ELECTRIFY-1

FROM JUNE 2021- DECEMBER 2021

VISION AND MISSION OF THE DEPARTMENT

VISION

To evolve as a centre of excellence in Electrical and Electronics Engineering that produces graduates of high quality with ethical values.

MISSION

- To impart technical knowledge through learner-centric education supplemented with practical exposure.
- To provide opportunities that promote personality development through co-curricular and extra-curricular activities.
- To inculcate human values & team spirit that enables the Electrical and Electronics Engineers to face the future challenges.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES(POS):

Programme Educational Objectives (PEOs)

PEO1: Be the practicing engineers in chosen technical fields such as designing, manufacturing and testing of various electrical systems.

PEO2: Fulfill the needs of society by solving technical problems in an ethical, responsible and an optimal way.

PEO3: Demonstrate professionalism through life-long learning.

Programme Outcomes (POs)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and concepts of electrical engineering to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and electrical.

PO3: Design/development of solutions: Design solutions for complex Electrical Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern Electrical Engineering and IT tools including prediction and modeling to complex electrical engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the electrical engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex Electrical Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the Electrical Engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

•PROGRAM SPECIFIC OUTCOMES(PSOS):

•To contribute for the Development of green energy technologies to meet future energy demands.

•To identify, formulate, design, investigate and operate various electrical systems.

TABLE OF CONTENT

WORKSHOP ON PLC AUTOMATION

Department has conducted a one week

Workshop on Industrial Automation with PLC

ORGANIZERS : APSSDC, VIJAYAWADA.

RESOURCE PERSONS :

1. Mr. K. K. Varma, Trainer in APSSDC.
2. Y. Madhu Vamsi, Trainer in APSSDC.
3. Y. Siva Gangadhar Rao, Trainer in APSSDC.

BENEFICIARY EEE 5TH SEMISTER – NO.OF STUDENTS :51

It is a decent stage to encourage understudies that help them to get further understanding


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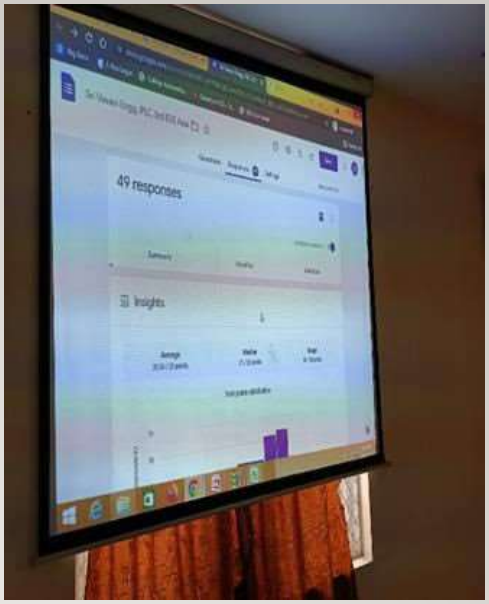
49 responses
Insights


2021-22
B.Tech.

WORKSHOP ON IOT

Department has conducted a one week

Workshop on IOT by

ORGANIZERS: APSSDC, VIJAYAWADA.

RESOURCE PERSONS:

1. Ms. Mamidi Jyoshitha, Trainer in APSSDC.
2. Mr. I. Ravikumar, Trainer in APSSDC.

BENEFICIARY EEE 5TH SEMISTER – NO.OF .STUDENTS: 57

This program provides an opportunity for participants to enrich their knowledge and skill in developing interfaces of electrical apparatus with IOT


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SpaceX Star link internet: Costs, collision risks and how it works

"Star link is the name of a satellite network developed by the private spaceflight company SpaceX to provide low-cost internet to remote locations. SpaceX eventually hopes to have as many as 42,000 satellites in this so-called mega constellation."

The size and scale of the project flusters astronomers, who fear that the bright, orbiting objects will interfere with observations of the universe as well as spaceflight safety experts who now see Star link as the number one source of collision hazard in Earth's orbit. In addition to that, some scientists worry that the amount of metal that will be burning up in Earth's atmosphere as old satellites are deorbited, could trigger unpredictable changes to the planet's climate.

STARLINK : THE SATILITE INTERNET PLAN

SpaceX's satellite internet proposal was announced in January 2015. Though it wasn't given a name at the time, CEO Elon Musk said that the company had filed documents with international regulators to place about 4,000 satellites in low Earth orbit.

"We're really talking about something which is, in the long term, like rebuilding the internet in space," Musk said during a speech in Seattle when revealing the project. (Musk also owns electric car company Tesla, but Tesla does not produce satellites.)

Musk's initial estimate of the number of satellites soon grew, as he hoped to capture a part of the estimated $1 trillion worldwide internet connectivity market to help achieve his Mars colonization vision. The U.S. Federal Communications Commission (FCC) has granted SpaceX permission to fly 12,000 Star link satellites, and the company has filed paperwork with an international regulator to loft up to 30,000 additional spacecraft.

To put that into perspective, as of Jan. 5 2022, 12,480 satellites have been launched in all of history with only 4,900 still active, according to the European Space Agency(opens in new tab).

SpaceX launched its first two Star link test craft, named Tintin A and Tintin B, in February 2018. The mission went smoothly. Based on initial data, the company asked regulators for its fleet to be allowed to operate at lower altitudes than originally planned, and the FCC agreed.

The first 60 Star link satellites launched on May 23, 2019, aboard a SpaceX Falcon 9 rocket. The satellites successfully reached their operational altitude of 340 miles (550 kilometers) — low enough to get pulled down to Earth by atmospheric drag in a few years so that they don't become space junk once they die.

HOW STARLINK SATELITES WORK

The current version of each Star link satellite weighs 573 lbs. (260 kilograms) and is, according to Sky & Telescope magazine roughly the size of a table.

Rather than sending internet signals through electric cables, which must be physically laid down to reach far-flung places, satellite internet works by beaming information through the vacuum of space, where it travels 47% faster than in fiber-optic cable, Business Insider reported.

Current satellite internet works using large spacecraft that orbit 22,236 miles (35,786 km) above a particular spot on Earth. But at that distance, there are generally significant time delays in sending and receiving data. By being closer to our planet and networking together, Starlink's satellites are meant to carry large amounts of information rapidly to any point on Earth, even over the oceans and in extremely hard-to-reach places where fiber-optic cables would be expensive to lay down.

Musk has said that the Starlink network would be able to provide "minor" internet coverage after 400 spacecraft were up and running, and "moderate" coverage after about 800 satellites became operational.

As of early January 2022, SpaceX had launched more than 1,900 Starlink satellites overall. The constellation is now providing broadband service in select areas around the world, as part of a beta-test program with download speeds of between 100 Mb/s and 200 Mb/s and latency as low as 20 milliseconds, according to a Starlink guide.

Users on the ground access the broadband signals using a kit sold by SpaceX. The kit contains a small satellite dish with mounting tripod, a wifi router, cables and a power supply

STAR LINK VS VERSUS ASTRONOM

Within days of the first 60-satellite Star link launch, sky watchers spotted a linear pearl string of lights as the spacecraft whizzed overhead in the early morning. Web-based guides showed others how to track down the spectacular display.

"This was quite an amazing sight, and I was shouting 'Owowowow !' when the bright 'train' of objects entered into view," Netherlands-based satellite tracker Marco Langbroek told Space.com in 2019 via email. "They were brighter than I had anticipated."

That brightness was a surprise to almost everyone, including both SpaceX and the astronomical community. Researchers began to panic and shared photos of satellite streaks in their data, such as this one(opens in new tab) from the Lowell Observatory in Arizona.

online in 2022. Radio astronomers are also planning for interference from Star link's radio based antennas

They expressed particular concerns about future images from highly sensitive telescopes such as the Vera Rubin Observatory (formerly known as the Large Synoptic Survey Telescope), which will study the entire universe in exquisite detail and is expected to come.

The International Astronomical Union (IAU) expressed concerns in a statement(opens in new tab) released in June 2019. "Satellite constellations can pose a significant or debilitating threat to important existing and future astronomical infrastructures, and we urge their designers and deployers as well as policy-makers to work with the astronomical community in a concerted effort to analyze and understand the impact of satellite constellations," the statement said.

In April 2021, Thomas childknecht, the deputy director of the Astronomical Institute of the University of Bern, who represents Switzerland in the IAU, said at the European Space Agency's space debris conference that the union was calling on the United Nations to protect pristine night sky as cultural heritage against the uncontrolled expansion of mega constellations.

In a report released in October 2022, the American Astronomical Society (ASS) likened the impact of mega constellations on astronomy to light pollution. The report said the sky may brighten by a factor of two to three due to diffuse reflection of sunlight off the spacecraft.

STARLINK AS A MAJOR SOURCE OF ORBIAL COLLISIONS

SpaceX received more backlash in September 2019, when the European Space Agency (ESA) announced that it had directed its Aeolus satellite to undertake evasive maneuvers and avoid crashing into "Star link 44," one of the first 60 satellites in the mega constellation. The agency took action after learning from the U.S. military that the probability of a collision was 1 in 1,000 — 10 times higher than ESA's threshold for conducting a collision-avoidance maneuver.

In August 2021, Hugh Lewis, the head of the Astronautics Research Group at the University of Southampton, U.K. and Europe's leading space debris expert, told Space.com that Star link satellites represent the single main sources of collision risk in low Earth orbit.

According to computer models, at that time, Star link satellites were involved every week in about 1,600 encounters between two spacecraft closer than 0.6 miles (1 kilometer). That's about 50% of all such incidents. This number rises with every new batch of satellites

Lewis also expressed concerns that Star link's operator SpaceX, a newcomer into the satellite business, is now the single most dominant player in the field whose decisions can affect safety of all operations in low Earth orbit.

STARLINKS EFFECTS ON THE ATMOSPHERE

SpaceX plans to refresh the Star link mega constellation every five years with newer technology. At the end of their service, the old satellites will be steered into Earth's atmosphere where they will burn up. That is certainly commendable when it comes to space debris prevention, however, there is another problem.

The vast amount of satellites that will be burning in the otherwise pristine upper layers of the atmosphere could actually alter the atmospheric chemistry and have unforeseen consequences for life on the planet.

In a paper published in May 2021 in the journal Scientific Reports(opens in new tab), Canadian researcher Aaron Boley said the aluminum the satellites are made of will produce aluminum oxide, also known as alumina, during burn-up. He warned that alumina is known to cause ozone depletion and could also alter the atmosphere's ability to reflect heat.

"Alumina reflects light at certain wavelengths and if you dump enough alumina into the atmosphere, you are going to create scattering and eventually change the albedo of the planet," Boley told Space.com.

That could lead to an out-of-control geoengineering experiment, a change in the Earth's climate balance. The effects of such alternations are currently unknown.

Karen Rosenlof, an atmospheric chemistry expert at the National Oceanic and Atmospheric Administration (NOAA), told Space.com she too was concerned about the effects of the particles from the burning satellites in the atmosphere. Rosenlof actually has expertise in modelling the effects of geoengineering interventions.

David Fahey, the Director of NOAA's Chemical Sciences Laboratory, and Martin Ross, a physics and meteorology scientist at the Aerospace Corporation, both told Space.com that more research is urgently needed to understand the effects of burning increasing amounts of satellites in the atmosphere.

The problem, the scientists said, is that in those high layers of the atmosphere, the particles are likely going to stay forever.

Boley said that while the amount of satellites burning in the atmosphere will be considerably smaller than the amount of meteorites, the chemical composition of the artificial objects is different, thus the presence of the products of their burning is something scientists know nothing about.

"We have 54 tones (60 tons) of meteoroid material coming in every day," Boley said. "With the first generation of Star link, we can expect about 2 tones (2.2 tons) of dead satellites reentering Earth's atmosphere daily. But meteoroids are mostly rock, which is made of oxygen, magnesium and silicon. These satellites are mostly aluminum, which the meteoroids contain only in a very small amount, about 1%."

As the accumulation of those particles would increase over time, so would the intensity of the effects. It thus cannot be ruled out that over decades the pollution from burning mega constellation satellites could lead to changes on a scale akin to what we are currently experiencing with fossil-fuel-induced climate change.

"Humans are exceptionally good at underestimating our ability to change the environment," said Boley. "There is this perception that there is no way that we can dump enough plastic into the ocean to make a difference. There is no way we can dump enough carbon into the atmosphere to make a difference. But here we are. We have a plastic pollution problem with the ocean, we have climate change ongoing as a result of our actions and our changing of the composition of the atmosphere and we are poised to make the same type of mistake by our use of space."

WHAT SPACEX WANTS TO DO

SpaceX has stated that it will work with organizations and space agencies to mitigate the impacts of its megaconstellation. And the company has tried to assuage astronomers' concerns over Starlink's effect on the night sky.

"SpaceX is absolutely committed to finding a way forward so our Starlink project doesn't impede the value of the research you all are undertaking," Patricia Cooper, SpaceX's vice president of satellite government affairs, told astronomers at a January 2020 meeting of the American Astronomical Society in Honolulu, Nature reported(opens in new tab).

SpaceX has taken action to this effect. For example, recently launched Starlink satellites sport visors designed to prevent sunlight from glinting too brightly off their most reflective parts.

But the huge numbers of satellites in mega constellations from SpaceX and other private space companies, such as One Web, suggest that light-pollution and other issues may continue, and advocates have called for greater regulations from government agencies.

"Here is a gift for the leaders of the world, a task more non-partisan than any other which has come before: protect our skies," stargazer Arwen Rimmer wrote in The Space Review, a weekly online publication devoted to essays and commentary about space, in early 2020.

Star link operates in low orbit

Low-Earth orbit satellites can |in'< to Earth faster, but more are needed to provide coverage

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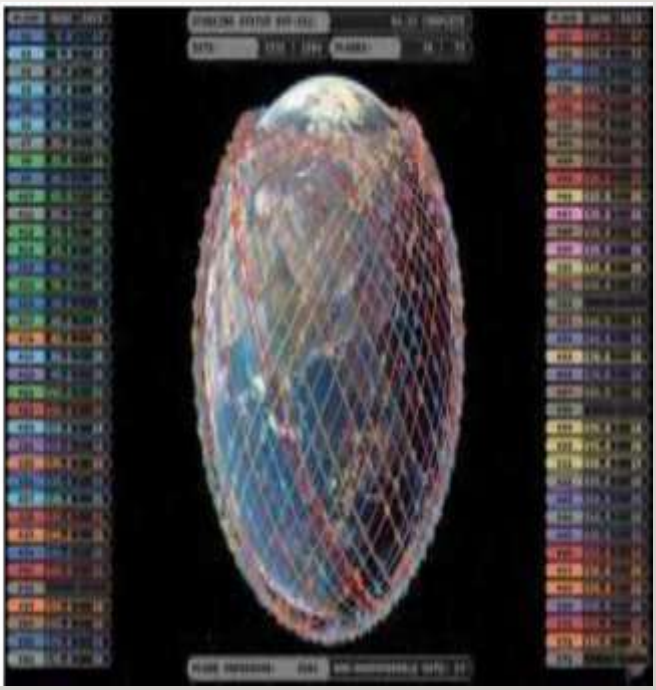
STAR LINK LOST IN 2022 SOLAR STROM

On Feb. 3, 2022, a SpaceX Falcon 9 rocket made a routine and successful launch of 49 Starlink satellites from NASA's Kennedy Space Center in Florida. But only a day later, a geomagnetic storm above Earth pushed up the density of the atmosphere, increasing the drag on the satellites and dooming the bulk of them to an early death.

"Preliminary analysis show the increased drag at the low altitudes prevented the satellites from leaving safe mode to begin orbit-raising maneuvers, and up to 40 of the satellites will reenter or already have reentered the Earth's atmosphere," SpaceX wrote in an update(opens in new tab) Feb. 8.

Each satellite was put into a low initial orbit that had a minimum altitude as little as 130 miles (210 kilometers) above Earth, at the orbit's lowest point. SpaceX has said it intentionally releases Starlink batches into such an orbit to allow for quick disposal, just in case something goes wrong during launch. But this positioning also leaves satellites vulnerable to solar activity that affects Earth's atmosphere.



"In fact, onboard GPS suggests the escalation speed and severity of the storm caused atmospheric drag to increase up to 50 percent higher than during previous launches,' SpaceX wrote in its update.

The company tried to save them, by placing all the satellites in a a protective "safe mode" and commanding them to fly edge-on "like a sheet of paper" to minimize drag. SpaceX also spoke directly with the U.S. Space Force and the company LeoLabs to track the machines with ground-based radar, it added.

Ultimately, however, most of that Star link batch was lost. SpaceX noted the upshot is the satellites "pose zero collision risk with other satellites and by design demise upon atmospheric reentry." That latter part means the satellites won't generate any debris that hits the ground.

"This unique situation demonstrates the great lengths the Star link team has gone to ensure the system is on the leading edge of on-orbit debris mitigation," SpaceX added.

ARTICLE BY:

KUDULLA.RAMA SIVA KRISHNA

(21A85A0209)

ROBOTICS

- Robotics is a branch of engineering and science that includes electronics engineering, mechanical engineering and computer science and so on. This branch deals with the design, construction, use to control robots, sensory feedback and information pro

Advantages:

- Cost Effectiveness. There will be no lunchbreaks, holidays, sick leave or shift time allocated for robotic automation. ...
- Improved Quality Assurance. ...
- Increased Productivity. ...
- Work In Hazardous Environments. ..

Disadvantages:

- They Lead Humans to Lose Their Jobs. ...
- They Need Constant Power. ...
- They're Restricted to their Programming. ...
- The Perform Relatively Few Tasks. ...
- They Have No Emotions. ...
- They Impacts Human Interaction. ...
- They Require Expertise to Set Them Up. ...
- They're Expensive to Install

Effects of robotics:

. Robots **eliminate dangerous jobs for humans** because they are capable of

working in hazardous environments. They can handle lifting heavy loads, toxic substances and repetitive tasks. This has helped companies to prevent many accidents, also saving time and money.

Causes of robotics:

Robots **save workers from performing dangerous tasks**. They can work in hazardous conditions, such as poor lighting, toxic chemicals, or tight spaces. They are capable of lifting heavy loads without injury or tiring. Robots increase worker safety by preventing accidents since humans are not performing risky jobs.

What major problems are robotics researchers trying to overcome?

- New materials and fabrication schemes. While robots have made significant advancements in recent years, they are still made from bolts, bearings and motors.

- Biohybrid and bioinspired robots. ...
- Power and energy. ...
- Robot swarms. ...
- Navigation and exploration. ...
- AI for robotics. ...
- Brain-computer interfaces. ...
- Social interaction

Conclusion:

.Today we find most robots working for people in industries, factories, warehouses,

and laboratories. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition.

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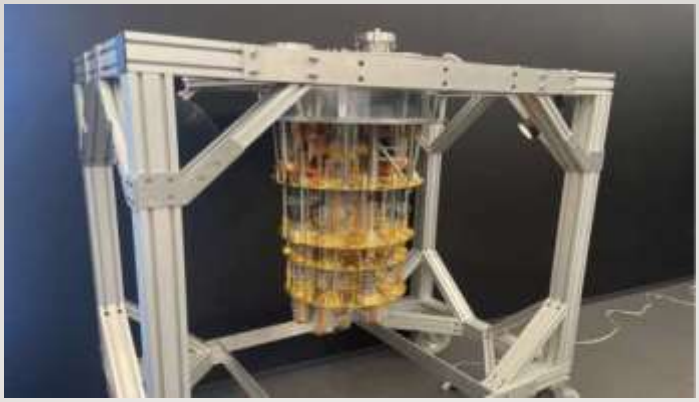
QUANTUM COMPUTERS

A quantum computer is a machine that performs calculations based on the laws of quantum mechanics, which is the Behaviour of particles at the sub-atomic level.

The word "quantum", in quantum computer, originates from "quantum mechanics," a basic theory in physics. In brief on the scale of atoms and molecules, matter behaves in a quantum manner.



Basic Concept Of Quantum Computers & Difference with Existing Computers:

*In existing computers , all information is expressed in terms of 0s and 1s, and the entity that carries such information is called a "bit."

*A bit can be in either a 0 or 1 state at any one moment in time.

*A quantum computer ,on the other hand , uses a "quantum bit" or "qubit" instead of a bit.

*Accordingly, two qubits in this state can express the four values of 00, 01, 10, and 11 all at one time.

How fast is a quantum computer?

Quantum computing is a new generation of technology that involves a type of computer 158 million times faster than the most sophisticated supercomputer we have world today.
It is a device so powerful that it could do in four minutes what it would take a traditional supercomputer 10,000 years to accomplish.

The best quantum computer:

The U.S leads the world in quantum computing private equity, with 110 deals closed between 2016 and 2021, compared with China's 30. In 2019, Google was first to achieve so-called quantum supremacy, or the creation of a quantum computer that is able to solve specific problems faster than a classical computer.

PRINCIPLES

Quantum computing focuses on the principles of quantum theory, which deals with modern physics that explain the behavior of matter and energy of an atomic and subatomic level. Quantum computing makes use of quantum phenomena, such as quantum bits, superposition, and entanglement to perform data operations.

QUANTUM SUPERPOSITION :

An electron has dual nature. It can exhibit as a particle and also as wave. Wave exhibits a phenomenon known as superposition of waves. This phenomena allows the addition of waves numerically. Superposition occurs all the time at the quantum level. That is any quantum object like a electron or photon is in superposition.

QUANTUM ENTANGLEMENT:

In Quantum Mechanics, it sometimes occurs that a measurement of one particle will effect the state of another particle, even though classically there is no direct interaction.

When this happens, the state of the two particles is said to be entangled.

Applications Of Quantum Computers:

^Artificial intelligence & Machine learning Computational Chemistry

*Drug design & Development

*Cybersecurity & Cryptography

*Financial Modelling *Logistics Optimization *Weather Forecasting.

QUBITS

Classical BIT

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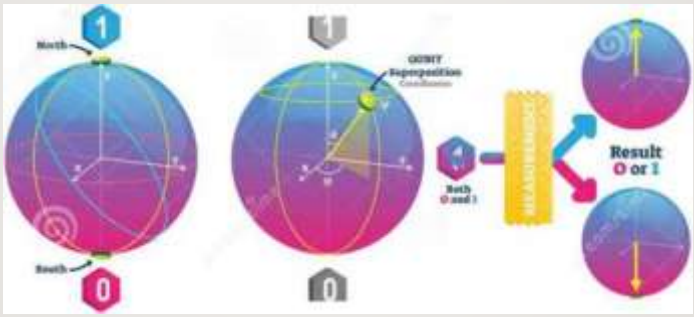

LASER MANIPULATION

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Two QUBITS Entanglement Indeterminate State Separated by any Distance Quantum Computer Both in QUBITS can be States are Revealed Reading in Both QUBITS

ARTICLE BY :

ARETI.PRASANNA

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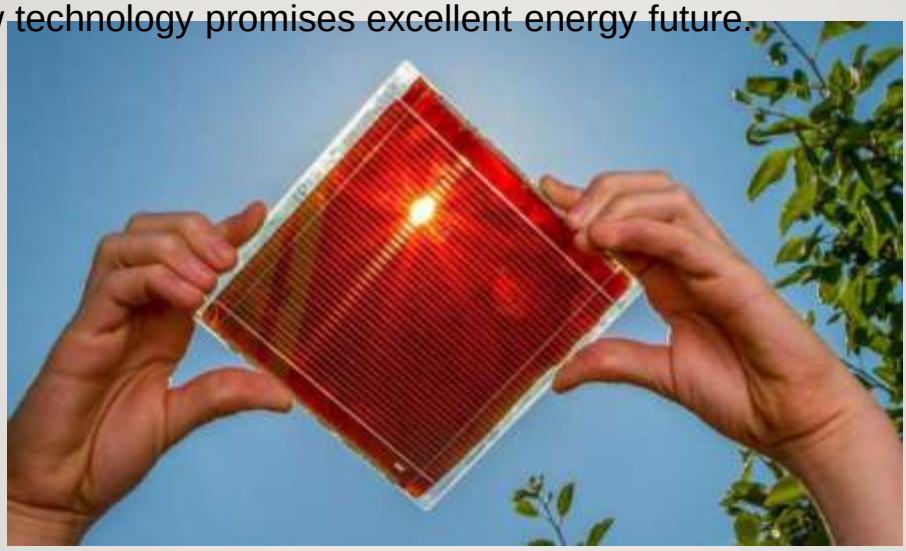
PEROVSKITES SOLAR CELLS

A well known renewable and clean source of energy is solar energy. We all have already aware of power generation by using solar energy. Solar cells converts photon energy into electrical energy and delivers the harvested power to the load. Silicon solar cells are most commonly used, with power conversion efficiency of about 28%. But over the last few years, organic-inorganic perovskite solar cells have gained increased research interest. This is due to their easy and cheap fabrication, and potential for high power conversion. Perovskite solar cells keeps improving the efficiency that may rival those of their silicon counterparts. The rapid growth in solar cell technology has made them a shining star in the photovoltaics industry. This new technology promises excellent energy future.

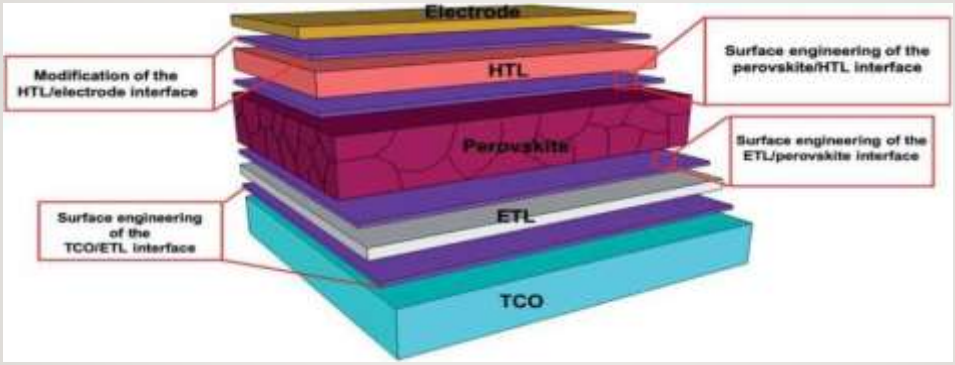


WHAT IS PEROVSKITE SOLAR CELL?

Perovskite solar cells are the main option competing to replace silicon solar cells and even most thin film photovolatics as the most efficient and cheap material for solar panels in the future. Perovskites have the potential of producing thinner and lighter solar panels, operating at room temperature. A perovskite solar cell is a type of solar cell which includes a perovskite structured compound, most commonly a hybrid organic-inorganic material, as the light harvesting active layer. Perovskites have closely similar structure to the mineral composed of calcium titanium oxide, the first discovered perovskite. Solar cells made with perovskites work in a similar fashion to traditional solar panels-a semiconductor absorbs energy and initiates a flow of electrons, which is captured by wiring and converted into usable electricity. Scientists believe that perovskite solar cells are capable

Manufacturability

Perovskite solar cells are thin-film devices built with layers of materials, either printed or coated from liquid inks or vacuum-deposited. Perovskite mineral has the capacity to absorb light and it utilizes less than 1micrometre of material to seize the similar quantity od sunlight compared to other solar cells. Producing uniform, high performance perovskite material in a large scale manufacturing environment is difficult, and there is a substantial difference in small-area cell efficiency and large-area module efficiency. This remains the active work within the PV research community. There are significant efforts to apply scalable approaches to perovskite fabrication. If perovskites can be made reliably using these scalable fabrications, they have the potential for faster capacity expansion than silicon PV. Perovskite manufacturing is highly scalable, and production costs have the potential to be very low compared to other solar panel technologies.



STABILITY AND DURABILITY

Perovskite solar cells have demonstrated competitive power conversion efficiencies (PCE) with potential for higher performance, but their stability is limited compared to leading photovoltaic (PV) technologies. Perovskites can decompose when they react with moisture and oxygen or when they spend extended time exposed to light, heat, or applied voltage. To increase stability, researchers are studying degradation in both the perovskite material itself and the surrounding device layers. Improved cell durability is critical for the development of commercial perovskite solar products.

Despite significant progress in understanding the stability and degradation of perovskite solar cells, they are not currently commercially viable because of their limited operational lifetimes. Early perovskite devices degraded rapidly, becoming non-functional within minutes or hours. The perovskite PV research and development (R&D) community is heavily focused on operational lifetime and is considering multiple approaches to

understand and improve stability and degradation. Efforts include improved treatments to decrease the reactivity of the perovskite surface, alternative materials and formulations for perovskite materials, alternative surrounding device layers and electrical contacts, advanced encapsulation materials, and approaches that mitigate degradation sources during fabrication and operation.

POWER CONVERSION EFFICIENCY AT SCALE

In small-area lab devices, perovskite PV cells have exceeded almost all thin-film technologies in power conversion efficiency, showing rapid improvements over the past five years. For widespread deployment of perovskites, maintaining these high efficiencies while achieving stability in large-area modules will be necessary. Continued improvement in efficiency in medium-area modules could be valuable for mobile, disaster response, or operational energy markets where lightweight, high-power devices are critical.

Perovskites can be tuned to respond to different colors in the solar spectrum by changing the material composition, and a variety of formulations have demonstrated high performance. This flexibility allows perovskites to be combined with another, differently tuned absorber material to deliver more power from the same device. This is known as a tandem device architecture. Using multiple PV materials enables tandem devices to have potential power conversion efficiencies over 33%. It is also possible to combine two perovskite solar cells of different composition to produce a perovskite-perovskite tandem. Perovskite-perovskite tandems could be particularly competitive in the mobile, disaster response, and defense operations sectors, as they can be made into flexible, lightweight devices with high power-to-weight ratios.

Perovskite solar cells have shown remarkable progress in recent years with rapid increase in efficiency, from reports of about 3% in 2009 to over 25% today. Although perovskite cells aren't available now, there are high efficiency solar panel options available to homeowners at competitive prices. These are having applications due to their wide various and useful properties in photochromic, electrochromic, image storage, switching, filtering, and surface acoustic wave signal processing devices. Due to their wide advantageous characteristics, they will be future of solar cells.

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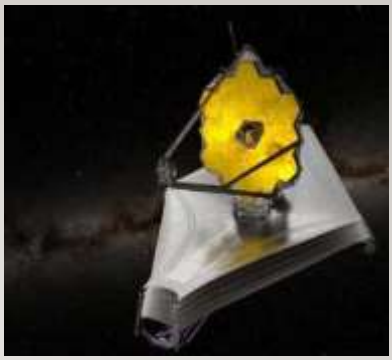
NASA JAMES WEBB TELESCOPE



The James Webb Space Telescope is the largest, most powerful space telescope ever built. It will allow scientists to look at what our universe was like about 200 million years after the Big Bang. The telescope will be able to capture images of some of the first galaxies ever formed. It will also be able to observe objects in our solar system from Mars outward, look inside dust clouds to see where new stars and planets are forming and examine the atmospheres of planets orbiting other stars.

Here are some fun facts about the James Webb Space Telescope:

Webb's First Images

DIVE INTO THE PURPOSE AND SIGNIFICANCE OF WEBB'S FIRST COLLECTION OF FULL-COLOR IMAGES AND DATA, RELEASED ON JULY 12, 2022.

After six months of unfolding, instrument testing, and finally, data gathering, the James Webb Space Telescope mission released its first collection of full-color images and other data on July 12, 2022. This collection demonstrates that the telescope is working properly, and showcases what it can do—reveal a universe unlike anything we have seen before..

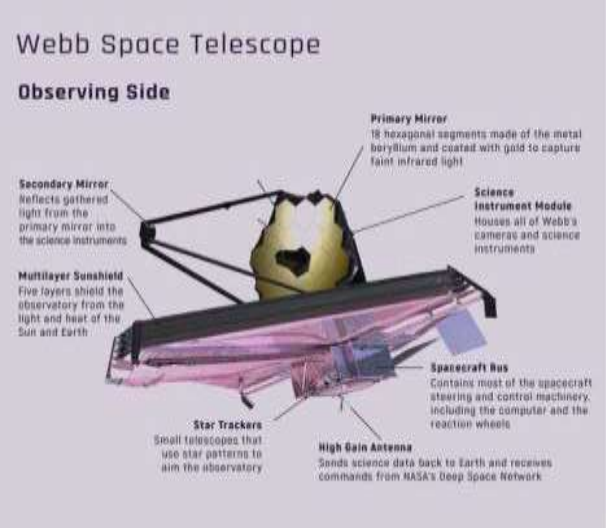
As the largest and most complex observatory ever launched into space, Webb went through an extended period of preparation before it could begin science work. Due to Webb's unprecedented design and unique unfolding process post-launch, the prescience commissioning process received lots of attention. Remarkable images gave the public a window into the world of Webb engineers and instrument scientists as they worked to align the 18 primary mirror segments, including the telescope's social media-ready "selfie" images.

These evaluation images served as an exciting pre-show for Webb's first full-color images and spectroscopic data, which showcase the telescope's full capabilities for the first time, with the mirrors aligned and all instruments fully operational. The first images serve as a kickoff for Webb's operational phase, previewing the science to come.

Creating Webb's First Images

Deciding what Webb should look at first was a project many years in the making. The task was an international partnership between NASA, ESA (European Space Agency), the Canadian

Brainstorming began more than five years before Webb's December 2021 launch. The goals: showcase Webb's unprecedented capabilities and deliver a "wow" for both astronomers and the public, to kick off science operations and build excitement for the future.



Webb's Science Instruments. Schematic-style drawing of Webb with instrument area outlined in gold. Pop-out box outlined in gold shows drawing of instruments NIRSpec, FGS/NIRISS, NIRCam, and MIRI, and shows their capabilities via icons that appears in another box, reading: What's inside? Cameras, take pictures of astronomical objects. Spectrographs, break light into colors for analysis. Coronagraphs, block starlight, allowing observation of planets orbiting nearby. See extended description in research gallery for more information. EXPAND

Once Webb was launched and in space, each of its instruments had to be tested in several operating modes. These modes include standard imaging as well as spectroscopy and various masking techniques that allow the telescope to detect faint sources of light next to very bright ones. Once each of Webb's four science instruments and seventeen modes was fully tested and given the green light by their science and engineering teams, the first images and other data were captured and delivered to the imaging team for processing. All raw data from telescopes go through processing so that the scientific features can be separated from visual static and effects from the hardware itself.

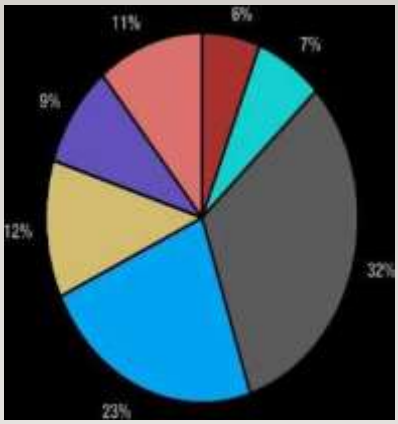
A multidisciplinary team of more than 25 people at STScI—including instrument scientists, imaging specialists, writers, and artists followed a carefully planned schedule for a month to produce the collection of first images and spectroscopic data—the detailed information that Webb can read in wavelengths of light.

WHAT'S NEXT?

Science! A portion of Webb's observing time in its first five months is dedicated to the Early Release Science program, and that data is made available to the astronomy community immediately so that they can learn about Webb's capabilities and how to make the best use of its instruments.

Pie chart of astronomy categories, each in a different color, with percentages for each portion. Solar system 6 percent, large-scale structure of the universe 7 percent, galaxies

and the IGM 32 percent, exoplanets and disks 23 percent, stellar physics 12 percents, supermassive black holes and their hosts 9 percent, stellar populations and the insterstellar medium, 11 percent. EXPAND



Fractions of time allocated in Webb Cycle 1, by science category. CREDIT: NASA and P. Jeffries (STScI)

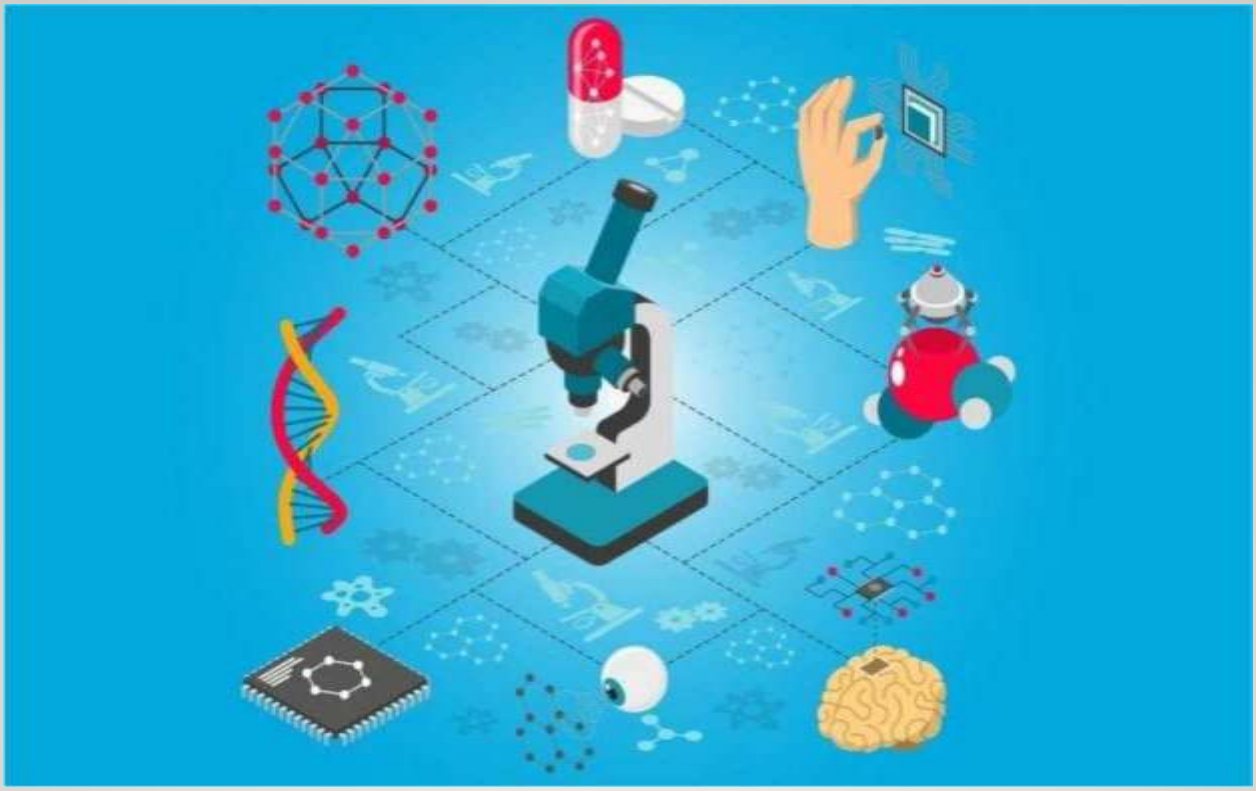
Astronomers who worked on developing Webb and its instruments are guaranteed time to use the observatory for science during its first three planned observation cycles. These Guaranteed Time Observation programs further explore and demonstrate Webb's capabilities, covering a wide range of science topics, including "deep field" observations— the type of long looks at one patch of sky made famous by the Hubble Space Telescope.

Members of the general astronomy community applied and have been approved for time to use Webb during its first cycle of science observations, called the General Observer programs. These scientific studies mark the official beginning of Webb's general science operations—the work it was designed to do. Astronomers will use Webb to observe the universe, analyze the data collected, and publish scientific papers on their discoveries.

Beyond what is already planned for Webb, there are the unexpected discoveries astronomers can't anticipate. One example: In 1990 when the Hubble Space Telescope launched, dark energy was completely unknown. Now it is one of the most exciting areas of astrophysics.

AN ARTICLE BY
DONGA DURGA DILEEP
(21A85A0205)

described a process in which scientists would be able to manipulate and control individual atoms and molecules. Over a decade later,in his explorations of ultraprecision maching, professor norio taniguchi coined the term nanotechnology. It wasn't until 1981, with the development of the scanning tunnelinh microscope that could "see" individual atoms, that modern nanotechnology began.



BENEFITS OF NANOTECHNOLOGY

Nanotechnology has a wide range of potential usages that could produce advancements in medical treatment, pharm tech, food transportation and the electronics industry. A nanometer, the scale used for nanotechnology, is one billionth of a meter.

For a sense of scale, a sheet of paper is 100,000 nanometers thick.As you can see, nanotechnology, any technology that operates between 1-100 nanometers, works on an unfathomably small scale. However, despite many positive signs that the technology has possible societal impact, there are some objectors who oppose the science's future on ethical and legal grounds. However, many of their arguments are vaguely defined and lack substantiative evidence. What is certain is that nanotechnology is at the forefront of technology and industry. The science has many specific benefits that are already being researched to improve heart health, provide more efficient solar power and elongate the shelf life of vegetables.

ADVANTAGES AND DISADVANTAGES

ADVANTAGES AND DISADVANTAGES

Primarily nanotechnology has the following advantages to offer to the world:

- functional, It will help in manufacturing the products that will be way cheaper, more energy-saving and lighter in weight. Japan is already investing $750 million a year in nanotechnology. It's estimated that within the next 15 years, the global market will be making $1 trillion worth of nanotechnology products a year.
- There will a mindboggling impact of nanotechnology on health where researchers are already working on studying the spread of malaria in the human body using nanotechnology to create its vaccine.
- Nanotechnology can help to improve the effects of drugs and medicines by making them more functional, cheaper and durable.
- It promises to provide better water purification techniques and ensure long-lasting distillation measures.
- Nanotechnology pesticides for crops will directly attack the pathogens in agriculture fields without destroying or causing any harm to the crops. At the same time, it will help in increasing the efficiency of fertilizers.
- It can help to provide cheaper sources of energy.

Primarily nanotechnology has the following advantages to offer to the world:

Apart from the merits, there are possibilities that nanotechnology will be a hazard for the environment in a sense that these nanoparticles have the tendency to accumulate in the atmosphere and even in the food chain. Hence, researchers must bring this matter to their consideration to work on the preventive measures of this adverse impact prior to fully implementing nanotechnology in products.

APPLICATIONS OF NANOTECHNOLOGY

Nanotechnology is used to revolutionize many technology and industry sectors: electronics, energy, material science, medicine, transportation, transportation, and environmental science.

ARTICLE BY S.SIVA

NAGAVALLI

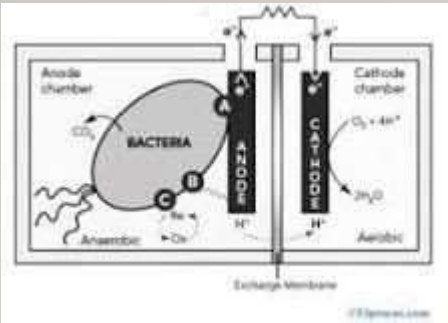
EEE 21A85A0219

MICRO FUELCELL

A micro fuel cell (MFC) is **a power source that uses oxidized hydrogen to convert chemical energy into usable electrical energy**. MFCs power small electronic devices such as laptops, cameras and portable radios. MFCs are scaled-down versions of the hydrogen fuel cell.

Working of micro fuel cell:

MICRO FUEL CELL



The working of microbial fuel cell (MFC) technology is based on the principle of redox reactions. The bacteria oxidize the organic matter to produce carbon
dioxide (CO_2), electrons, and protons. The natural metabolism of the microbes is utilized to generate electricity.

Advantages of micro fuel cells:

Using MFCs are very beneficial to the environment as it helps in the reduction of pollution and cuts the cost of water treatment tremendously. Apart from being an energy source, MFCs also has the potential to provide sustainable power sources to isolated communities and desalinate water.

Disadvantages of micro fuel cell:

Nowadays, the main drawback for the full-scale application of MFC is the cost of materials and the low buffering capacity of domestic wastewater. For this reason, there is no industrial application of MFC to date.

Effects of fuel cells:

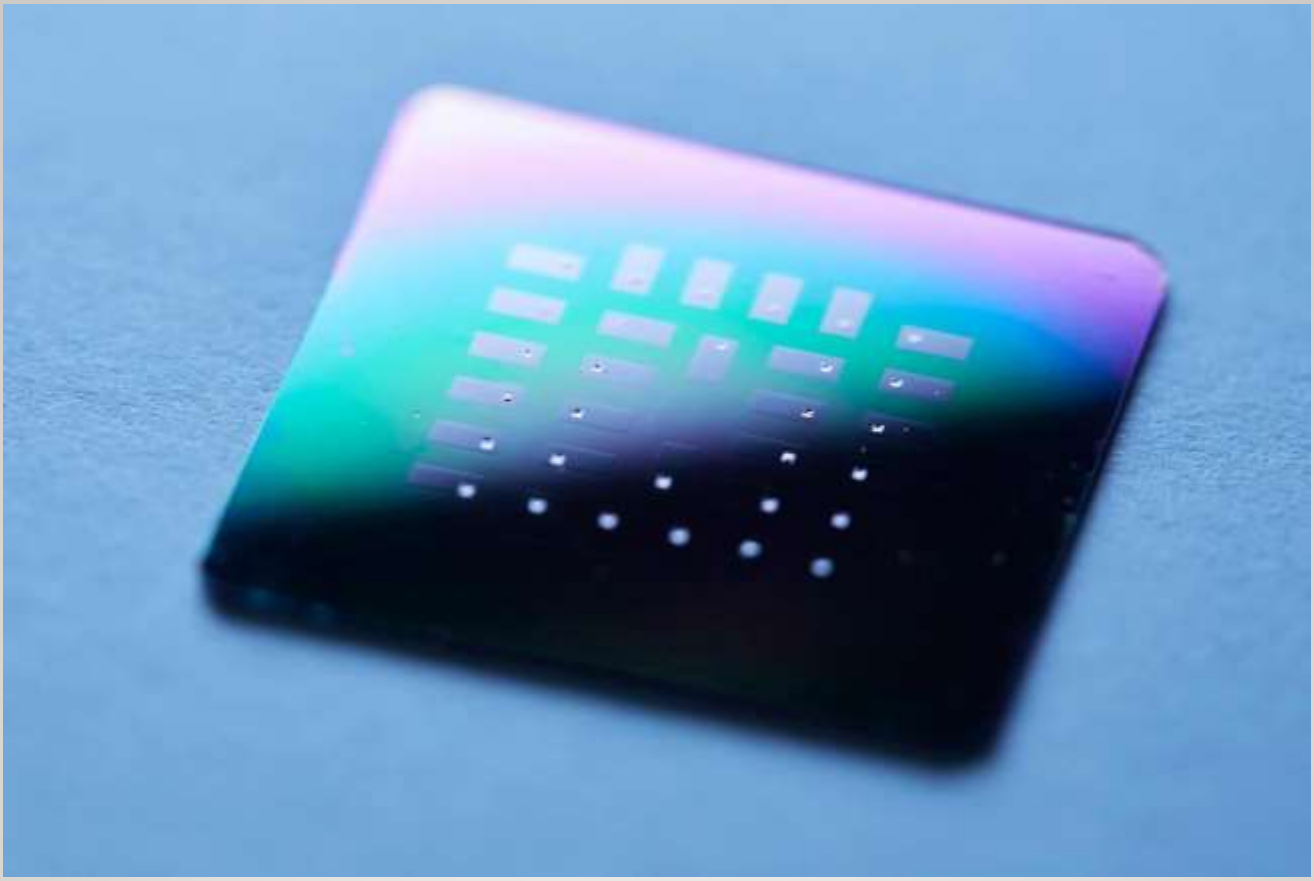
Fuel cells have strong benefits over conventional combustion-based technologies currently used in many power plants and cars. They produce much smaller quantities of greenhouse gases and none of the air pollutants that create smog and cause health problems.

Cost and durability are the major challenges to fuel cell commercialization. However, hurdles vary according to the application in which the technology is employed. Size, weight, and thermal and water management are barriers to the commercialization of fuel cell technology.

A micro fuel cell (MFC) is a power source that uses oxidized hydrogen to convert chemical energy into usable electrical energy. MFCs power small electronic devices such as laptops, cameras and portable radios. MFCs are scaled-down versions of the hydrogen fuel cells

MICRO FUEL CELL

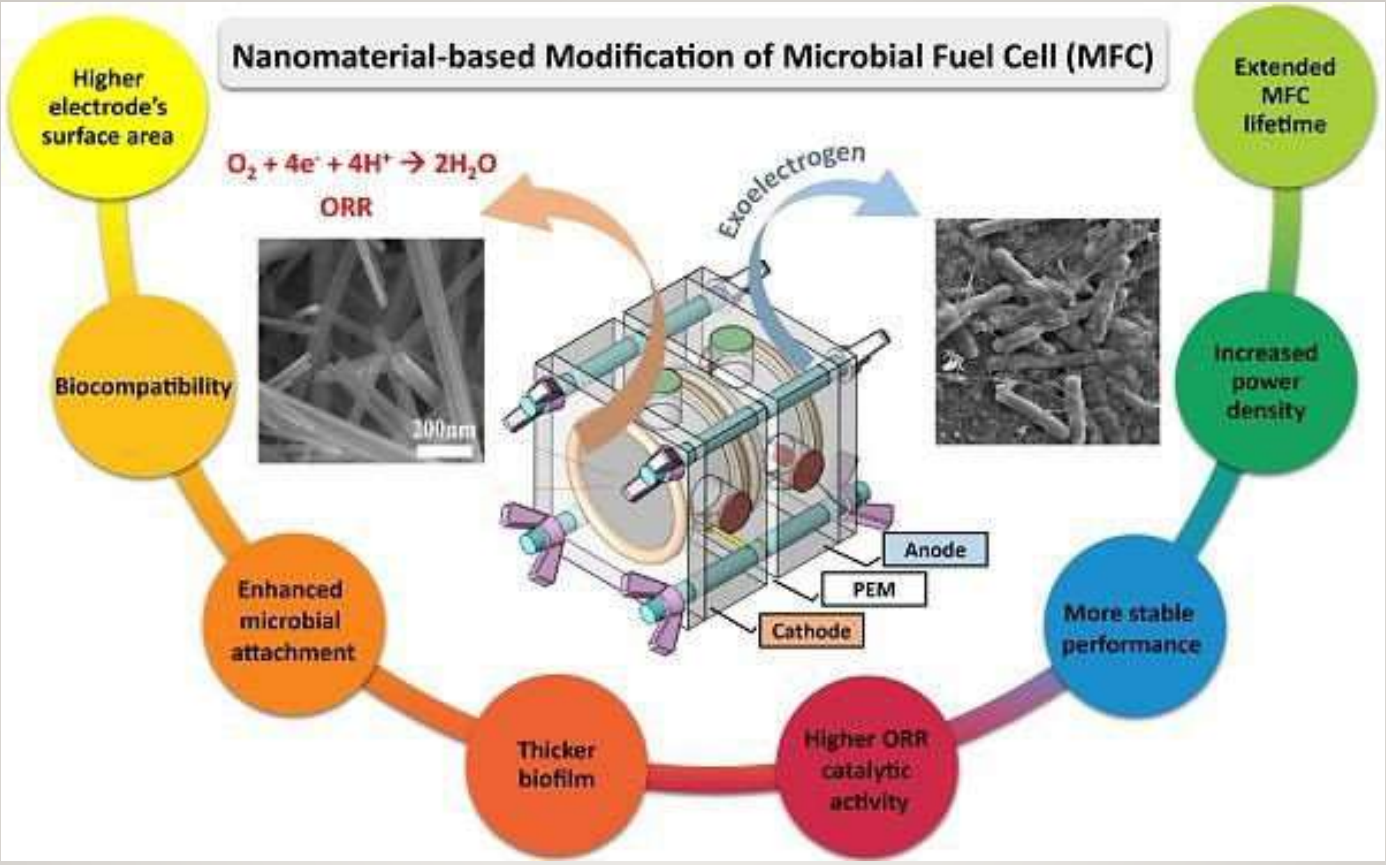
used in vehicles.



To improve power generation in microbial fuel cell (MFC) the surface modifications of anode materials are one of the most important factors. As the material used for anode is usually a limiting factor in power production in an MFC. Ideal anodic materials should be

MICRO FUEL CELL

biocompatible, conductivity and chemically stable.



Thus it can be concluded that the membrane free single-chamber air-cathode microbial fuel cell can improve the maximum power densities by 25% and **58%**, and thus shortened the start-up time by 51% and 45%, respectively using surface modified and unmodified.

Fuel cells have strong benefits over conventional combustion-based technologies currently used in many power plants and cars. They produce much smaller quantities of greenhouse gases and none of the air pollutants that create smog and cause health problems.
FCEL's expected +109.9% revenue growth for fiscal 2022 is driven by a one-off sale of modules, and its top line expansion is expected to moderate to +20.9% in FY 2023. Fuel Cell Energy stock is a Hold, considering both its valuations and business outlook.

20A81A0272

QUANTUM COMPUTING

What is quantum computing?

Quantum computing is a rapidly-emerging technology that harnesses the laws of quantum mechanics to solve problems too complex for classical computers.

Today, IBM Quantum makes real quantum hardware -- a tool scientists only began to imagine three decades ago -- available to thousands of developers. Our engineers deliver ever-more-powerful superconducting quantum processors at regular intervals, building toward the quantum computing speed and capacity necessary to change the world.

These machines are very different from the classical computers that have been around for more than half a century. Here's a primer on this transformative technology.

Principles

Quantum computing focuses on the principles of quantum theory, which deals with modern physics that explain the behavior of matter and energy of an atomic and subatomic level. Quantum computing makes use of quantum phenomena, such as quantum bits, superposition, and entanglement to perform data operations.

Types of Quantum Computers

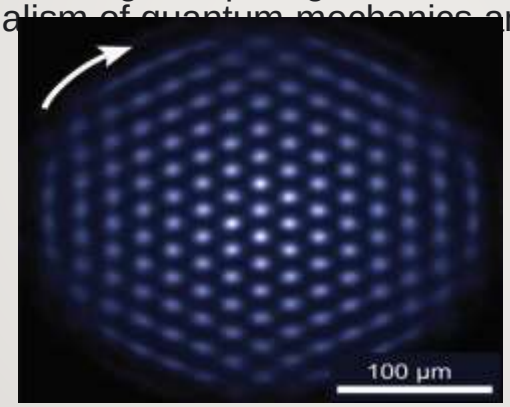
- Quantum
- Annealer
- Analog
- Quantum.
- Universal
- Quantum.

HOW QUANTUM ANNEALING WORKS IN D-WAVE QPUS

The quantum bits—also known as *qubits*—are the lowe energy states of the superconducting loops that make the D-Wave QPU. These states have a circulating cu and a corresponding magnetic field. As with classical bits, qubit can be in state of 0 or 1; see. But because the qubit is a quantum object, it can also be in a superposition of the 0 state and the 1 state at the same time. At the end of the quantum annealing process, each qubit collapses from a superposition state into either 0 or 1 (a classical state)

What is analog quantum?

Abstract. Quantum analog computing is based upon similarity between mathematical formalism of quantum mechanics and phenomena to be



What is universal Quantum computing ?

A universal set of gates for (classical or quantum) computation is a set of gates that can be used to approximate any other operation. It is well known that a universal set for classical computation augmented with the Hadamard gate results in universal quantum computing.

INDUSTRY APPLICATIONS OF QUANTUM COMPUTING

MANUFACTURING AND INDUSTRIAL DESIGN

Manufacturing requires efficient processes and designs to produce high-quality products . The design process can be incredibly tedious. Industrial designers need to consider multiple variables to craft a working product. This is especially important in machinery, transportation, and electronics . For example, designers often need several drafts when manufacturing a high-speed jet. This process ensures that they have the most efficient wing design for high speeds. It also applies to other key parts of the machine.

LOGISTICS

Logistics is often a time and location-sensitive industry. Thus, it would benefit a lot from optimizing processes. There are a lot of factors to consider when transporting something from one place to another. You have supply chains, vehicle availability, traffic, and customer expectations, among others.

FINANCE

Financial procedures often rely on a lot of complex mathematical processes. Analysts deal with many variables to predict possible outcomes of the market. Major events can require fast-paced responses that classic computers struggle to do Quantum computing can help make more accurate simulations and predictions of market activity. They are also a lot better at Monte Carlo simulations than traditional methods.

CHEMICAL ENGINEERING

Chemical engineering deals with the manipulation of atoms and molecules. The field itself involves the application of quantum principles . It is also a widely encompassing field. Chemical engineering has applications in manufacturing, healthcare, construction, food processing, electronics, etc.

ARTIFICIAL INTELLIGENCE

Artificial intelligence is another emergent technology already making waves in the mainstream. It involves “teaching” machines vast amounts of knowledge to perform various tasks.AI already has many applications in various fields. These include healthcare, e-commerce, education, finance, security, and media, among others.

CHALLENGES AND PROSPECTS

If quantum computing is so great, why aren’t more industries using it? There are a few challenges that come with using quantum computing today . The first issue is the complexity of quantum computing processes. Quantum computers are difficult to engineer and program. Thus it becomes challenging to find skilled individuals to operate and maintain the necessary machinery.

K.KRISHNA SAI

20A81A0220

ELECTRIC CURRENTS IN OUTER SPACE RUN T

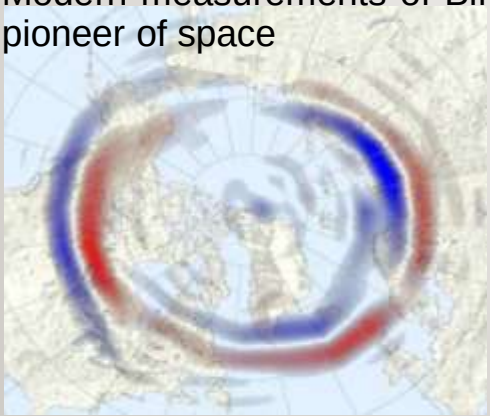
Modern society relies on electric currents. We can generate them, guide them from to another (including very remote places), and make them work for us.

The use of electricity has provided the greatest technological advances in humankind. But electric currents also occur in nature by themselves and **"run the show"** in outer space. **Electric Currents in Geo space and Beyond**, a new book just published by the American Geophysical Union, explores our most up-to-date understanding of electric currents in the solar system.

Here the editors answer some questions about past and recent advances in this field.

HOW AND WHEN WERE ELECTRIC CURRENTS IN SPACE DISCOVERED?

Modern measurements of Birkeland currents, named after the Norwegian pioneer of space physics, **Kristian Birkeland**. Credit: **Robin J. Barnes**, AMPERE Science Data Center, the Johns Hopkins University Applied Physics Laboratory Already in 1779, the American scientist, inventor and politician, Benjamin Franklin, spoke of a **"quantity of electricity**" in the atmosphere causing the aurora borealis. Much later, in 1908, the Norwegian pioneer of space physics, Kristian Birkeland, laid out a first theory of electric currents reaching out to space.

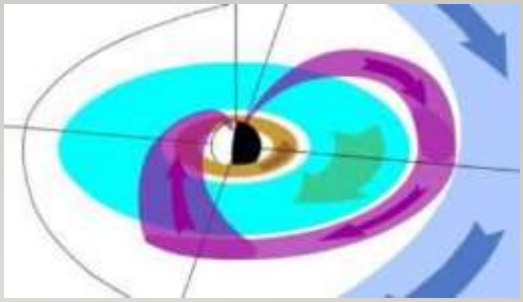


outer space is fundamentally electrical in nature.

HOW ARE THESE CURRENTS OBSERVED AND MEASURED?

Since electric currents are comprised of moving charged particles, such as ions and electrons, the most direct way to measure currents is by probing and counting the individual particles. Highly

tuned instruments that fly on board satellites do exactly that. While particle counting is quite challenging, as one might expect, one can also make use of the fact that electric currents generate a magnetic field around them, which in turn can be measured, more easily, by instruments, called **Magnetometers**. From these magnetic fields one can then infer using Maxwell's equations the underlying currents. In fact, this remote sensing allows us to infer some electric currents in outer space from ground-based magnetometers. However, a difficulty is to separate the field contributions at the same location from several distant currents that are simultaneously present. In the case of electric currents on the Sun, neither the charged particles nor the magnetic field can be measured directly, so yet another method is used, which relies on the signature that the magnetic field leaves on light from the Sun (due to the Zeeman effect). This allows the magnetic field to be inferred, and then the electric current.



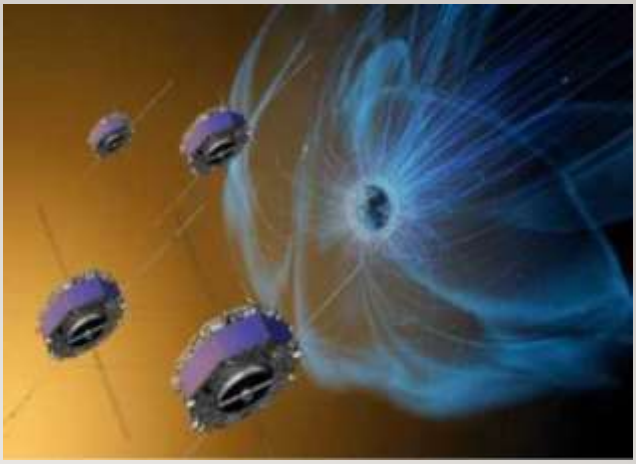
WHAT ARE THE MAIN CHARACTERISTICS OF ELECTRIC CURRENTS IN NEAR-EARTH SPACE?

In our homes and in cities, electric currents are guided along thin wires, but this is far from the case in outer space. Electric currents are spread out over a few hundreds of meters to tens of thousands of kilometers, and their cumulative magnitudes are much bigger than any currents on Earth. For example, the ring current, with a strength of **2-4 million Amperes (MA**), flows in closed loops in an equatorial current sheet out to distances of 60,000 kilometers and merges into the magnetotail current on the night side beyond this distance. The strength of the tail current exceeds 10 MA and is closed at the dawn and dusk flanks of the magnetotail by the Chapman-Ferraro current system of the magnetopause. Field-aligned currents flow between the ionosphere and magnetosphere along the background magnetic field with magnitudes of **1-6 MA**.

HOW DO THE CHARACTERISTICS OF ELECTRIC CURRENT SYSTEMS VARY AROUND OTHER PLANETS AND HELIOSPHERIC BODIES?

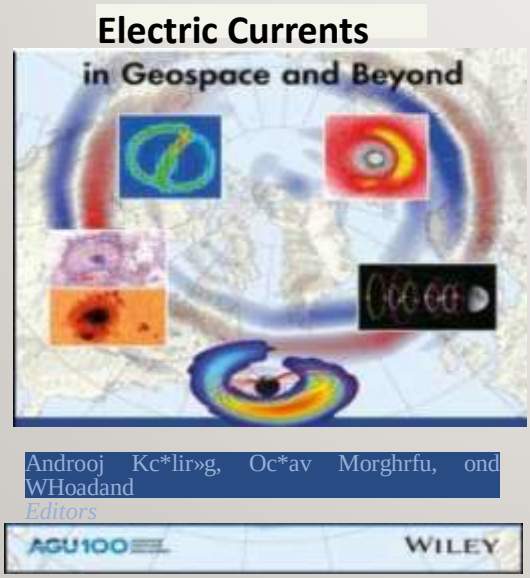
Interestingly, electric currents organize themselves in similar fashion around planets having an ionosphere and a magnetosphere while being buffeted by the solar wind. In comparison to Earth, the ring currents at Saturn and Jupiter are about **10 and 90 MA**, respectively, while the tail currents are greater than **10 and 70 MA**, respectively. The large-scale field-aligned currents between ionosphere and magnetosphere can reach magnitudes of 6 and 60 MA at Saturn and Jupiter, respectively. In contrast, the Sun's electric currents are orders of magnitude larger. For example, currents at the surface of the Sun near sunspots are typically **100,000-1,000,000 MA**.

possible to advance the understanding of the electric current systems in the magnetosphere and ionosphere - like those associated with substorms and, on smaller scales, with bursts of fast magnetospheric plasma flows, the cusp current system, the multi-scale structure of the field-aligned currents, or the three dimensional configuration of the Ionospheric currents. The new technique of energetic neutral atoms enabled global imaging of the ring current around the Earth (by the IMAGE mission), including storm time development, and Saturn (by the Cassini



mission), while missions like ARTEMIS and Rosetta provided detailed perspectives on the currents around the Moon and in cometary comae respectively. In solar physics, the advent of instruments in space to infer electric currents at the surface of the Sun (on the Hinode and Solar Dynamics Observatory satellites) has resulted in measurements of unprecedented quality and resolution, leading to many new research results.

How is the book organized?



A remarkable result of space research is that there are several common current systems (ring currents, current sheets, field-aligned currents, Ionospheric currents) that occur at several planets in spite of their great differences, such as physical dimension, planetary rotation rate, Ionospheric conductivity, and exposed solar wind conditions. However, along with these current systems goes a large variety of different aspects of each current system. Therefore, we decided to organize the 30 chapters in the book by these common current systems (as separate sections), allowing direct comparisons among different astronomical bodies, which also includes the Sun, moons and comets.

Article by

Donga Durga Dileep (EEE - 21A85A0205)

AR TECHNOLOGY -WORKING AND APPLICATIO

INTRODUCTION

LIDAR is the acronym for the words ‘**Light Detection and Ranging**‘, in free translation it would be "light detection and range”.
It uses remote sensing to measure the properties of reflected light. The technology as a whole can measure the correct distance between different objects.

This technology is usually present in specific devices (such as photographic cameras).

It is present from simple devices, such as electronic rulers for architects (a laser that measures without having to hold a tape measure), to other more complex devices. Its operation will be detailed below. Its uses are quite varied and can be explored further.

WHAT IS A LIDAR SENSOR?

The LIDAR sensor is a pulsed laser system. It is widely used for obtaining spatial information. It can measure and get the actual distance objects are from each other, but it can also be used to define measurements.
For example- To know exactly how tall a tree is in Central Park, An airplane with the sensor at the bottom can give this information precisely.

It can also be found by another name, LADAR (Laser Detection and Ranging). The applications, uses and technologies are the same, it’s just another way of being called. Generally, this nomenclature is found in military contexts.

HOW DOES LIDAR WORK

LIDAR can measure distances through light. The light source comes from laser beams in the near-infrared (IR) band, emitted by the sensor itself. It can model the terrain surface three-dimensionally.

The more beams present in the sensor, the greater its range. When it is used in environments with living beings - animals or people - the amount of light source is lower. A big benefit is that it is low energy, this is because the beam is not very strong. If a very strong beam hits the vision, it can damage if it too intense. The larger the sensor, the more beams it will be able to emit. This is valid for satellites with LIDAR, which orbit around the Earth. They can reach thousands of kilometers away with the same precision.

This system can be present on both mobile and fixed platforms. This indicates that LIDAR can be implemented in a tower, fixed to the ground, in an airplane, or even inserted into gadgets, along with several other sensors.

LIDAR combines the Global Navigation Satellite System (GNSS) and the Inertial Navigation System (INS).

The GNSS is responsible for providing the location of the aircraft in space, thus being able to inform where the objects are. The INS informs the altitude angles of what is being measured. To obtain the result, a calculation is made.

The variables are the elapsed time of the emission of the laser pulse to the target and its return time to the sensor.

The sensor converts time into the distance from the speed of light. After that, the value is associated with placement information. The result will show the 3D coordinates of the object in question. Laser pulses are emitted at a certain repetition frequency rate.

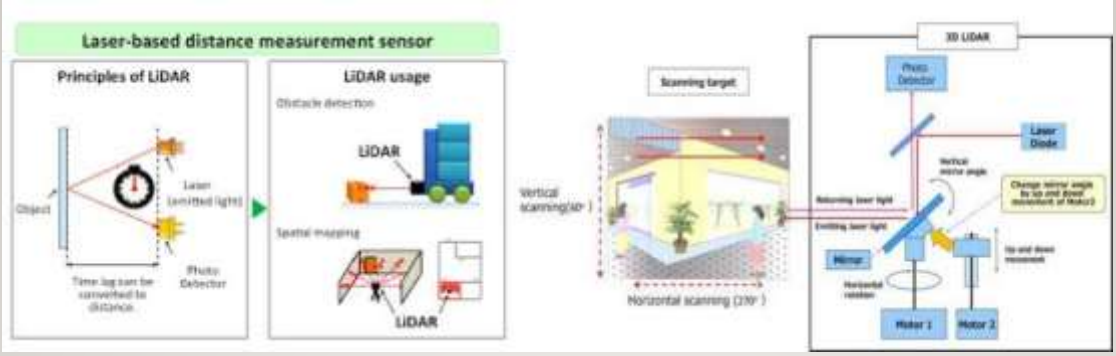
They act as a scanner, doing a kind of scan perpendicular to the direction of the line from which it is being picked up.

LIDAR is a technology developed in the 1960s, which began to be explored in the 1990s. It is the use of a closed beam of laser light that does not open. Therefore, it has a very limited cone, this is its great virtue.

The system measures the speed the beam takes to return. The time it takes him to hit and come back. In general, it is a distance meter.

In this way, the LIDAR Sensor can achieve multiple reflections. This means that several pulses can be reflected from the same object. The technology manages to obtain high precision results in its analyses.

For this reason, it is used militarily, by space missions, for accurate terrain measurements, and is starting to be implemented in everyday features



APPLICATIONS AND USES OF LIDAR

Okay, after understanding how the sensor works, comes the next step: what it is for? We've already mentioned some of their uses, but let's go into a little more detail about the functions they can have.

We say that the LIDAR Sensor acts like a scanner, managing to scan the environment. That is, it can accurately tell which objects are in their "vision" radius. It can detect any type of body, whether a moving object or not.

One of the most "noble" uses will be in autonomous vehicles, aircraft, and machines.

We start with an example a little further away. Self-driving cars are receiving more and more investments - with Tesla as a leader in the segment. Even though it doesn't seem like a close reality, its uses are increasingly expanded.

Although we think only of cars, agricultural machines already make use of these technologies.

We emphasize that Tesla makes use of its technology. The company has camera systems on the sides of the car, which identify the environment and process using cutting-edge computer technology.

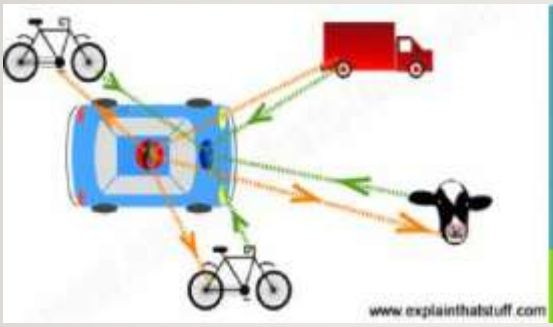
Although the company has researched LIDAR, it is not widely used in their cars. The models available on the market are not equipped with sensors.

The technology is used in engineering projects primarily to obtain accurate topographic surveys. It is especially important for the elaboration of digital models intended for exact studies of the environment.

That's because it can provide accurate information very quickly. It can adapt to spaces with a lot of vegetation, such as in very urbanized environments, with a large volume of constructions.

KNOWLEDGE AREAS THAT USE LIDAR SENSORS:

- geodesy (a subdivision of geophysics concerned with determining the dimensions and shape of the Earth)
- archeology
- architecture
- geography
- geology
- geomorphology
- seismology
- Forest engineering
- coastal oceanography
- remote and physical sensing of the atmosphere



PREPARED BY-

M.VARUN KUMAR GOWDA
20A81A0269

GYROBUS

A gyro bus is an electric bus that uses flywheel energy storage, not overhead wires like a trolleybus. The name comes from the Greek language term for flywheel, gyros.

ADVANTAGES

- Quiet
- "Pollution-free" (Pollution confined to generators on electric power grid.)
- Runs without rails (An advantage because the route can be varied at will.)
- Can operate flexibly at varying distances

DISADVANTAGES

- Weight: a bus which can carry 20 persons and has a range of 2 km (1.2 mi) requires a flywheel weighing about 3 tons.
- The flywheel, which turns at 3000 revolutions per minute, requires special attachment and security—because the external speed of the disk is 900 km/h (560 mph).
- Driving a gyro bus has the added complexity that the flywheel acts as a gyroscope that will resist changes in orientation, for example when a bus tilts while making a turn, assuming that the flywheel has a horizontal rotation axis. This effect can be counteracted by using two coaxial contra-rotating flywheels.

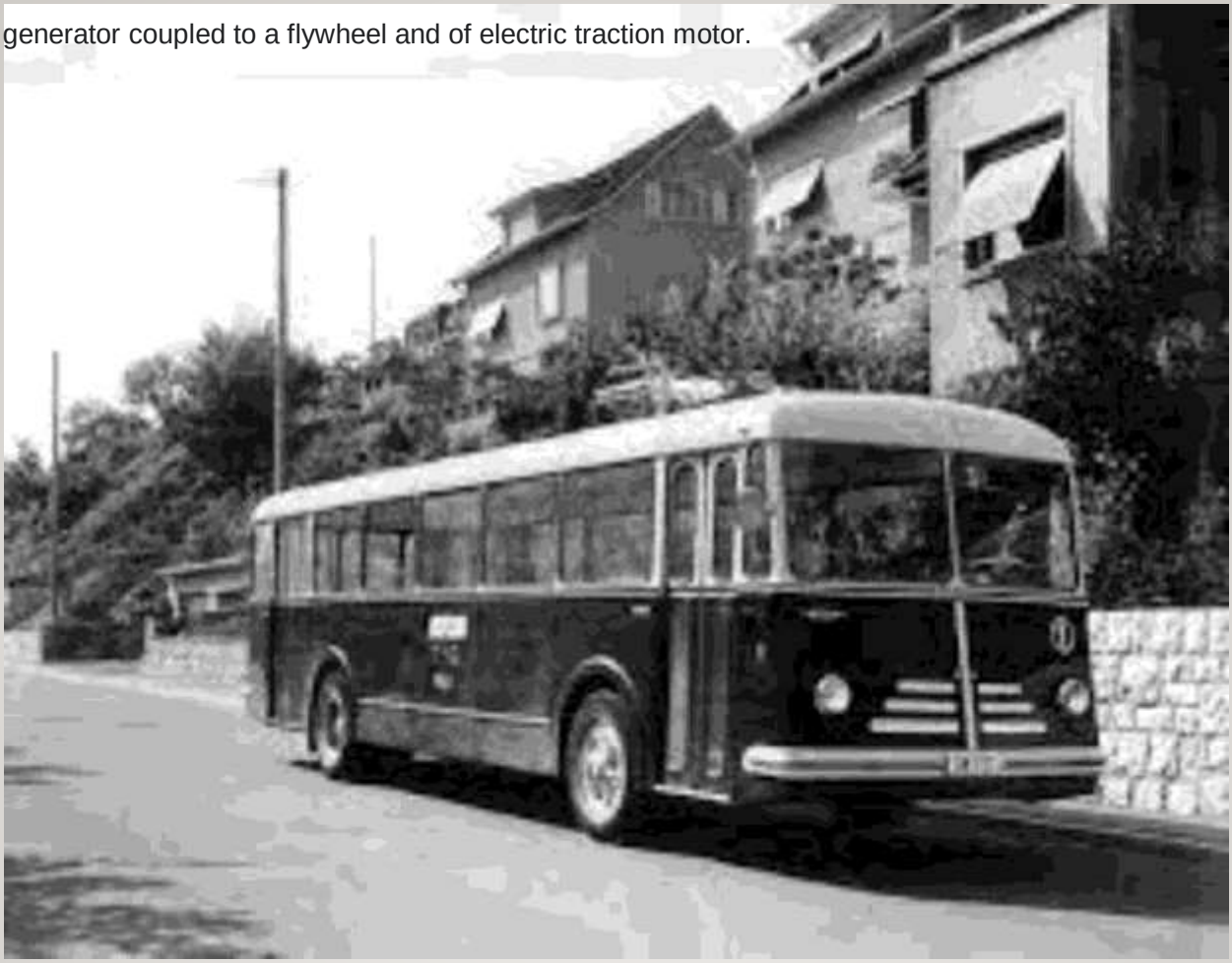
- Driving a gyrobus has the added complexity that **the flywheel acts as a gyroscope that will resist changes in orientation**, for example when a bus tilts while making a turn, assuming that the flywheel has a horizontal rotation axis. This effect can be counteracted by using two coaxial contra-rotating flywheels.

CONCLUSION:

Since 1955 there have been some practical applications of electrogyrobuses such buses are equipped with a flywheel unit consisting of an asynchronous motor and

GYROBUS

generator coupled to a flywheel and of electric traction motor.



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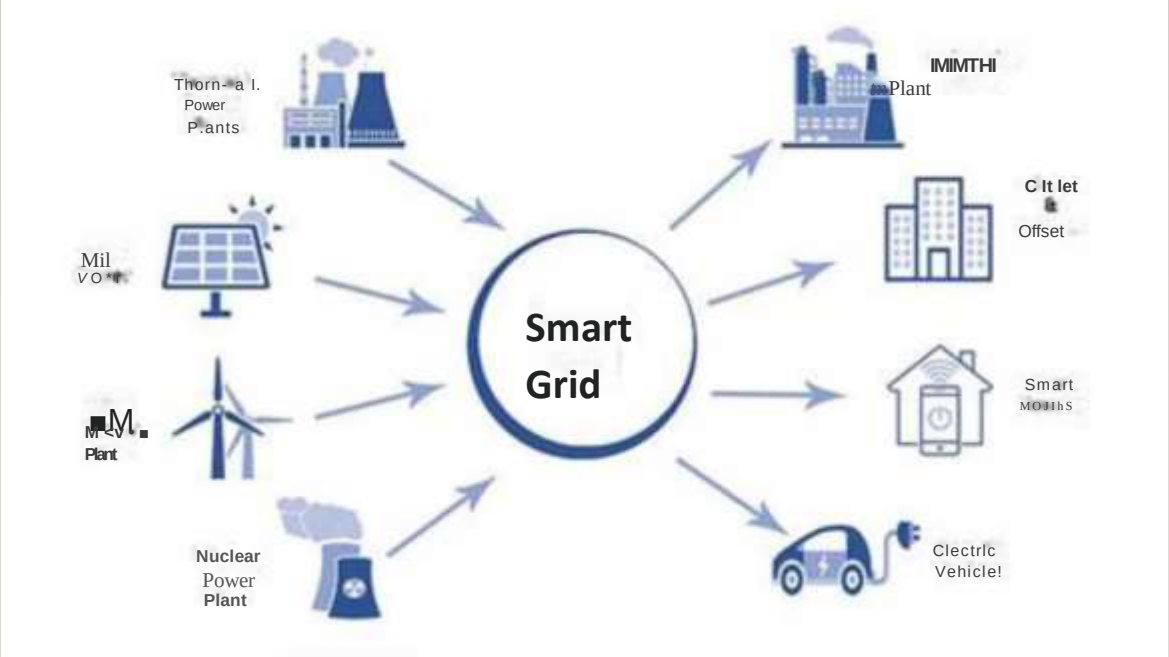
SMART GRID



ABOUTS

A smart grid is an electricity network based on digital technology that is used to supply electricity to consumers via two-way digital communication. This system allows for monitoring, analysis, control and communication within the supply chain to help improve efficiency, reduce energy consumption and cost, and maximize the transparency and reliability of the energy supply chain. The smart grid was introduced with the aim of overcoming the weaknesses of conventional electrical grids by using smart net meters.

Many government institutions around the world have been encouraging the use of smart grids for their potential to control and deal with global warming, emergency resilience and energy independence scenarios.

Technology:-

- The bulk of smart grid technologies are already used in other applications such as manufacturing and telecommunications and are being adapted for use in grid operations
- integrated communications: Areas for improvement include: substation automation, demand response, distribution automation, supervisory control, and data acquisition (SCADA), energy management systems, wireless mesh networks and other technologies, power-line carrier communications, and fiber-optics
- Phasor measurement units. Many in the power systems engineering community believe that the Northeast blackout of 2003 could have been contained to a much smaller area if a wide area phasor measurement network had been in place
- Distributed power flow control: power flow control devices clamp onto existing transmission lines to control the flow of power within. Transmission lines enabled with such devices support greater use of renewable energy by providing more consistent, real-time control over how that energy is routed within the grid. This technology enables the grid to more effectively store intermittent energy from renewables for later use
- Electricity has been an important part of our daily life. For centuries, we have been using the conventional electricity method without having much concern about it. However, with technologies getting more advanced, electricity is changing as well
- A smart grid is a technology that divides the electricity grid into a two-way flow of data and electricity. The technology includes energy measures ad operations such as smart appliances, smart meters, energy-efficient resources, and more
- Not only distribute energy, but the system also provides monitoring, control, communication, as well as analysis within the supply chain

Technology used in Smart Grid:-

Smart grid technology combines the electric network with the advanced digital communication network. Thus, it can provide a better power distribution that is easy to control. Some of the basic technologies of the smart grid include:

- Intelligent appliances
- Smart meters
- Smart substations
- Superconducting cables
- Integrated communications

Smart Grid in IOT;-

The Internet of Things becomes an important part of the smart grid. It provides a communication network so that the smart grid can be operated accordingly. The power meter and other components are connected to the internet, allowing consumers to control and monitor the power use. In case there is trouble and error on the system, it can be easily detected because all parts have been integrated into the IOT. Combining electric networks with the IOT is a big change in the industry and it is seen by the future to sustain the power.

KEY COMPONENTS IN SMART GRID:-

Installing a smart grid is a big project. Though there are many components to substitute, here are the six key components of a smart grid.

- Advanced metering infrastructure
- Demand response
- Electric vehicles
- Wide-area situational awareness
- Energy resource distribution and storage
- Management grid distribution

ADVANTAGES AND DISADVANTAGES

Implementing new technology is a big challenge. There are lots of considerations before making the big change. Though the smart grid is expected to be a breakthrough in the electricity industry, there are also advantages and disadvantages to consider.

ADVANTAGES:-

- Reduce equipment failure thanks to the automatic system.
- Reduce electricity costs and meter costs
- Reduce electricity losses and the chance of a blackout

DISADVANTAGES:-

- Continuous and stable network communication should be established.
- Network communication can be affected during a certain situation such as heavy rain, stormy wind, snow, and such. It becomes a big challenge for smart grid technology.
- Privacy problem because the power meter is integrated to the internet, hence it is prone to hacking.

SCIENCE CAN AMUSE
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