October, 2017

ELECTRONICA

NEED OF SOCIETY

CONSUMER ELECTRONICS

SPECIAL

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Consumer Electronics Market

Are Chatbots The Future

- The IoT for Environmental Monitoring

- Smart Power Solutions for Smart Cities

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA
Department of Electronics & Communication Engineering
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Approved by AICTE and Affiliated to Dr. A.P.J. Abdul Kalam Tech. University, UP

OCTOBER,2017

VISION

To prepare the students for global competence, with core knowledge in electronics and communication engineering having focus on research to meet the needs of industry and society.

MISSION

M1:To become dynamic and vigorous knowledge hub with an exposure to state of art technologies for connecting world.

M2:To provide in-depth knowledge of Electronics and Communication Engineering ensuring the effective teaching learning process.

M3:To train students to take up innovative projects in group with sustainable and inclusive technology relevant to the industry and social needs.

M4:To empower students to become skilled and ethical entrepreneurs.

M5:To promote and adapt professional development in a perpetual demanding environment and nurture the best minds for the future.

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PSOs

PSO 1- To apply the knowledge of mathematics, science and electronics & communication engineering to work effectively in the industry based on same or related area.

PSO 2- To use their skills to work in modern electronics & communication engineering tolls, software and equipments to design solutions for complex problems in the related field that meet the specified needs of the society.

PSO 3- To function effectively as an individual and as a member or leader of a team by qualifying through examinations like GATE, IES, PSUs, TOEFL, GMAT and GRE etc.

PEOs

PEO-1 To have excellent scientific and engineering breadth so as to comprehend, analyze, design and solve real- life problems using state-of-the-art technology.

PEO-2 To lead a successful career in industries or to pursue higher studies or to understand entrepreneurial endeavors.

PEO-3 To effectively bridge the gap between industry and academics through effective communication skill, professional attitude and a desire to learn.
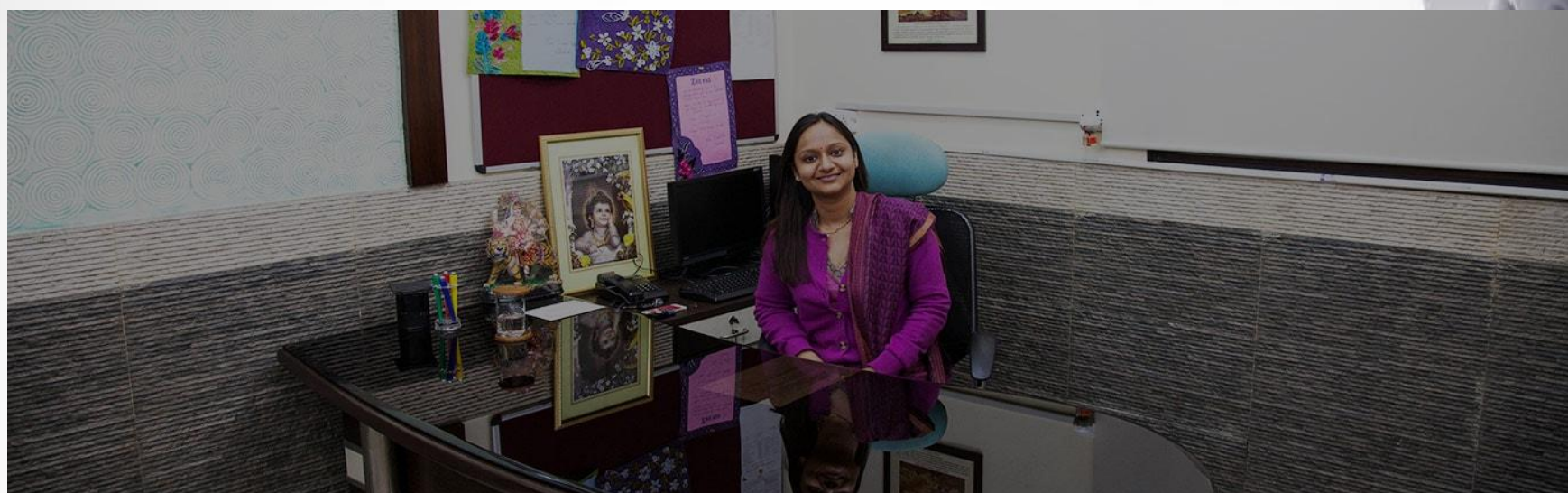
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FROM THE DESK OF THE MANAGING DIRECTOR

"Work is Worship"

Dr. Om Prakash Agarwal (Managing Director) success is not a one-shot process. It is the result of a continuous improvement after each failure. The fear of failure needs to be captured in order for a person to learn from his failure too. It is an invaluable opportunity to rectify errors and move forward. Failure in working for a good cause is better than success in working for a wrong cause.

Over the years now, NIET has built quite a special position in the private higher education sector. With its distinctive culture, it provides a clear student-centered environment in which to explore existing technical knowledge, and gain new learning at the leading edges of technology development.

Our unique educational system ensures that you gain not just depth and breadth in your chosen area of specialization, but also a holistic set of skills that will equip you to face the real world. At every stage there will be opportunities to expand your boundaries, platforms for collaboration and learning, and recognitions for those who strive to excel. Thus, I would like each one of you to join NIET and aspire as global leaders and a successful human being.

NIET Greater Noida

GET FUTURE-READY

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ADDITIONAL MANAGING DIRECTOR

"Education is the most powerful weapon which you can use to change the world" - Nelson Mandela

Dr. Neema Agarwal

In the course of last 20 years many technical & management institutes have sprung up all over the country. Graduates passing out every year are highly optimistic, that technical courses ensure a rewarding career.

The economic, corporate and social environments are undergoing radical changes. To survive, manage and excel in this dynamically changing atmosphere; it demands engagement of professionals who are well informed, competent, courageous and versatile.

Beyond the academics, the curriculum at NIET is strongly linked with several recent themes like latest technologies needed by organizations, soft skills, communication, among others. Our approach has resulted in programs of study relevant to the leadership trends and challenges of tomorrow. Classroom learning is made interesting by highly qualified and experienced faculty through interactions, presentations, role plays, case studies and out bound learning programs. This is further reinforced by practical learning through Industrial visits and summer training. Students regularly undergo personality development and grooming sessions that leads to both extrinsic and intrinsic confidence boosting and prepares them for the corporate world.

We appreciate your interest and want you to know that we are here to bring you a leading edge technical education.

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FROM THE DESK OF EXECUTIVE VICE PRESIDENT

Mr. Raman Batra

This new generation is an interesting one. Most of them are born in a world where technology has always been at the forefront. These students rely on Google, texting, social media and Wi-Fi, and they view email - not letter writing - as a formal form of communication.

NIET has been helping students write their own stories since its inception. Committed to providing the best jobs by creating life-changing educational opportunities and collaborative learning environments, we have stayed at the forefront of innovation in higher education, providing the tools our students need to make them industry ready from day one and make an impact in the world.

NIET has a Pyramid Finishing School, which provides training to the students according to the industry requirements giving the individual student a 360 degree in employability skills. The Institute has also made tie-ups with MNCs like Microsoft, Oracle, KPMG, ICICI Direct, Prometric and Pearson. These tie-ups not only promise to enhance student employability by manifold, but also take the lead in encouraging 'innovative' learning like never before. Taking the league forward, we have established various innovation labs to provide students hands-on experience in various modern-day technologies.

I, thus, invite you to join our movement to create Corporate Citizens who become role models, wherever they go, for developing their professional career. I promise you a challenging academic experience, with an international flavor, which will truly transform your lives.

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MESSAGE FROM DIRECTOR

Welcome you to the Noida Institute of Engineering & Technology, Gr. Noida. Ever Since its inception in 2001 our endeavor at NIET has been to provide excellent quality of education and training to young minds aspiring to become engineers, managers, pharmacists and technocrats.

In order to achieve this goal we have established an infrastructure that compares with the best in the world. Our faculty members are highly talented and qualified. Additionally, we invite the finest minds from the industry and academia as guest lecturers. With the help of a very supportive staff we ensure a healthy learning atmosphere for our students.

We motivate our students to dream big and guarantee that we inculcate the right spirit and the necessary talent to realize their objective. We also continuously strive to instill ethical values in our wards so that they become responsible citizens of tomorrow.

NIET has always stood for quality and excellence and we make every effort to constantly asses and improve ourselves. These efforts have been recognized, appreciated and awarded by prestigious educational bodies both in India and abroad.

I wish you the very best as you choose to become a part of this exciting and vibrant learning community.

Dr. Ajay Kumar

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MESSAGE FROM THE HOD

It is a matter of great pride for the department of ECE that *Electronica* is getting wide response from the student's community. The editors of *Electronica* wish to ignite their readers to dream for the highest order of technical advancements in the area of Electronics and Communication Engineering.

I acknowledge the contributions made by the authors and the hard work of the Editorial Board members who managed against all odds and obstacles to bring out the magazine. This magazine has proved its worth by inspiring many students and faculty members to write articles for the benefit of students at large. I look forward to hearing from the readers. Their feedback and contribution of articles for future issues is greatly desired.

Dr. V K Pandey

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OCTOBER, 2017

HUMANOID ROBOT

DHANANJAY SINGH
ASSISTANT
PROFESSOR

A **humanoid robot** is a robot with its body shape built to resemble the human body. The design may be for functional purposes, such as interacting with human tools and environments, for experimental purposes, such as the study of bipedal locomotion, or for other purposes.

In general, humanoid robots have a torso, a head, two arms, and two legs, though some forms of humanoid robots may model only part of the body, for example, from the waist up. Some humanoid robots also have heads designed to replicate human facial features such as eyes and mouths. Androids are humanoid robots built to aesthetically resemble humans.

Humanoid robots are now used as research tools in several scientific areas. Researchers study the human body structure and behavior (biomechanics) to build humanoid robots. On the other side, the attempt to simulate the human body leads to a better understanding of it. Human cognition is a field of study which is focused on how humans learn from sensory information in order to acquire perceptual and motor skills. This knowledge is used to develop computational models of human behavior and it has been improving over time.

It has been suggested that very advanced robotics will facilitate the enhancement of ordinary humans. See transhumanism.

Although the initial aim of humanoid research was to build better orthosis and prosthesis for human beings, knowledge has been transferred between both disciplines. A few examples are powered leg prosthesis for neuromuscular impaired, ankle-foot orthosis, biological realistic leg prosthesis and forearm prosthesis.

Besides the research, humanoid robots are being developed to perform human tasks like personal assistance, through which they should be able to assist the sick and elderly, and dirty or dangerous jobs.

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Humanoids are also suitable for some procedurally-based vocations, such as reception-desk administrators and automotive manufacturing line workers. In essence, since they can use tools and operate equipment and vehicles designed for the human form, humanoids could theoretically perform any task a human being can, so long as they have the proper software. However, the complexity of doing so is immense.

They are also becoming increasingly popular as entertainers. For example, Ursula, a female robot, sings, plays music, dances and speaks to her audiences at Universal Studios. Several Disney theme park shows utilize animatronic robots that look, move and speak much like human beings. Although these robots look realistic, they have no cognition or physical autonomy. Various humanoid robots and their possible applications in daily life are featured in an independent documentary film called Plug & Pray, which was released in 2010.

Humanoid robots, especially those with artificial intelligence algorithms, could be useful for future dangerous and/or distant space exploration missions, without having the need to turn back around again and return to Earth once the mission is completed.

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ROBOTICS TECHNOLOGY DEVELOPMENT IN 2020

The robotics industry is spec to create 3 million additional Jobs between 2014 and 2020, led by consumer electronics and the electric vehicle industry. By 2020, robotics will be a $100 billion industry, equivalent in size to the worldwide medical tourism industry in 2012.
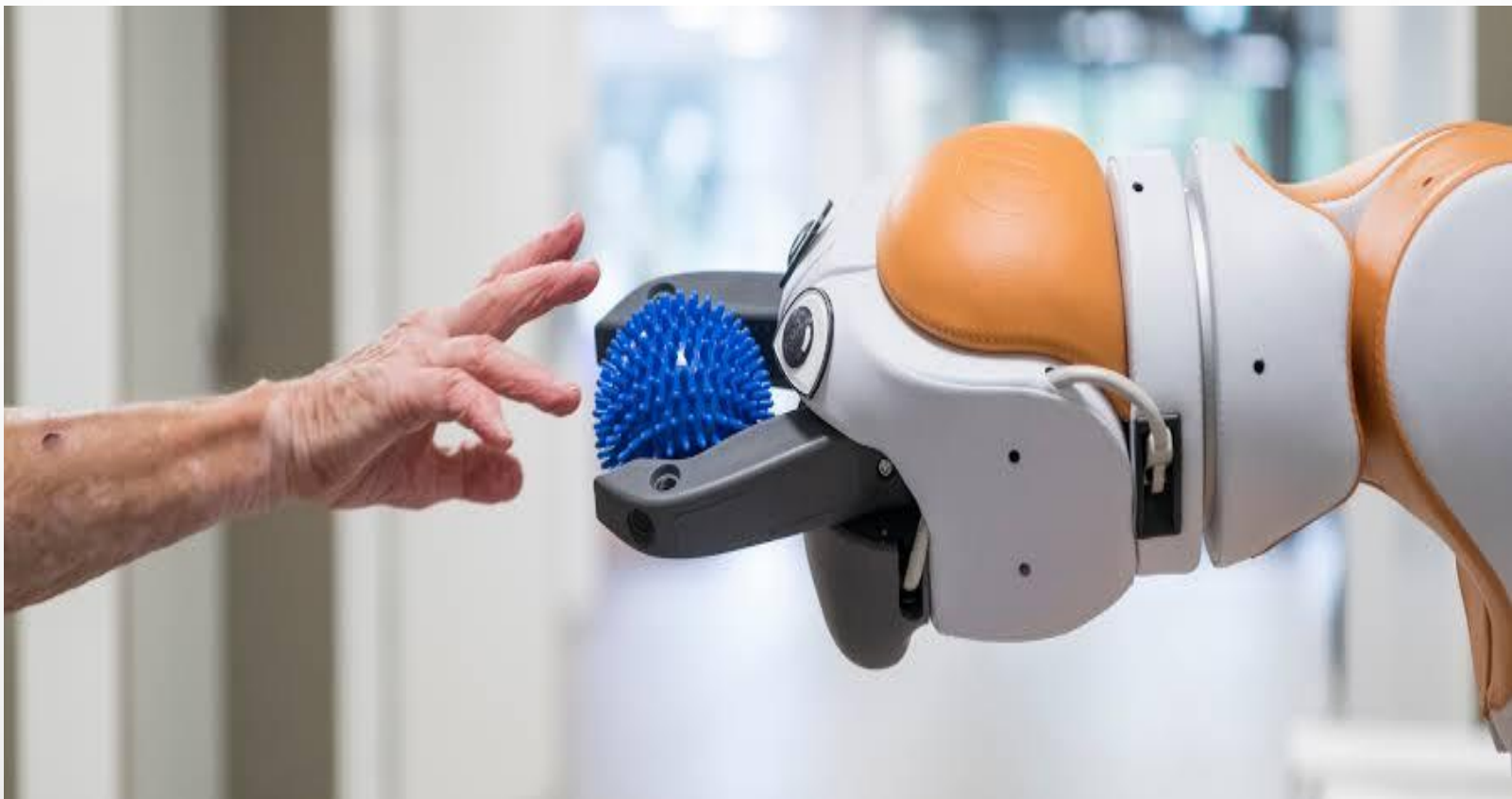
Nidhi
EC

The rehabilitation robot market grows 40-fold between 2014 and 2020, fueled by advancements in rehab/therapy robots, active prostheses, exoskeletons, and wearable robotics.

Between 2017 and 2020, the use of robotics generate 2 million additional job positions. 2020 sees robotics gain momentum and become vital components in a number of applications. From swarms of "microbots" to self-assembling modular robots to strength- enhancing robotic exoskeletons, applications using robotics cut across industries and transform the way work is done. Robots paired with Al perform complex actions and are capable of learning from humans, driving the intelligent automation phenomenon.

Robotics Technology in 2020

1. Microbots allow emergency responders to explore environments that are too small or too dangerous for humans or larger robots ; deploying them in "swarms" compensates for their relatively limited computational ability.

2. Exoskeletons allow users to augment their physical strength, helping those with physical disabilities to walk and climb, it also finds application in the military.

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3. Body-machine interfaces help amputees to feed-forward controls that detect their will to move and also receive sensorial feedback that converts digital readings to feelings.

4. Modular robots bring forth LEGO like robotic cubes that can arrange themselves in present patterns to accomplish specific tasks.

5. Intelligent robots combine artificial intelligence and machine learning technologies to give robots human-like expressions and reactions.

6. Robotic strength increases as elastic nanotubes give robots muscles that are more compact and stronger than human muscles ; allowing robots to outrun and out-jump humans.

7. Alternately powered robots use sources like solar, wind and wave energy to be powered indefinitely and open up applications in areas that are off-grid.

8. Robotic networks emerge and allow robots to access databases, share information and learn from one another's experience,

9. Telepresence robots act as your stand-in at remote locations .

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Google Soli Chip

This Project Soli radar chip creates a small bubble around the phone and remains aware of any gestures or movements within that bubble But, didn't you just use some of these features in your Apple iPhone or some other flagship Android phones?

Priyanshu Singh
EC

Google announced Project Soli in 2015 during a session at its I/O Developer Conference. Since then, Google's ATAP (Advanced Technology and Projects) division has been developing the technology, which can be used in wearables, phones, computers, cars and IoT devices. This is everything you need to know about Google's Soli chip, including what it is, how it works and what it does in the new Pixel 4 and Pixel 4 XL phones.

What is Google's Soli chip?

Google's Soli is a purpose-built chip to track your motion on a microscopic scale. It uses miniature radar for real-time motion tracking of the human hand; its able to track sub-millimetre motion at high speeds with great accuracy.

The Soli chip measures just 8mm x 10mm and it incorporates the sensor and antenna array into a single device, meaning it can be used in even the smallest wearables. It has no moving parts, consumes very little energy, isn't affected by light conditions and works through most materials making it a pretty exciting bit of technology.

In tandem with the chip, Google ATAP is developing a language for interacting with devices using gestures. Devices equipped Soli chip can then use a universal set of gestures. Google calls these Virtual Tool Gestures and they involve things like pressing an invisible button between your thumb and index finger or turning a dial by rubbing your thumb and index finger together.The idea is that these gestures feel physical and responsive thanks to the feedback from fingers touching each other, even though the gesture itself is virtual.

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How does Google's Soli chip work?

The Google Soli chip uses radar, so it works by emitting electromagnetic waves with objects within the beam reflecting information back to the antenna, according to Google ATAP. Information gathered from the reflected signal - things like time delay or frequency changes - give the device information about the interaction. Soli senses "subtle changes in the received signal over time. By processing these Soli can distinguish complex finger movements and hand shapes within its field. "Gesture controls are interpreted thanks to a number of different ways the information can be interpreted, including raw radar data, machine learning, probable gestures and pre-defined interactions.

How will Soli change the way we use devices?

Soli has the potential to change the way we use all devices - from phones to wearables and everything in between. Wearables are probably the most obvious and natural place to apply the technology because those types of devices usually have such small displays (and there is an obvious need for richer, more functional input options on them).

The Apple Watch, for instance, has the physical Digital Crown that provides users with additional ways to navigate the Watch OS interface. A smartwatch that incorporates the Soli chip wouldn't need a digital crown though, because you'd be able to wave your fingers to get things done, such as mimic turning down a volume dialler to decrease the volume or mimic pressing a button to turn something on or off.

However, it's the Google Pixel 4 smartphone that is the first device to incorporate the Soli chip. It allows for gesture controls, such as users simply waving their hands in order to skip songs, snooze alarms and silence phone calls. These capabilities are said to expand over time, with Google saying that this is just the beginning of what it will offer.

Is Soli ready for developers?

Google ATAP is looking for developers to evolve, test and build Soli applications. Currently only the Pixel 4 is taking advantage of the Soli chip.

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Baryons

The constituents of the Universe are classified according to the principles of the standard model of elementary particles. This model identifies baryons as matter composed of triplets of fundamental particles called quarks.

The standard model of particle physics recognises two types of elementary particle, differentiated by the quantum mechanical notion of spin. These particles play fundamentally different roles in nature, and can only have values of spin that are integers (0, 1, 2,…) or half-integers (1/2, 3/2, 5/2,…). Particles that carry the forces of nature are integer spin bosons, while half-integer spin fermions make up the matter on which these force act.

baryons1.jpg

Baryons are particles (hadrons) composed of 3 quarks.

Fermions are classified into two families:
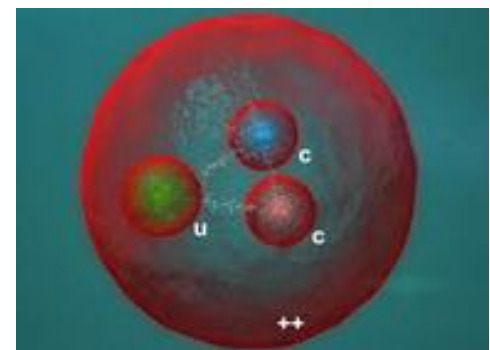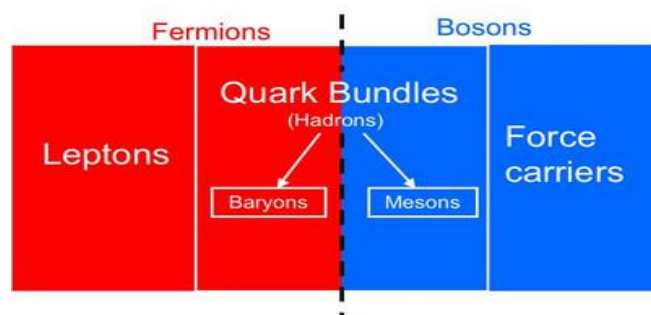
Quarks which experience the strong force. This causes quarks to never occur as solitary particles in nature. They are always found in 'bundles' of 2 (mesons) or 3 (baryons). Collectively, these quark bundles are referred to as hadrons.

Leptons which do not experience the strong force.

Baryons contain 3 quarks. There are many different baryons observed in particle accelerators (e.g. Λ0, Σ+, Σ−, Σ0, Δ+, Δ−, Δ0, ….), simply because there are many ways to make allowable combinations of 3 from the 12 quarks available (including anti-quarks). The vast majority of these extremely massive particles are highly unstable, decaying as a shower of smaller particles in as little as 10-23 seconds. In nature, there are only 2 common baryons – protons and neutrons – and together they dominate the mass of normal matter in the Universe.

Zeeshan Ali

EC

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GRAVITRICITY

As the world generates more and more electricity from intermittent renewable energy sources, there is a growing need for technologies which can capture and store energy during periods of low demand and release it rapidly when required.

At Gravitricity a new developing novel storage technology which offers some of the best characteristics of lithium batteries and pumped storage.

Ideally suited to network-constrained users and operators, distribution networks and major power users, the technology operates in the 1MW to 20 MW power range and enables existing grid infrastructure to go further in a renewable energy world.
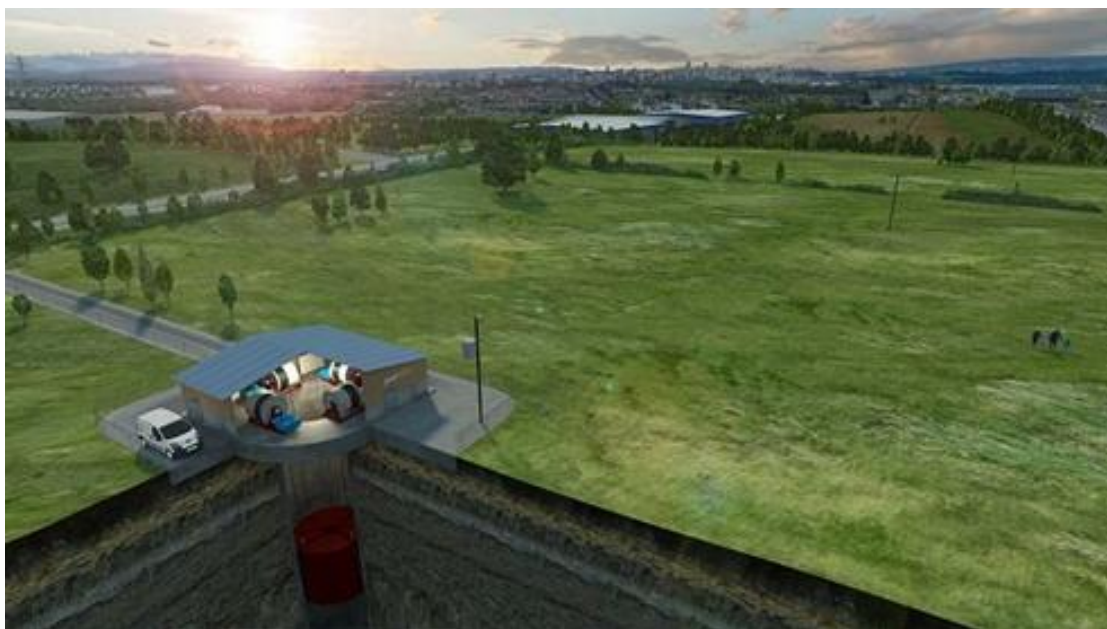
Technology

This technology is based on a simple principle: raising and lowering a heavy weight to store and release energy. The Gravitricity system suspends weights of 500 - 5000 tonnes in a deep shaft by a number of cables, each of which is engaged with a winch capable of lifting its share of the weight. Electrical power is then absorbed or generated by raising or lowering the weight. The weight is guided by a system of tensioned guide wires (patents applied for) to prevent it from swinging and damaging the shaft. The winch system can be accurately controlled through the electrical drives to keep the weight stable in the hole.

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Gravitricity™ technology has a unique combination of characteristics:

50-year design life – with no cycle limit or degradation
Response time – zero to full power in less than one second
Efficiency – between 80 and 90 percent
Versatile – can run slowly at low power or fast at high power
Simple – easy to construct near networks
Cost effective – levelised costs well below lithium batteries
Each unit can be configured to produce between 1 and 20MW peak power, with output duration from 15 minutes to 8 hours.
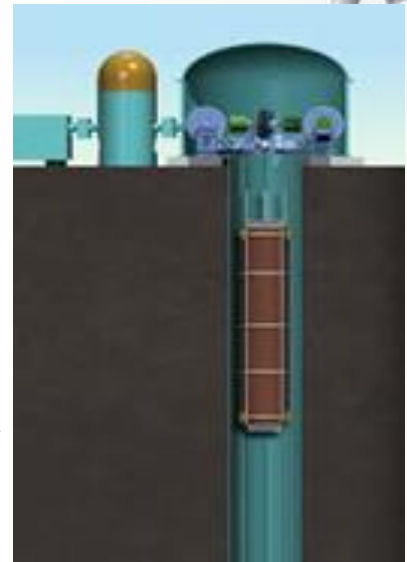
The key requirement is a deep hole in the ground; it can be a disused mineshaft brought back into use, or a purpose-sunk shaft. Shaft depths can be from 150m for new shafts down to 1500m for existing mines.

The grid connection is through modern power electronics to permit rapid switching between generation and absorption of power and the system can deliver active as well as reactive power to help with grid stability.

While the weight system can be used on its own, the energy storage capacity of the overall system can be much increased when the shaft is used as a pressure vessel, allowing a compressed air energy storage (patent applied for.) to operate alongside the weight system. This involves adding a pressure-tight "lid" to the top of the shaft and lining the shaft to prevent leakage. The ground provides the bursting resistance other than at the very top of the shaft. The winches and generators will be contained in the pressurized space so that only electrical cables need to penetrate the pressure vessel walls.

Initially the technology used existing mine shafts. Future deployments will be able to utilise existing mines or purpose-built shafts, allowing development wherever storage is required.

Prashant Saxena
EC

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QUANTUM COMPUTING
Era of New Computing

Quantum Computing is the study of a non-classical mode of computing. A quantum computing could transform the memory/state into a quantum superposition of all the possible classical states.

So, here we are going to talk all about quantum computers. A quantum computer is a device that could perform such computing.

In 1981, at Argonne National Labs, Paul Benoff used Max Planck's idea that energy exists in individual units, as does matter to theorize the concept of quantum computing.

Quantum Computing focuses on the principle of Quantum theory, which deals with the behaviour of matter and energy at atomic and sub-atomic levels.

It makes use of quantum phenomena such as quantum bits , superposition and entanglement to perform data operations.

We might not be familiar with these principles but let me tell you all, that superposition is a principle refers to the quantum pheneomena where a quantum system can exist in multiple states or places at the exact time.

Quantum Computing takes the advantage of the storage ability of subatomic particles to exist in more than one state at any time. Due to the way the tiniest of particles behave, operation can be done much more quickly and use less energy than classical or binary computers.

In classical computers, a bit can be in two states- either of two poles of the sphere and qubit can be any point on the sphere.

Advantages-

- Quantum computers are much faster than classical computers. Complex problems were performed in just 3 minutes which would take 10,000 years if computed by classical computer.
- It can model complicated chemical reactions, a task that conventional super computers are good at.
- Quantum techniques can be used in cryptography which may be fully secured and cannot be hacked or cracked unethically.

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Obstacles –

There are some obstacles like quantum decoherence, figuring out best algo etc.

The loss of coherence (super positioning of states) caused by vibrations, temperature fluctuation, EM waves outside environment, which destroys the quantum property.

Many organisations like Google, NASA,IBM are working on the quantum computing technique to make it successful. Recently google's 'Sycamore' processor computed exactly 53 qubits.

Still the full control has not been achieved over quantum computing technique but it is hoped it will be achieved in coming years entering a New Era of Computing.

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Vijay Kumar
EC

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