factors like trade-off between routing traffic at the optical layer, creating dedicated light paths in order to maximize the traffic carried and the availability of spare capacity.

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