KAMARAJ
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Department of Electrical and Electronics Engineering

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VISION OF THE DEPARTMENT:

To make the Department of Electrical and Electronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of the world.

MISSION OF THE DEPARTMENT:

Department of Electrical and Electronics Engineering is committed to impart highly innovative and technical knowledge in the field of Electrical and Electronics Engineering to the urban and unreachable rural student folks through Total Quality Education.

ENERGY HARVESTING

In today's world, energy consumption is an undeniable concern. As the demand for electricity continues to rise and non-renewable resources dwindle, the need for sustainable energy solutions becomes increasingly apparent. Among the innovative solutions that have gained attention in recent years, energy harvesting stands out as a promising avenue for powering our future. Energy harvesting, also known as energy scavenging, involves the capture and conversion of ambient energy from various sources into usable electrical power. This technology has the potential to revolutionize the way we generate energy and contribute significantly to a greener, more sustainable world.

UNDERSTANDING ENERGY HARVESTING

Energy is all around us, in various forms, waiting to be harnessed. Energy harvesting exploits this idea by capturing energy from sources like sunlight, mechanical vibrations, heat differentials, radiofrequency signals, and more. Unlike traditional energy generation methods that often rely on finite resources, energy harvesting focuses on tapping into sources that are consistently available in the environment. This approach holds the promise of minimizing our reliance on fossil fuels and reducing the carbon footprint associated with energy production.

TYPES OF ENERGY HARVESTING

Solar Energy Harvesting: Solar panels are perhaps the most well-known form of energy harvesting. They convert sunlight into electricity through photovoltaic cells, offering a clean and abundant source of power. As technology improves, the efficiency and affordability of solar panels continue to increase, making them a staple in renewable energy systems.

Vibration Energy Harvesting: Mechanical vibrations generated by everyday activities, such as walking or vehicle movement, can be harvested to produce electricity. Piezoelectric materials are often used to capture these vibrations and convert them into usable energy.

Thermoelectric Energy Harvesting: Temperature differences between two points can be transformed into electricity using thermoelectric materials. This technology is particularly useful in industrial settings where there are significant heat differentials, as well as in wearable devices that can harness body heat.

Radiofrequency (RF) Energy Harvesting: Radiofrequency signals that permeate the air from various wireless devices can be captured and converted into electricity. This method is especially promising for powering small electronic devices with low energy requirements.

Wind Energy Harvesting: Urban environments are often characterized by constant wind currents. Energy harvesting systems can capture this kinetic energy and convert it into usable power, contributing to localized energy generation.

APPLICATIONS OF ENERGY HARVESTING: SHAPING A SUSTAINABLE FUTURE

The realm of energy harvesting extends far beyond theoretical possibilities; it finds its practical applications in a wide range of fields, each contributing to a more sustainable and efficient future. As a student delving into this exciting domain, understanding these applications can provide insight into the immense impact energy harvesting can have on our daily lives.

1. IoT and Sensor Networks: The Internet of Things (IoT) revolution hinges on connectivity, and yet, powering countless sensors and devices can be a challenge. Energy harvesting offers a solution by enabling these devices to draw power from their surroundings. This translates to smart agriculture with soil moisture sensors, intelligent buildings with occupancy detectors, and even medical devices that can be powered by the human body's energy.

2. Wearable Technology: Imagine wearable devices that never require charging. Energy harvesting empowers wearable technology to capture energy from movement, body heat, and even ambient light. This means fitness trackers, smart watches, and medical monitors can function seamlessly without the need for frequent battery replacements.

3. Remote and Off-Grid Applications: Energy harvesting has the potential to revolutionize remote and off-grid locations. Deploying sensors, communication systems, and even small-scale power generation in these areas can be both cost-effective and environmentally friendly. This is

particularly significant for monitoring environmental conditions, wildlife tracking, and disaster management in areas with limited access to conventional power sources.

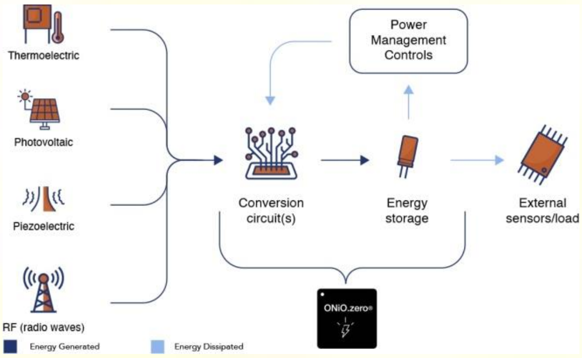
4. Structural Health Monitoring: In the realm of civil engineering, energy harvesting finds its way into infrastructure. Vibration energy harvesting can be utilized to power sensors that monitor the structural health of buildings, bridges, and other critical structures. This not only reduces maintenance costs but also enhances safety by providing real-time data on potential structural issues.

5. Environmental Monitoring: Monitoring and preserving the environment are crucial concerns, and energy harvesting aids in this endeavor. Autonomous sensors powered by harvested energy can continuously monitor air and water quality, track wildlife migration patterns, and assess the impact of human activities on ecosystems.

6. Transportation and Autonomous Systems: Energy harvesting contributes to the efficiency and sustainability of transportation systems. By capturing energy from vehicle vibrations, wind, or sunlight, it can power onboard electronics and sensors, reducing the overall energy consumption of vehicles and increasing their autonomy.

7. Human-Powered Systems: In scenarios where manual labor is involved, energy harvesting offers a valuable solution. Examples include kinetic energy recovery systems in bicycles and foot-powered chargers for electronic devices, allowing individuals to generate power while engaging in routine activities.

8. Renewable Energy Integration: Energy harvesting can complement existing renewable energy sources. For instance, integrating energy harvesting technologies into solar panels can enhance their overall efficiency by capturing wasted heat or vibrations and converting them into additional power.



ADVANTAGES:

Sustainability: Energy harvesting taps into renewable sources of energy that are readily available in the environment, reducing our reliance on non-renewable resources and contributing to a more sustainable energy landscape.

Efficiency: Energy harvesting technologies can convert ambient energy into usable power efficiently, often with minimal environmental impact. This efficiency enhances the overall energy generation process.

Versatility: Energy harvesting has a wide range of applications, from IoT devices to structural health monitoring, transportation, and environmental sensing. This versatility makes it a valuable tool for various industries.

Reduced Environmental Impact: By eliminating the need for disposable batteries and reducing the demand for conventional power sources, energy harvesting mitigates the environmental impact associated with battery production, usage, and disposal.

Extended Device Lifespan: Energy harvesting extends the lifespan of devices and sensors, as they can operate without the need for frequent battery replacements or recharging, leading to reduced maintenance costs.

Remote Accessibility: Energy harvesting enables the deployment of sensors and devices in remote or inaccessible locations, such as deserts, oceans, or rugged terrain, where traditional power sources are impractical.

Innovation and Integration: Energy harvesting encourages innovation in materials science, engineering design, and technology integration. This constant progress leads to more efficient and effective energy harvesting solutions.

DISADVANTAGES:

Low Power Output: Many energy harvesting methods currently produce low power outputs, limiting their applicability to low-energy devices. This constraint hinders their integration into high-power demand applications.

Dependence on Environmental Conditions: Energy harvesting efficiency often depends on specific environmental conditions, such as sunlight intensity, vibration frequency, or temperature differentials. Variability in these conditions can affect energy generation.

Initial Investment and Complexity: Implementing energy harvesting systems may require an initial investment in specialized materials, components, and engineering expertise. The complexity of integrating these systems can also pose challenges.

Limited Scalability: While energy harvesting is well-suited for small-scale applications, scaling up to meet larger energy demands presents challenges in terms of efficiency, cost-effectiveness, and technology scalability.

Technological Immaturity: Some energy harvesting technologies are still in their early stages of development, and their reliability and long-term performance may not be fully established.

Trade-offs in Design: Designing devices that balance energy harvesting capabilities with other functionalities (such as form factor and features) can be challenging, leading to compromises in design and performance.

Variable Energy Availability: The availability of ambient energy sources like sunlight and vibrations can vary depending on location and time of day, leading to fluctuations in energy generation.

CHALLENGES AND FUTURE OUTLOOK

While energy harvesting holds immense promise, it is not without its challenges. One major obstacle is the relatively low power output from many harvesting methods, which makes them suitable for low-energy applications rather than large-scale power generation. Additionally, the efficiency of energy conversion, the reliability of the harvesting devices, and the cost-effectiveness of implementing these systems need to be further improved.

Despite these challenges, researchers and engineers around the world are actively working to overcome these barriers. Advances in material science, nanotechnology, and engineering design are driving innovations in energy harvesting technology. As these technologies mature, we can expect to see increased integration of energy harvesting systems in various aspects of our lives, from self-powered sensors in smart cities to wearable devices that never require charging.

CONCLUSION:

The concept of energy harvesting is a testament to human innovation and adaptability. By harnessing the power of the environment around us, we have the potential to create a more sustainable and self-sufficient energy landscape. As students and future leaders, it's essential that we continue to explore, learn, and contribute to the field of energy harvesting. Through collaboration, research, and dedication, we can pave the way for a brighter and cleaner future, where our energy needs are met without compromising the health of our planet.

-K.Santhiya Bharathi-III EEE

DIGITAL ELECTRONICS

INTRODUCTION

In an era characterized by rapid technological advancement, digital electronics stands at the forefront of innovation, shaping industries and lifestyles alike. From the devices we use daily to the intricate systems that power modern infrastructure, digital electronics has profoundly impacted every facet of our lives. This article delves into the fundamental principles, applications, and the future potential of digital electronics.

APPLICATIONS OF DIGITAL ELECTRONICS

Computing Devices: The most ubiquitous application of digital electronics is in the realm of computing. Microprocessors, which are densely packed with transistors and logic gates, form the brains of computers, smart phones, and a myriad of other devices. These devices execute instructions at lightning speed, enabling complex tasks like data processing, image rendering, and AI-driven decision-making.

Communication Systems: The world's communication infrastructure, including the internet, relies heavily on digital electronics. Digital signals can be easily transmitted, received, and processed, enabling efficient and error-corrected communication over vast distances. Fiber-optic cables, cellular networks, and satellite communication systems all owe their efficacy to digital electronics.

Entertainment and Media: The music we stream, the movies we watch, and the games we play owe their existence to digital electronics. Digital storage formats like MP3, MP4, and various multimedia codes allow for efficient compression and distribution of audiovisual content.

Automation and Control: Industries have harnessed digital electronics for automation and control purposes. Programmable Logic Controllers (PLCs) use digital logic to manage manufacturing processes, while home automation systems enable users to control their environments remotely.

Medical Technology: From digital imaging systems like MRI and CT scans to wearable health monitors, digital electronics plays a pivotal role in modern healthcare. Precise measurements, rapid data processing, and real-time monitoring are made possible through the integration of digital technology.

THE FUTURE OF DIGITAL ELECTRONICS

Quantum Computing: Quantum computers, utilizing the principles of quantum mechanics, have the potential to revolutionize computing by solving complex problems exponentially faster than classical computers.

INTERNET OF THINGS (IOT): The IoT envisions a world where everyday objects are interconnected through the internet. This requires highly efficient and low-power digital electronics to enable seamless communication and data exchange between devices.

AI and Machine Learning: The growth of artificial intelligence and machine learning heavily relies on digital electronics. Hardware accelerators and specialized chips optimized for AI tasks are likely to become more prevalent, enhancing the speed and efficiency of AI applications.

MERITS OF DIGITAL ELECTRONICS:

Digital electronics brings forth remarkable advantages in modern technology. Its precision, achieved through discrete values of 0s and 1s, ensures accurate calculations and reliable operations, vital for scientific research and critical systems. Noise immunity is a key strength, making digital signals less susceptible to interference, ensuring robust communication over long distances and in challenging environments. Additionally, digital data can be replicated without degradation and stored indefinitely, enabling easy sharing, backup, and archival of information.

DEMERITS OF DIGITAL ELECTRONICS:

However, digital electronics is not without its drawbacks. The complexity of designing and managing intricate digital circuits poses challenges, demanding time and expertise. Power consumption is relatively high, as digital systems require continuous power for maintaining their states, raising concerns, especially in energy-sensitive applications. Conversion losses when translating between analog and digital signals can lead to inaccuracies. Moreover, initial setup costs can be substantial due to the need for specialized tools and knowledge, and rapid technological advancements can render digital devices obsolete sooner, contributing to electronic waste accumulation

CONCLUSION

In the grand tapestry of technological evolution, digital electronics stands as a cornerstone. Its ability to process and manipulate information with unparalleled precision has laid the groundwork for the modern digital age. As we continue to push the boundaries of what is possible, digital electronics will remain a driving force behind innovation, transforming the way we live, work, and interact with the world.

-K.Kowshika-III EEE

REVOLUTION OF ELECTRIC VEHICLE CHARGING STATION

INTRODUCTION

As the world transitions towards more sustainable transportation solutions, electric vehicles (EVs) have taken center stage. With this shift comes the essential infrastructure that enables EVs to thrive – electric vehicle charging stations. These stations are not just a convenience; they are a critical component of the green mobility revolution.

TYPES OF CHARGING STATIONS

Electric vehicle charging stations come in various types, each catering to different needs. Level 1 charging stations, often used at home, provide a standard 120-volt outlet. Level 2 charging stations offer faster charging through a 240-volt connection and are commonly found in public locations. For swift refueling, DC fast chargers deliver a high-voltage DC current directly to the vehicle's battery, significantly reducing charging times.

BENEFITS OVER TRADITIONAL REFUELING

Charging stations offer numerous advantages over traditional fossil fuel refueling. EV owners enjoy the convenience of charging at home, avoiding the need for frequent gas station visits. Moreover, the cost of electricity is generally lower than gasoline, resulting in potential long-term savings. EVs also produce zero tailpipe emissions, contributing to cleaner air and reduced greenhouse gas emissions.

INFRASTRUCTURE CHALLENGES AND SOLUTIONS

Expanding the charging network is a crucial challenge. To address this, collaborative efforts between governments, businesses, and communities are underway. Investments in charging infrastructure are necessary to ensure widespread access. Implementing smart charging solutions, optimizing charging station placement, and integrating renewable energy sources are steps towards overcoming these challenges.

ENVIRONMENTAL ADVANTAGES

The environmental benefits of electric vehicle adoption extend beyond zero emissions. EVs contribute to reduced noise pollution and decreased reliance on fossil fuels, ultimately leading to improved air quality and a healthier environment for all.

TECHNOLOGICAL ADVANCEMENTS

Charging station technology is evolving rapidly. Innovative designs incorporate user-friendly interfaces, payment systems, and remote monitoring capabilities. Bidirectional charging allows EVs to not only draw power from the grid but also feed excess energy back into it, contributing to grid stability.

CONDITIONS FOR EFFECTIVE CHARGING

For EV owners, optimizing the use of charging stations is essential. Planning routes around charging stations, taking advantage of off-peak electricity rates, and using smart phone apps to locate available stations can enhance the charging experience.

CHARGING STATIONS:

Beyond Urban Landscapes. Charging stations are not limited to bustling urban areas. They are spreading to suburban neighborhoods and even rural locations, ensuring that EVs are a feasible option for people living outside city centers. This expansion of charging infrastructure promotes inclusivity and widens the scope for EV adoption.

EDUCATIONAL OPPORTUNITIES

As a student, electric vehicle charging stations offer unique learning opportunities. Understanding the technology behind these stations, how they interact with the grid, and their role in sustainable transportation can contribute to a well-rounded education. Additionally, students studying engineering, urban planning, or environmental sciences can actively participate in designing, developing, and optimizing charging infrastructure.

FUTURE TRENDS AND DEVELOPMENTS

The future of charging stations holds exciting possibilities. Wireless charging technology is emerging, enabling EVs to charge without physical connections. Ultra-fast chargers promise even quicker refueling times, while increased integration of renewable energy sources into charging networks will make EVs even greener.

CHARGING STATIONS AND ENERGY GRID INTEGRATION

Charging stations can play a significant role in grid integration. They can help balance electricity demand by using smart charging technology to charge vehicles during off-peak hours. Moreover, bidirectional charging allows EVs to discharge energy back to the grid, contributing to grid stability during peak demand.

CONCLUSION

Electric vehicle charging stations are propelling us towards a sustainable and eco-friendly transportation future. With a range of charging options, environmental benefits, and supportive policies, the charging infrastructure is rapidly evolving to meet the demands of electric mobility. As technology advances and partnerships strengthen, the electric vehicle charging landscape is set to revolutionize the way we think about transportation and our impact on the planet.

-G.Keerthana-III EEE

EVENTS ORGANIZED:

- **Mr.S.Jegan** organized ISTE sponsored guest lecture on "Role of Electrical Engineers in Software industry" by **Mr.K.Sudareshwar,** APTIV components India Pvt Ltd, Tech Center India, Bangalore.
- **Mr.S.Jegan** organized ISTE sponsored project contest for III and IV year students. The Jury member is **Dr.Gnanavadivel** / EEE, MEPCO, Sivakasi.
- **Dr.A.Rajavel AP/EIE** and Mr.R.Ganesan, organized a Workshop titled "Electronics Circuit Design using MultiSim Tool" for VSVN college students on 06.01.2023.
- **Dr.D.Prince Winston ,** organized a Guest Lecture titled "Market needs and scope of Artificial intelligence and data science" for EEE Students by **Er.R.Anandha Murugan,** Chief technology officer, Prutity HR solution private Ltd on 21.01.2023.
- **Mr.S.Jegan,** organized a Alumni Guest Lecture titled "Job scopes in Electrical Engineering" by

Mr.K.Sundareswar, Software Engineer CI CD expert APTIV Components India Pvt., Ltd, Tech Center India Bengaluru" for EEE Students on 25.01.2023.

- **Dr.S.Kalyani,** organized a online seminar titled "Advanced Feature and tool box in MATLB R2022a" for faculty members by **Mr.C.H.Raviendar Reddy,** Application Engineer, Design Tech PvtLtd on 27.01.2023.
- **Dr.A.Rajavel, AP/EIE** and Mr.R.Ganesan, organized a Workshop titled "Advancement in Engineering" for VSVN college students on 10.02.2023.
- **Mr.T.Hariprasath,** organized a Guest Lecture titled "Design Thinking, Critical Thining and Innovation Design" for EEE Students by **Mr.M.J.Vishnu Prasad,** KPMG Consultant, Bangalore on 25.02.2023.
- **Dr.Sakthivel.G AP/EEE** and **Mr.Ramesh Prabhu.S AP/EIE**, organized a Symposium titled "Evatar'23 – National Level Technical Symposium" for National Level UG students on 01.03.2023.
- **Mr.S.Jegan,** organized a Guest Lecture titled "Job scopes in automotive industries" by **Ms.S.Swathika,** Associate Engineer, Caterpillar, Chennai" for EEE Students on 11.03.2023.
- **Mr. R. Ganesan,** organized a Guest Lecture titled "Personality Development for Core and IT jobs" by **Dr.S.Albert Alexander** Associate Professor Grade 2 Department of Energy and Power Electronics, VIT Vellore." for EEE Students on 11.03.2023.

ACHIEVEMENTS

- **D.Shalini, C.Bhavya Shree, K.P. Shree Nachiaar, Dr.D.Prince Winston** received a fund of Rs.10.5 Lakh grant from MSME Hackathon.
- **M.Pravin, Dr.D.Prince Winston** received a fund of Rs.11.5 Lakh grant from MSME Hackathon.
- **S.Benjamin Deva Sakayam, Dr.B.GuruKarthik Babu** received a fund of Rs.6 Lakh grant from MSME Hackathon.

CO-CURRICULAR ACTIVITIES

- **D.Shalini** has won first prize in Paper Presentation contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **D.Shalini** has won first prize in Circuit Debugging contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **C.Bhavya Shree** has won first prize in Circuit Debugging contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **C.Bhavya Shree** has won first prize in Paper Presentation contest at PSR

Engineering college, Sivakasi on 18.03.2023.

- **R.Shalini** has won third prize in Circuit Debugging contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **K.Bharathi** has won third prize in Circuit Debugging contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **N.Caroline Reshma** has won second prize in Circuit Debugging contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **A.Janani Priya** has won second prize in Circuit Debugging contest at PSR Engineering college, Sivakasi on 18.03.2023.
- **Sridhar.B** has won third prize in Technical Quiz contest at EESOR Association on 16.02.2023-17.02.2023.
- **Sridhar.B** has won second prize in Tricky Circuit contest at EESOR Association on 16.02.2023-17.02.2023.
- **Sridhar.B** has participated in Innovation and Design conducted by Startup TN Tirunelveli, Virudhunagar on 24.01.2023-25.01.2023
- **M.S.Vishal** has attended Internship at Jothi Electrical Industries on 03.02.2023-05.02.2023.
- **M.Gobinath** has attended Internship at Jothi Electrical Industries on 03.02.2023-05.02.2023.
- **K.Ramkumar** has attended Internship at Jothi Electrical Industries on 03.02.2023-05.02.2023.
- **K.Sri Sanjay Ram** has attended Internship at Jothi Electrical Industries on 03.02.2023-05.02.2023.
- **Sridhar.B** has attended Workshop on Astronomy at VigyanPrasar (Department of Science and Technology,)Ariviyal Palagai, Tamilnadu Science and Technology Centre-Madurai on 07.01.2023-08.01.2023.
- **Kirubhakaran.G** has attended Internship at Mine Power on 01.02.2023-17.02.2023
- **Ananth.K** has attended Internship at Mine Power on 01.02.2023-17.02.2023
- **S.Sudharson** has attended workshop on Maintenance and Troubleshooting of Electrical Appliances at MEPCO innovative Foundation on 18.01.2023-20.01.2023
- **S.Sudharson** has attended workshop on Green Power Generation at Sri Ramakrishna institute of technology, Coimbatore on 07.02.2023.
- **S.Sudharson** has attended internship on Web development at

FuturiK Technologies on 17.12.2023-31.12.2022.

- **P.Mohamed Luqmaan** has attended internship on Embedded C at Pheonix Softech on 19.12.2022-31.12.2022
- **D.Shalini** has participated Technical Quiz at PSR Engineering college, Sivakasi on 18.03.2023.
- **D.Shalini** has participated Project Display at PSR Engineering college, Sivakasi on 18.03.2023
- **C.Bhavya Shree** has participated Technical Quiz at PSR Engineering college, Sivakasi on 18.03.2023
- **C.Bhavya Shree** has participated Connection at PSR Engineering college, Sivakasi on 18.03.2023
- **C.Bhavya Shree** has participated Project Display at PSR Engineering college, Sivakasi on 18.03.2023
- **R.Shalini** has participated Treasure Hunt at PSR Engineering college, Sivakasi on 18.03.2023
- **K.Bharathi** has participated Treasure Hunt at PSR Engineering college, Sivakasi on 18.03.2023
- **N.Caroline Reshma** has participated Treasure Hunt at PSR Engineering college, Sivakasi on 18.03.2023
- **A.Janani Priya** has participated Treasure Hunt at PSR Engineering college, Sivakasi on 18.03.2023
- **N.Caroline Reshma** has participated Connection at PSR Engineering college, Sivakasi on 18.03.2023
- **A.Janani Priya** has participated Connection at PSR Engineering college, Sivakasi on 18.03.2023
- **R.Shalini** has participated Connection at PSR Engineering college, Sivakasi on 18.03.2023
- **K.Bharathi** has participated Connection at PSR Engineering college, Sivakasi on 18.03.2023

ETHICAL QUOTES :

"Live as if you were to die tomorrow. Learn as if you were to live forever".

- *Mahatma Gandhi*

GATE QUESTIONS:

1. A 1000×1000 bus admittance matrix for an electric power system has 8000 non-zero elements. The minimum number of branches (transmission lines and transformers) in this system are _____ (up to 2 decimal places).

   Ans: 3500

2. In a load flow problem solved by Newton-Raphson method with polar coordinates, the size of the Jacobianis If

there are PV buses in addition to PQ buses and a slack bus, the total number of buses in the system is ________.

Ans: 61

CHIEF EDITOR:

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EDITOR:

Mr.S. Jegan, AP/EEE

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