Maratha Vidya Prasarak Samaj's
Rajarshi Shahu Maharaj Polytechnic, Nashik
Udoji Maratha Boarding Campus, Near Pumping Station, Gangapur Road, Nashik-13.
RSM POLY Affiliated to MSBTE Mumbai, Approved by AICTE New Delhi, DTE Mumbai & Govt. of Maharashtra, Mumbai.

Departmental Technical March 2024

Department Vision:-

To be a professional department to develop technicians for modern E&TC industries.

Department Mission:-

M1: To impart education to meet the requirements of the industry and society by technological solutions.
M2: To provide quality in education and facilities for students to help them to achieve higher academic career growths.
M3: Develop technical knowledge & soft skills to improve overall personality.
M4: To promote use of information communication technology in education.

ProgramEducational Objectives:-

PEO 1: To produce competent professionals who can apply knowledge of basic science, mathematics and fundamentals of electronics & Telecommunication in their professional fields.

PEO 2: To prepare & encourage students for technological changes through domain knowledge & improve their skills in field of Electronics & Telecommunication Engineering.

PEO 3: To prepare students for continuous professionals and social development through soft skills & self-learning abilities.

Quantum computing

(Harshala Garje TYEJ)

Quantum computing is a cutting-edge field of computing that utilizes the principles of quantum mechanics to process and store information.

Source:https://energy.economictimes.indiatimes.com/news/renewable/over-60-countries-back-deal-to-triple-renewable-energy-this-decade-officials/105108811

Unlike classical computers, which use bits as the basic unit of information (representing either a 0 or a 1), quantum computers use quantum bits, or qubits, which can represent both 0 and 1 simultaneously due to the principle of superposition.

Key concepts in quantum computing include:

Superposition: Qubits can exist in multiple states simultaneously, allowing quantum computers to perform multiple calculations at once.

Entanglement: Qubits can be entangled, meaning the state of one qubit is dependent on the state of another, regardless of the distance between them. This property enables quantum computers to perform complex calculations more efficiently.

Quantum Interference: Qubits can interfere with each other, amplifying the probability of obtaining the correct answer and reducing the likelihood of errors.

Quantum computing has the potential to revolutionize various fields, including cryptography, optimization, drug discovery, material science, and artificial intelligence. Some specific applications and implications of quantum computing include:

Cryptography: Quantum computers have the potential to break many of the encryption methods currently used to secure sensitive information, leading to the need for quantum-resistant encryption algorithms.

Optimization: Quantum computers can solve certain optimization problems much faster than classical computers, making them valuable for tasks such as logistics optimization, financial modeling, and complex system simulations.

Drug Discovery: Quantum computers can simulate molecular interactions with high precision, accelerating the process of drug discovery and development by modeling the behavior of molecules and predicting their properties.

Machine Learning and AI: Quantum computing algorithms can enhance machine learning and artificial intelligence tasks by enabling faster data processing, improved pattern recognition, and more efficient optimization of algorithms.

Despite the promising potential of quantum computing, there are significant challenges that need to be addressed, including qubit stability, error correction, scalability, and the development of practical quantum algorithms. As of my last update in January 2022, quantum computing research and development are ongoing, with major companies, research institutions, and governments investing in advancing this technology

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Environmental and sustainable technologies

(Akansha Gite TYEJ)

Environmental and sustainable technologies encompass a wide range of innovations and practices aimed at addressing environmental challenges while promoting sustainability across various sectors. These technologies focus on reducing resource consumption, minimizing environmental impact, and fostering a transition to a more sustainable and resilient future. Here are some key areas and examples of environmental and sustainable technologies:

Renewable Energy: Renewable energy technologies harness energy sources that are naturally replenished, such as sunlight, wind, water, and geothermal heat. Examples include:

Solar photovoltaic (PV) systems for electricity generation

Wind turbines for wind power generation

Source:https://www.cnet.com/tech/computing/ibm-new-53-qubit-quantum-computer-is-its-biggest-yet/#google_vignette

Hydroelectric power plants for electricity generation from flowing water. Geothermal power plants for electricity generation using heat from the Earth's interior

Energy Storage: Energy storage technologies play a crucial role in integrating intermittent renewable energy sources into the grid and improving energy system flexibility. Examples include:

Lithium-ion batteries for grid-scale and distributed energy storage.Pumped hydroelectric storage for large-scale energy storage by pumping water to higher elevations during times of excess energy and releasing it to generate electricity when needed

Thermal energy storage systems for storing and releasing heat energy for heating and cooling applications

Energy Efficiency: Energy efficiency technologies focus on reducing energy consumption and improving energy utilization across various sectors, including buildings, transportation, and industry. Examples include:

Energy-efficient appliances and lighting systems

Building insulation and passive design strategies for reducing heating and cooling energy demand

Advanced HVAC (heating, ventilation, and air conditioning) systems with energy recovery ventilation

Efficient transportation technologies such as electric vehicles (EVs), hybrid vehicles, and fuel-efficient engines

Circular Economy: Circular economy principles aim to minimize waste generation and maximize resource efficiency by designing products, materials, and systems for reuse, recycling, and remanufacturing. Examples include: Recycling technologies for processing and recovering materials from waste streams

Reusable packaging and product design for extended product lifecycles

Remanufacturing processes for refurbishing and restoring products to their original condition

Biomimicry-inspired design approaches for creating sustainable products and systems based on natural ecosystems

Water and Wastewater Treatment: Technologies for water and wastewater treatment help conserve and protect water resources while ensuring safe and clean water supplies for various purposes. Examples include:

Advanced water purification technologies such as reverse osmosis and ultraviolet (UV) disinfection

Biological wastewater treatment systems such as activated sludge and anaerobic digestion

Water reuse and recycling systems for reclaiming and repurposing treated wastewater for irrigation, industrial processes, and non-potable uses

Smart Grid and Energy Management: Smart

grid technologies integrate advanced communication, control, and monitoring capabilities into electricity grids to optimize energy distribution, improve grid reliability, and support the integration of renewable energy sources and electric vehicles. Examples include:

Smart meters and advanced metering infrastructure (AMI) for real-time monitoring of electricity consumption

Demand response systems for adjusting electricity demand in response to grid conditions and price signals

Grid-edge devices and distributed energy resources (DERs) such as rooftop solar PV systems and energy storage systems for decentralized energy generation and management

Green Building and Sustainable Infrastructure: Green building and sustainable infrastructure technologies focus on designing and constructing buildings, infrastructure, and urban environments that minimize environmental impact, improve resource efficiency, and enhance occupant health and well-being. Examples include:

Green building certification systems such as LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method)

Sustainable materials and construction techniques such as recycled and low-impact building materials, passive solar design, and green roofs

Smart city technologies for enhancing urban sustainability and resilience through integrated infrastructure, data analytics, and citizen engagement

These are just a few examples of the diverse range of environmental and sustainable technologies that are being developed and deployed to address global environmental challenges and promote a more sustainable future. Continued innovation, collaboration, and investment in these technologies are essential for achieving long-term environmental sustainability and resilience.

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Extended Reality (XR)

(Zeba Sheikh SYEJ)

Extended Reality (XR) is an umbrella term that encompasses various immersive technologies, including Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). These technologies blend the physical and digital worlds to create immersive experiences for users. Here's a breakdown of each component of XR:

Virtual Reality (VR): VR technology creates a completely immersive digital environment that users can interact with using specialized headsets or goggles. By blocking out the physical world and replacing it with a simulated environment, VR enables users to experience scenarios and environments that may not be possible or accessible in real life. VR applications range from entertainment and gaming to education, training, simulations, and virtual tourism.

Augmented Reality (AR): AR technology overlays digital content onto the real-world environment, enhancing the user's perception of reality. Unlike VR, which replaces the real world entirely, AR supplements it with additional information, graphics, or interactive elements. AR experiences can be accessed through mobile devices, smart glasses, or heads-up displays (HUDs). AR applications include mobile apps, navigation tools, marketing campaigns, remote assistance, and industrial maintenance.

Mixed Reality (MR): MR combines elements of both VR and AR, allowing virtual and real-world objects to coexist and interact in real-time. MR technology enables users to interact with digital content in the context of their physical environment, creating highly immersive and interactive experiences. MR experiences often require specialized headsets or glasses that incorporate sensors and cameras to map and track the user's surroundings accurately. MR applications span various industries, including gaming, education, design and visualization, remote collaboration, and advanced manufacturing.

XR technologies have the potential to transform numerous industries and applications, offering new ways to engage users, train employees, design products, visualize data, and collaborate remotely. As XR hardware becomes more accessible and affordable, and software development tools continue to evolve, the adoption of XR is expected to grow across sectors such as entertainment, healthcare, education, retail, architecture, engineering, and manufacturing. Continued advancements in XR hardware, software, and content creation are driving innovation. and expanding the possibilities for immersive and interactive experiences.

Quantum computing and drug discovery

Quantum computing has the potential to revolutionize drug discovery by significantly accelerating the process of drug design, optimization, and molecular simulation. Traditional drug discovery involves the screening of large libraries of chemical compounds to identify potential drug candidates, followed by optimization through iterative cycles of synthesis and testing to improve efficacy and safety. This process is computationally intensive and time-consuming, often taking years and requiring significant resources.

Quantum computers offer several advantages that can expedite various aspects of drug discovery:

Quantum Simulation: Quantum computers can simulate molecular interactions and properties with much greater precision and speed compared to classical computers. This capability allows researchers to model the behavior of complex molecules, understand molecular structures, and predict their properties, such as binding affinity to target proteins or potential side effects.

Quantum Machine Learning: Quantum machine learning algorithms can analyze vast amounts of chemical and biological data more efficiently, enabling the identification of patterns, relationships, and potential drug targets. Quantum machine learning techniques can assist in predicting drug-target interactions, optimizing chemical synthesis routes, and designing novel drug molecules with specific properties.

Quantum Optimization: Quantum computers excel at solving optimization problems, which are prevalent in drug discovery workflows, such as molecular docking, ligand design, and protein folding. Quantum optimization algorithms can search through vast chemical space more effectively, identifying promising drug candidates and optimizing their molecular structures for desired properties, such as potency, selectivity, and bioavailability.

Quantum Chemistry: Quantum computers can perform ab initio quantum chemistry calculations to accurately model molecular electronic structures and properties. These calculations are essential for understanding chemical reactions, energy landscapes, and reaction kinetics in drug discovery. Quantum chemistry simulations can guide the rational design of new drug molecules and predict their stability, reactivity, and toxicity.

While quantum computing holds great promise for advancing drug discovery, there are several challenges and limitations that need to be addressed:

Hardware Scalability: Current quantum computers have limited qubit counts and coherence times, restricting the size and complexity of problems they can effectively solve. Scaling up quantum hardware and improving qubit coherence are ongoing research areas.

Error Correction: Quantum computations are susceptible to errors due to noise, decoherence, and imperfect qubit operations. Developing error-correction techniques and fault-tolerant quantum algorithms is crucial for reliable quantum computing in drug discovery.

Algorithm Development: Designing quantum algorithms that leverage the unique properties of quantum computers and outperform classical algorithms for specific drug discovery tasks requires interdisciplinary collaboration between quantum physicists, chemists, and computer scientists.

Despite these challenges, ongoing research and development efforts in quantum computing, combined with collaborations between academia, industry, and government, hold the potential to unlock new opportunities and transform the field of drug disc.

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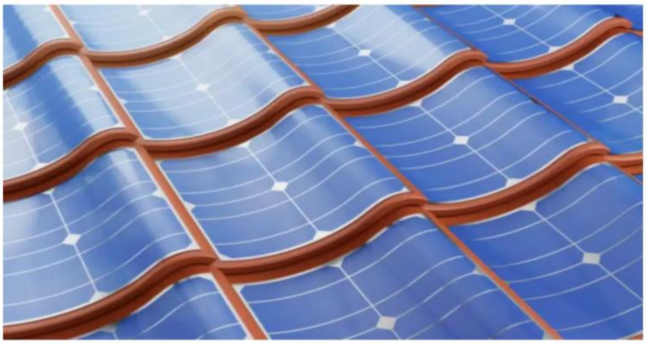
Stretchable Solar Cells Developed For Wearable Technology

(Prof N. A, Gade, HOD EJ)

The solar cells, stretchable and efficient, offer the potential to power wearable technology with renewable energy.

Researchers at the Korea Advanced Institute of Science & Technology (KAIST) are developing a sun-catcher made from organic materials that resembles rubber. According to a KAIST research report, the goal is for these flexible cells to power the increasingly common wearable technology in society eventually.

Through this research, not only did they develop the world's best-performing stretchable organic solar cell, but it is also significant that they developed a new polymer that can be applicable as a base material for various electronic devices that must be malleable and elastic.



The researchers stated that until recently, producing stretchable solar cells that maintain strong electrical ability has been challenging. However, their new organic polymer has significantly impacted the research, partly due to its lighter and more flexible nature.

Although not extensively detailed in the research summary, the polymer has achieved the "highest reported level of photovoltaic conversion efficiency" at 19%, indicating it can efficiently convert sunlight into power. The U.S. Energy Department highlights that organic polymers appeal due to their abundance on Earth and low production costs. The team has already surpassed the department's benchmark of approximately 11% efficiency for organic materials.

Additionally, this development would impress Stretch Armstrong, as it allows for ten times more stretchability than similar devices. Other solar innovations worldwide include paper-thin, flexible cells that can be laminated onto surfaces. Scientists have created organic sun-catchers in Hong Kong with nearly 20% efficiency. These advancements contribute to transforming our energy consumption to renewable solar, even for small devices like those in KAIST's work. The research team anticipates growth in the solar category.

The team successfully developed the world's highest-performing stretchable solar cell, capable of stretching up to 40% during operation, and demonstrated its potential for wearable devices.

As the market for wearable electronic devices expands quickly, stretchable solar cells that can operate under strain are gaining significant interest as a source of energy.

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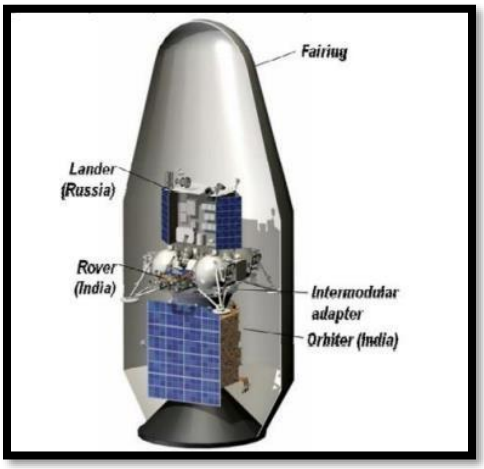
FAILURE OF CHANDRAYAAN 2

(Prof. A. H. Kale, Lecturer EJ)

CHANDRAYAAN 2 (India's second mission to the Moon), had failed to make a soft-landing on the lunar surface. The lander and rover malfunctioned in the final moments and crash-landed, getting destroyed in the process.

Chandrayaan II deviated from its path and couldn't make a soft landing. To finish the objectives set for Chandrayaan II, Chandrayaan III is slated to be launched by 2022. Chandrayaan III will have a different design from the Chandrayaan II. It will have a lander and rover like that of Chandrayaan II but no orbiter will be present with Lander and rover. With the aim of again exploring the moon surface ISRO has announced the next Moon mission that is Chandrayaan-3. It would have a "similar configuration" to the previous mission which would only include a Lander and a rover because India already has a working orbiter at the moon. An unnamed scientist new Lander would have stronger Legs to allow the spacecraft to withstand touching the surface at a higher velocity during landing.

The launch will be performed using the GSLV Mk III rocket. GSLV Mark 3 (GSLV Mk III) is a three- stage heavy lift launch vehicle that was also used for launching the Chandrayaan 2 in 2019.



It consists of a core liquid booster (L110), two solid rocket boosters (S200) on each side and a cryogenic upper stage (C25). India's biggest cryogenic engine CE-20 powers the upper stage. Two engines that burn 110t of fuel power the core stage.

The realization of Chandrayaan-3 involves various processes, including finalization of configuration, subsystem realization (manufacturing), integration, spacecraft-level detailed testing and a number of special tests to evaluate the systems performance on Earth.

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SKYLAB **(Bhagwat Abhijit SYEJ)**

"SKYLAB", was united states first space shuttle launched by NASA, lived in 24 weeks between May 1973 and February 1974. Skylab was launched on May 14,1973. Severe damage was sustained during launch and deployment, including the loss of the station's micro meteoroid shield/sunshade and one of its main solar panel. The launch is sometimes referred to as Skylab 1. The ATM (Apollo telescope mount) was attached to one end of the cylindrical workshop. It was used to study the sun, stars and Earth with no atmospheric interference. ATM had a length of 3.4 m and a diameter of 2.1 m.

Skylab had a mass of (90,610kg) , length is 82.4 feet (25.1m),widthis55.8feet(17.0m),21.67feet (6.61m), It travelled(1,400,000,000km) and included a workshop, a solar observatory, and several hundred life science and physical science experiments The station consisted of four major components: the Orbital Workshop(OWS),the Airlock Module(AM), the Multiple Docking Adapter(MDA),and the Apollo Telescope Mount (ATM).

Skylab's orbit eventually decayed, and it disintegrated in the atmosphere on July 11, 1979, scattering debris across the Indian Ocean and Western Australia. Skylab is very well known for its drastic incident that it is Unable to be re-boosted by the Space Shuttle, which was not ready until 1981,On January 28,1986, the broke apart 73 seconds into its flight, killing all seven crew members aboard. 41 years ago, the impending crash of the Sky lab space station defined the summer of 1979 for people across much of the southern hemisphere. The largest spacecraft ever to fall back to Earth was about to do so – but no one knew exactly when or where. Many people were genuinely frightened, no one has ever been killed by falling space debris, the cause of the incident Five years after the last Skylab mission, the space station's orbit began to deteriorate–earlier than was anticipated–because of unexpectedly high sunspot activity.

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Metaverse: Uplifitng Virtual Gaming

(Prof. P. G. Deshmukh, Lecturer EJ)

This generation is all about digitization and computing. It's like everyone has computers in them genes. Creating another world in the digital world is a part of digitization, namely virtual reality. Virtual reality seems great to hear, isn't it? It's an amazingly fascinating field creating a buzz in today's generation. Now let us first see what virtual reality really is.

Virtual reality is a simulated experience that can be similar or may vary from the real world. It is a computer-generated environment with objects which seem very real which makes them more attractive to us humans. Virtual reality is further divided into many different parts one of them being, GAMING. Virtual reality transforms gaming into another level. Let me tell you how, Virtual reality uses VR software as well as some special effects to give the gamers an amazing experience.

WHAT IS METAVERSE?

Metaverse completes our dreams of experiencing a different life which we can build for ourselves. We all see animated movies and dream of going into one and living in them, Metaverse can complete that dream o fours! So what is Metaverse? This concepthas been with us for the longest time, but it has been on a rise since2021.InThecovidpandemicsituationevery one was looking for something thrilling while sitting in homes. Games with virtual reality became our friend back then and since there is no looking back! Metaverse impacted our lives so much that it has now become a huge platform for different companies to showcase their abilities.

Metaverse uses blockchain technology to build its virtual world. The most amazing thing about Metaverse is that no one really has their impact on Metaverse. Metaverse is a platform for each one of us. No individual is a king here. There is a group of individuals who together create Metaverse. Metaverse is a combination of blockchain technology, as in if there is a game created using Metaverse, there may be digital streets or even NFTl and anything you could ever imagine of. Metaverse has so much that one can always learn something or the other from it.

METAVERSE AND GAMING:

Virtual gaming has completely transformed after Metaverse has entered the gaming industry. Now the user can get access to games without any financial commitment, unlike before. Currently, Metaverse based gaming technologies are leading the gaming industry and leading the gamers experiences to a whole new level! Web 3 is another platform which allows the users to experiment more in their gaming experience. Web 3 allows the gamers to move their characters from one game to another, isn't that fascinating?

Metaverse is creating mind blowing hype within the gaming industries as well as gamers. Metaverse can transform the gaming industry and convert it into an After going through so much, most of us now agree that Metaverse has had a great impact on gaming technology and has transformed it sn't it?

Astonishing field. Metaverse is referred to as an internet-based world which is entirely based on visual reality. Metaverse has become a talk of the town which makes it ouch the sky in just a few years. According to Fortune business sin sights Global visual reality in the gaming market was about 6.26 billion USD in 2020 which is about to boost to about 53.44 billion USD in 2028. What a jump!

Another factor which makes Metaverse so special is multiplayer gaming. Multiplayer gaming allows the user to invite their friends from the real world and interact with the min the game it self.Thisalsohelps in building relationships with the players.

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