Department of Electronics And Communication Engineering

E-SPARSH

Technical Magazine   JUL - DEC 2021

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INSTITUTION

Vision of the Institute:
To be a premier center of learning in Engineering and Management education that evolves the youth into dynamic professionals with a social commitment

Mission of the Institute:

M1: To provide quality teaching- learning practices in engineering and management education by imparting core instruction and state-of-the-art infrastructure.

M2: To engage the faculty and students in acquiring competency in emerging technologies and research activities through Industry Institute Interaction.

M3: To foster social commitment in learners by incorporating leadership skills and ethical values through value-based education

DEPARTMENT

Vision of the Department:
To produce technically competent and research oriented Electronics and Communication Engineers to meet the Industrial and Social requirements.

Mission of the Department:

M1: To impart quality technical education in the field of Electronics and Communication Engineering through state-of-the art facilities and effective teaching learning process.

M2: To enrich the faculty and students with research and consultancy skills through Industry-Interaction and Training in Emerging areas of Electronics and Communication Engineering.

M3: To develop lifelong learning, leadership qualities and ethical values in learners to meet the societal and industrial needs.

Program Educational Objectives (PEOs)

PEO-I : Graduates will have the capabilities to analyze, design and develop innovative solutions for the problems in the field of Electronics and Communication Engineering using core competencies.

PEO-II :Graduates will have the ability to engage themselves in research and lifelong learning to achieve professional excellence.

PEO-III : Graduates will have successful career with leadership qualities, ethics and good communication skills in Electronics and Communication Engineering and related fields.

ECE PBRVITS | **DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**

Program Outcomes (POs)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. Communication: Communicate effectively on complex 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. 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)

PSO-1 : Graduates will be able to design and analyze Image Processing and communication systems concepts using appropriate tools.

PSO-2 : Graduates will be able to design and develop solutions for real world problems by applying the concepts of VLSI and Embedded systems.

DEPARTMENT PROFILE

The Department of Electronics and Communication Engineering (ECE) was established in the years 1998–99 with an intake of 60 and currently running with an intake of 240. It is 23 years old now and one of the most well-established departments in our Institution. It is also offering one post graduate programme with the specialization of VLSI Design with an intake of 30 students.

The Department is known for its esteemed faculty members who are renowned for their path-breaking contributions in the field of electronics and communications. It is well equipped with laboratories, audio-visual facilities and software tools such as MultiSim, ModelSim, Lab View, HFSS, MATLAB, and Xilinx.

We offer our students an excellent educational experience that combines intellectual rigor and cross-disciplinary breadth. The course contents are periodically updated to introduce new scientific and technological developments. Electronic design, communication technologies, hands-on programming, a research focus, and entrepreneurship skills are all part of our signature educational curriculum. The ECE domain is often regarded as a challenging culmination of hardware and software. Our curriculum focuses primarily on the knowledge and skills that emerging engineers need.

Electronics and Communication Engineering -ECE

As a part of nurturing the students with qualities like teamwork, technical skills and a glimpse of the competitive world of engineering and technology we are encouraging students to publish articles in the frontier areas of electronics and communication engineering.

I am confident that all the faculty members and student community involved with this technical e- magazine E-SPARSH have put their efforts in this in a way that the magazine both entertains and ignites the reader's mind.

I express my considerable appreciation to all the authors of the articles in this technical e- magazine E-SPARSH. These contributions have required a generous amount of time and effort. It is this willingness to share knowledge, concerns and special insights with fellow beings that has made this magazine possible.

Dr. A. Maheswara Rao
Professor & HOD, ECE.

1. PILGRIMS TRACKING AND IDENTIFICATION USING RFID TECHNOLOGY

Nowadays there were so many problems regarding the crowd control and security issues in the holy areas. Especially during pilgrimage, the pilgrimage authority is facing so many problems regarding crowd control, security issues, and identification of the pilgrims and the tracking of the pilgrims. India is a multi-religious country, in which so many holy areas are there every year; the respective authorities of the holy areas were facing many problems. But they are unable to provide those facilities in a full fledge manner. However, providing a solution to solve the problems completely is impossible. But we can reduce these problems up to some extent.

There are so many technologies which were implemented in Saudi Arabia during Hajj pilgrimage for to reduce these types of problems. Here, we are proposing one architecture in which we are using RFID technology. In our proposed paper, we are dealing the Tirupati pilgrims' case. Details about every pilgrim will be taken at the entrance, and each pilgrim will be given an active RFID tag with a specific UID numbers.

Here readers were used to read the UID numbers of each tag and these UID numbers are given to the host server where it updates the location of the particular pilgrim. In this we are providing these tags as wrist band tags.

Here we are using LAN network between the readers and the host servers, Intranet between the PML servers and Internet between the Gateway PML servers. A mobile sensor node is placed in every segmented area which is an additional feature in our paper Tirupati (Pilgrimage) is the most crowded gathering of Hindus on earth. It has unique characteristics with regard to the people who attend it (pilgrims), the place they meet in, and the kind of rituals they perform. These characteristics result in a set of challenges to the authorities in controlling the crowd, and identifying the personalities.
The following are some of the common difficulties faced by the pilgrims and the authorities alike:
• Identification of pilgrims (lost, dead, or injured)
• In Medical Emergencies.
• Guiding lost pilgrims to their camps.
• Crowd control.
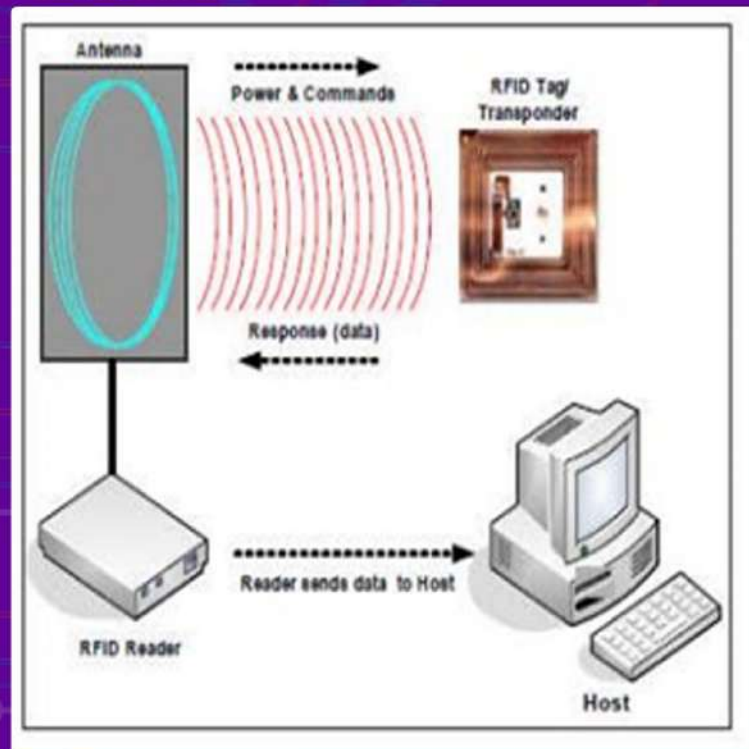
In the last few years RFID systems have experienced a surge of deployment partly due to drop in cost. The components used to build the RFID tags and readers have become more sophisticated as they provide greater functionality, longer reading range, and higher speed of data transfer. The tracking and monitoring system consists of mobile units carried by the pilgrims and a fixed Wireless Sensor Network (WSN) capable of gathering, processing, and routing data on locations and time stamps of mobile units carried by the pilgrims.

KUKATI SUMA
(18731A0419)

2. TECHNICAL ASPECTS OF GOOGLE LENS

Let's appreciate the fascinating features and technology behind Google lens through this article. The Google lens was first introduced by Google in 2017; in 2019 some more features were added. Upgraded android mobiles already have Google lens in the camera but one can easily install and enjoy the application. Talking about features, Google lens assists you to identify, search, shop, and translate, by just using your mobile camera.

For instance, using GL, take a picture of SSID sticker on the back of a Wi-Fi router, will automatically connect you to the Wi-Fi. While travelling u face language issues, point the lens at text on road side, some shop name, restaurant name, it will translate for you. U got stuck in some mathematical equation, capture it through lens, it will give step-by-step explanation for you. You want to identify any plant, animal, monument, landmarks, buildings, take help from Google lens. Want to buy something u seeing, capture and do the shopping.
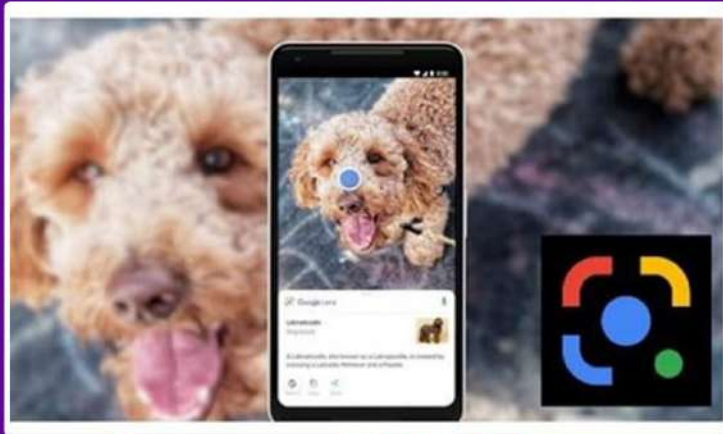
Technology behind this application:
After the Google Go captures an image, it needs to make sense (shapes and letters) for text and image recognition, so optical character recognition (OCR) uses Region Proposal Network (RPN). This is a fully convolutional network which predicts object and object ness scores at each position. It is trained to generate high quality region proposals and uses Fast R- CNN for detection. While capturing the text, it can have different fonts, styles or it can be blurry, it can cause the model to misunderstand words. To improve the accuracy, GL uses Knowledge Graph; this provides contextual clues, such as a word is a noun and should not be spell-corrected etc.

The Convolutional Neural Networks have become the backbone of most of the computer vision applications, for obvious reasons. It's not wrong to say that deep learning has majorly shifted towards designing CNN architectures.

Google lens also uses CNN and LSTM networks, as models, trained on data from a variety of sources, ranging from Re Captcha to scanned images from Google Books. To build a universal tool, Google used Camera X, to capture high-quality images with nominal lag. Camera X is a new Android support library, available in Jetpack. It is an abstraction layer over the Android Camera2 API that resolves device compatibility issues.

Lens uses Google Tran slate's Neural Network Translation Algorithms, to translate entire sentences at a time, rather than going word-by-word, this preserves proper grammar and diction. The most helpful way with Google Lens is reading the text aloud. For High-fidelity audio, Google applies machine learning to disambiguate and detect entities like dates, phone numbers and addresses, and generates realistic speech using Deep Mind's Wave Net. This application is indeed a breakthrough in mobile applications using artificial intelligence.

PAIDA HRITHIKA
(18731A0423)

3. BLOCK CHAIN DISTRIBUTED LEDGER TECHNOLOGY

Block chain is a peer-to-peer decentralized distributed ledger technology that makes the records of any digital asset transparent and unchangeable and works without involving any third-party intermediary. It is an emerging technology that is having huge public attention. It is allowing thousands of computers or servers to maintain a single secured and immutable ledger. Block chain can perform user transactions without involving any third party. It is also called Block chain wallet which is nothing but a program that allows one to spend BTC, ETH, etc. Such wallets are secured methods so one can have full control over.

HOW TO LEARN BLOCKCHAIN!?

Now - a - day's learning block chain is easy. There are many online courses and training sessions. Block chain council is one such organization that offers online training and certification programs for beginners. So they can have successful career in Block chain.

References: www.simplilearn.com

VALLEPU SREE LAKSHMI KAVYA
(18731A0433)

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4. LIQUID SOLAR ENERGY SYSTEM

That Can Store Electricity for 18 Years Due to a "radical" new scientific discovery, solar-powered electronics is one step closer to being a regular part of our life. A solar energy system that can store solar energy for up to 18 years and release it as heat when needed was developed by researchers at a Swedish university. By attaching the device to a thermoelectric generator, the researchers have now been successful in enabling it to generate electricity. The idea created at Chalmers University of Technology in Gothenburg may pave the way for self- charging electronics that utilize solar energy that has been stored and is available on demand, but it is still in its early stages.

Carbon, hydrogen, and nitrogen are used in the specifically created molecular system. The atoms in the solution rearrange and change shape when exposed to sunlight, causing the molecule to transform into an isomer with high energy. This serves as a method for storing liquid solar energy. Researchers were able to recover the power by combining a thermoelectric generator, an incredibly tiny device, with a liquid solar energy storage method. To power them, the technology can be included into headphones and smart watches.

The only usage of this technology so far has been to generate a little quantity of electricity, but researchers claim the results are very encouraging and may allow them to further modify the system to extract more energy.

AADI SARANYA
(18731A0438)

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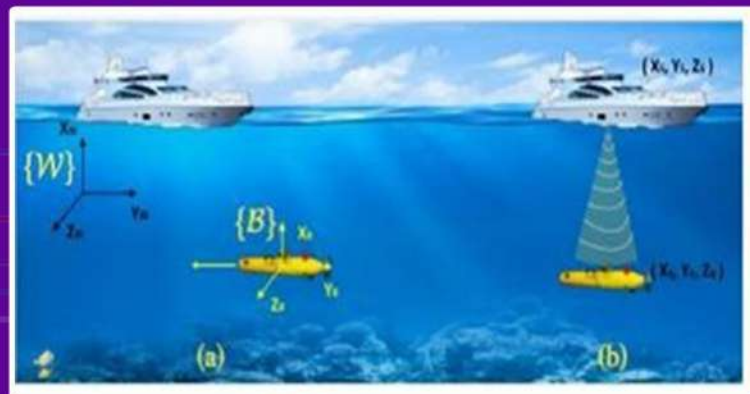## 5. HYBRID OPTICAL /ACOUSTIC UNDER WATER COMMUNICATION

Underwater wireless information transfer is of great interest to the military, industry, and the scientific community, as it plays an important role in tactical surveillance, pollution monitoring, oil control and maintenance, offshore explorations, climate change monitoring, and oceanography research. In order to facilitate all these activities, there is an increase in the number of unmanned vehicles or devices deployed underwater, which require high bandwidth and high capacity for information transfer underwater.

Existing Under Water Communication Techniques
In existing method, the RF Communication is not suitable for communication above 10 meters. Optical communication needs line-of-sight & for acoustic communication data transmission rates is low. To overcome these disadvantages an effective communication technique is proposed - "Hybrid Optical/Acoustic under water communication".

Proposed Method- "Hybrid Optical/Acoustic Under Water Communication":
University of Warwick-UK & King Abdullah University of science and technology- Saudi Arabia, extensively working on this "Hybrid Optical/Acoustic under water communication".

From above fig, (a) Acoustic communication is used by an AUV (Autonomous under Water Vehicles) to move closer to the surface ship equipment sensor. (b) Optical communication link is used once within this range for high data transfer. "Hybrid Optical/Acoustic under water communication" technique presents a novel optical acoustic two-way communication link.

1. The downlink of this communication system, from the ship or base station to the AUVs (Autonomous under Water Vehicles), is a wide-angle low-bandwidth acoustic link which is also used for tracking and locating the AUVs.

2. Meanwhile, the multiple uplinks are high-bandwidth, highly-directional optical links for data transmission between ship or base station to the AUV. The purpose of the underwater AUVs is to relay high volumes of monitored data to the base station where it processes the information.

Conclusion:

Proposed method - "Hybrid Optical/Acoustic under water communication" facilitates the Acoustic communication technique for navigation/tracking and Optical communication technique for data exchange.

References:

1. Localization and Tracking Control Using Hybrid Acoustic-Optical Communication for Autonomous Underwater Vehicles - Ding Zhang, IbrahimaN'Doye, TarigBallal, Tareq Y. Al-Naffouri, Mohamed-Slim Alouini, Taous- MeriemLaleg-Kirati, King Abdullah University of science and technology, Saudi. (Source: repository.kaust.edu.sa)

AVULA MANJU PRIYA
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6. ENERGY STORAGE AND ITS APPLICATIONS FOR AATMA NIRBHAR BHARAT

The energy storage is mainly used to compensate the variability of renewable energy sources. It means that the energy storage systems can absorb and store the excess power available with the renewable sources and deliver power to the load as and when required. With this feature, energy storage can increase the power availability time in the system and leads to improved utilization of renewable energy sources. They also provide the flexibility for the operation of distribution systems with their charge/discharge power control capability.

Applications of Energy Storage:

There are several applications of energy storage systems such as power balance, peak shaving, and demand response, etc. An example of grid connected battery energy storage is shown in Fig.
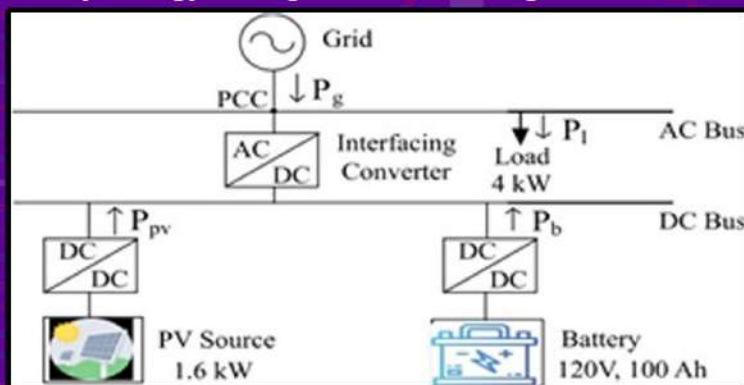
The active power balance is the essential condition to be satisfied for normal operation of the power system. The process of reducing peak power is considered as peak shaving. It is possible to reduce the peak powers by discharging the energy storage during peak power hours. The peak shaving is helpful for reducing the infrastructure cost. Because, the infrastructure cost depends on the peak power of the system.

Further, recently the time variation of energy price is introduced which is currently applicable for some of the industrial customers in India. For example, in case of the time-of-use energy price structure, the energy price is low during the off-peak load hours and it is more during the peak hours.

Therefore, reduction in the peak power leads to the reduction in the energy consumption cost. Further, the use of energy storage along with renewable energy sources allows the consumers to change their load profile patterns and participate in demand response programs. On the other side, in the transportation sector for electric vehicles applications, the energy storage is very important. The increased uses of EVs provide reduced carbon emissions as well as reduced environmental pollution. There are many start-ups coming in manufacturing of EVs.

In India, the extensive use of energy storage systems will enable the nation to achieve 40 per cent renewable energy penetration target by 2030. Therefore, considering the above discussion it is not sufficient to have only green energy technologies for the development of the country. It is important to have energy storage available with the green energy technologies for increased flexibility and several benefits which leads to the overall growth of the country. Therefore, it is very important to design and manufacture highly efficient energy storage systems in order to make India self-reliant in power industry.

References:

1. RampelliManojkumar, Chandan Kumar, Sanjib-Ganguly, and João. P. S. Catalão, 'Optimal Peak Shaving Control Using Dynamic Demand and Feed-In Limits for Grid- Connected PV Sources with Batteries,' in IEEE Systems Journal, vol. 15, no. 4, pp. 5560-5570, Dec. 2021.

2. https://www.niti.gov.in/making-india-aatmanirbhar-advance-battery-storage ttps://www.geospatial-world.net/blogs/what-is-lidar-technology-and-how-does-it- work/

आत्मनिर्भर भारत

DEVAIAH ELIZABETH
(18731A0444)

7. SWARM OF 3D PRINTING DRONES

A novel strategy for 3D printing, initiated by Imperial College London and Empa, the Swiss Federal Laboratories of Materials Science and Technology, employs flying machines known as drones that utilize collaborative construction techniques derived from nature like beehives. This innovation would indeed facilitate developing buildings and fixing them in high or complicated areas, transforming the way houses are built on the land.

The system, known as Aerial Additive Manufacturing (Aerial-AM), consists of drones that work collaboratively from a fixed schematic, trying to adapt its techniques as they progress. The 3D-printing drones fly autonomously, however, there is the involvement of manpower in the cycle that can check progress and act immediately if required using the data given by the quad copter.

The drones evaluate the printed geometric features on a real-time- time basis and modify their actions to make check they satisfy the design specs, with a manufacturing precision of 5 mm. The proof-of-concept prints included a 2.05-meter-high cylinder made up of 72 layers of polyurethane-based foam material and a 0.18- meter-high cylinder made up of 28 layers of a handmade building cement-like substance.

Reference:
1. https://singularityhub.com/2022/09/27/-like-a-swarm-of-bees-these-drones-can-3d-print-structures-while-in-flight/

BHUVANAGIRI POOJITHA
(19731A0405)

8. SMART BATHING: PERFECT FILL

It's a sophisticated bathtub made to make your bathroom feel like a spa. The temperature of the water, the amount of filling, the amount of fog, the color, and the timing of the draining are just a few of the variables that the users can regulate. The new Kohler Perfect Fill technology makes it simpler to run the ideal bath.

You'll need to set aside some time to run the ideal bath. The last thing anyone wants after a long day of work is a tepid tub, so we usually sit around and manually monitor the temperature as it fills. Even if the water is the ideal temperature right out of the tap, you still need to pay attention to the depth because a flood won't make you feel more at ease. Running a bath is therefore more work than you may imagine, especially when compared to having a shower.

By incorporating your tub into your smart home, Kohler's Perfect Fill drain system ought to be able to address that issue. The Perfect Fill technology will automatically draw your bath to the ideal temperature and depth with only a simple voice command or via the connected Kohler Konnect app - no monitoring is required.

Reference: https://weobserved.com/new-inventions-2022.html

CHAVALA POLAKSHI
(19731A0409)

9. DIGITAL TWINS

The digital twin is a technique that allows us to create a virtual replica of a real-world object and assess its advantages and disadvantages before putting the finished product in the hands of the customer. It is a computer program that uses actual data from physical objects or systems as inputs and provides predictions or simulations of how those inputs will influence the physical object or system. It is a modern method of market research that simulates products using computer-aided design (CAD). A digital twin, on the other hand, is more sophisticated and designed for real-time simulations.

IBM provides a fantastic illustration of a digital twin, which is a wind turbine equipped with sensors that provide crucial information on the weather and energy output of its digital twin. Digital twins have several advantages over previous models, including the ability to conduct a large number of simulations with reasonable accuracy and the ability to rapidly communicate newly discovered information to the wind turbine.
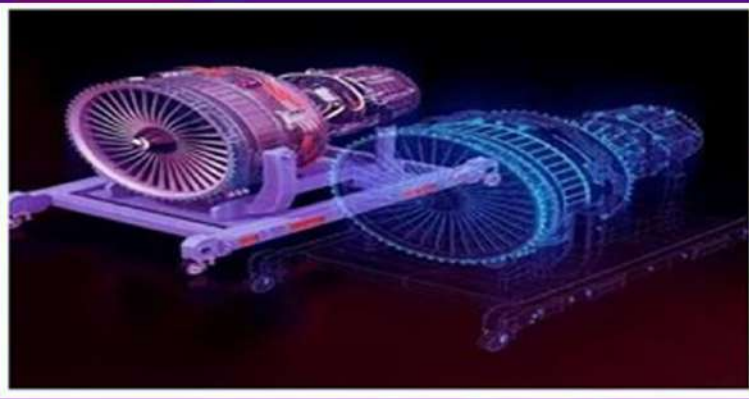
Use cases for digital twins

⊠ Before being built physically, items like turbines, railways, offshore oil platforms, and airplane engines can be developed and tested digitally.

⊠ Manufacturing is the industry where the adoption of digital twins is most likely advanced, with manufacturers currently simulating their operations with digital twins.

⊠ Digital twins of automobiles are created.

Reference: https://weobserved.com/new-inventions-2022.htm

Want to wirelessly control anything or have fun with leds or make a device which can interact with surroundings such as switching room lighting based on intensity of sun light? Then, probably you should try arduino.

Arduino.cc is a worldwide large community, that;s helping enthusiasts and hobbyists who are trying to learn embedded design. The arduino IDE, in which we write the code is user friendly and so easy. We can write the code in c language itself .

So check the capabilities of Arduino and google it for the possibilities we have wiith arduino. For interesting projects on arduino refer to www.arduino.cc www.instrucatables.com www.circuitstoday.com

PALLA SIREESHA (19731A0466)

NARA LAVANYA (19731A0463)

10. ARDUINO UNO

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller (MCU) and developed by Arduino.cc and initially released in 2010.The microcontroller board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable.

It can be powered by a USB cable or a barrel connector that accepts voltages between 7 and 20 volts, such as a rectangular 9-volt battery. It has the same microcontroller as the Arduino Nano board, and the same headers as the Leonardo board.The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.
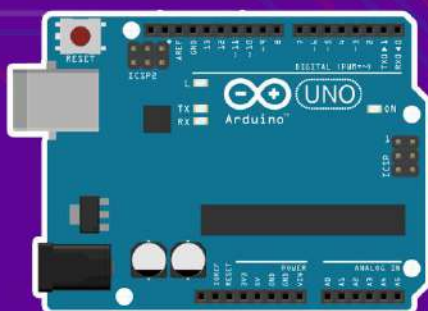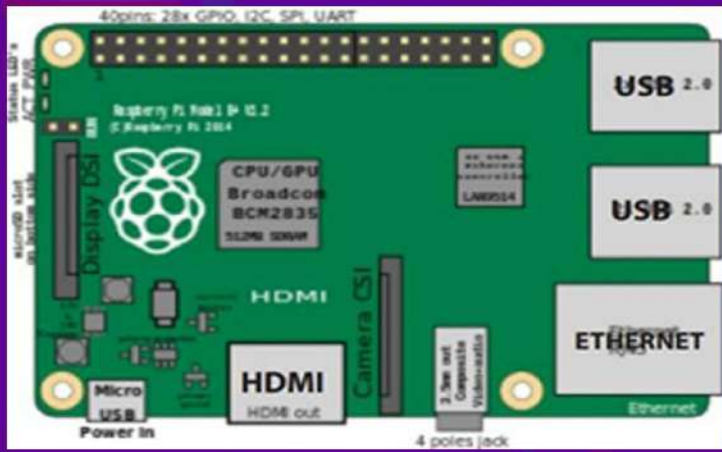

11. RASPBERRY PI

The Raspberry Pi is a series of credit card sized single board computers developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The original Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SOC), which includes an ARM1176JZFS 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (models B and B+) to 512 MB.

Specifications:

⊠ RAM: 512 MB,

⊠ Supports SD card for storage,

⊠ Networking: RJ45,

⊠ USB adapter,

⊠ Generic Keyboard and Mouse connectivity,

⊠ HD video controller,

⊠ Real Time Controller (RTC).

A wide variety of cool and innovative projects can be carried out using Raspberry pi. Though it is mainly intended for software development, a powerful performance for the projects can be extracted with the help of sophisticated hardware and software combination. It runs on a operating system that can be stored on the SD card. Some of the operating systems are ARCHLINUX ARM, PIDORA, OPENELEC, RASPBMC, PUPPY LINUX etc.

The OS is Linux based, and the programming code is written in Python language or equivalent. It supports Camera, Bluetooth, WIFI accessories and many more

PATHAPATI VAMSI PRIYA (19731A0468)

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12. INTERNET OF THINGS

Advances in sensor data collection technology, such as pervasive and embedded devices, and RFID Technology have led to a large number of smart devices which are connected to the net and continuously transmit their data over time. It has been estimated that the number of internets connected devices has overtaken the number of humans on the planet, since 2008. The collection and processing of such data leads to unprecedented challenges in mining and processing such data. Such data needs to be processed in real-time and the processing may be highly distributed in nature.

Even in cases, where the data is stored offline, the size of the data is often so large and distributed, that it requires the use of big data analytical tools for processing. In addition, such data is often sensitive, and brings a number of privacy challenges associated with it. This phenomenon of collective information processing for making our lives comfortable and better is so called as Internet of Things.

Internet of Things is an interconnection of 'things' i.e., physical devices by means of internet so that they can communicate with each other automatically to achieve greater range of services and results.
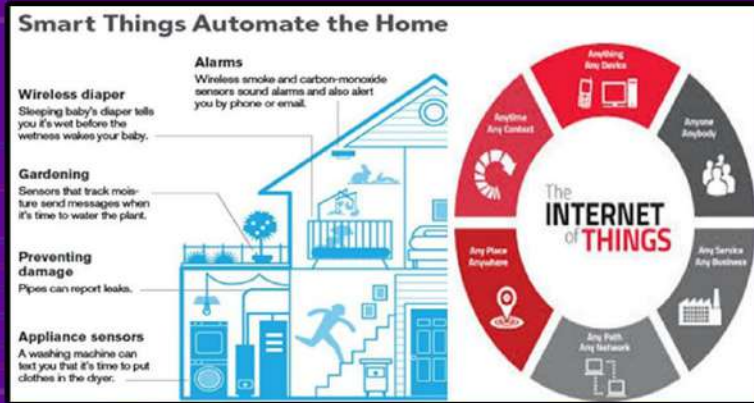
The physical devices include things embedded with electronics, software, sensors and connectivity. The services include Machine to Machine communication and Smart grid. Besides the plethora of new application areas for Internet connected automation to expand into, IoT is also expected to generate large amounts of data from diverse locations that is aggregated at a very high-velocity, thereby increasing the need to better index, store and process such data.

How it works:

Let us consider a house has a fire alarm, a GPS sensor, a programmed logic circuitry and an internet connection. One fine day, when no one is at home, fire was caught in a room due to a short circuit of electrical wires. Since, that house employed an IOT module; the firefighters can come directly to the house without anyone calling to them.

This is how it happens:

The fire alarm senses the accident and sends the information that some fire accident took place in the house. The GPS sensor helps in finding the exact location of the house. These two collectively work together and send the information to the nearby fire department by means of an Internet connection. Thus, the problem can be solved without any human notice.

Things we need: For interconnection of devices we need, first those devices whose output is as per our interest, such as in the above case, a sensor, a data accumulator or a data acquisition system, a data processor such as Big Data or equivalent and a good internet connection.

Applications:

a. Smart Cities, Smart Parking: Monitoring of parking spaces availability in the city.

b. Structural health: Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

c. Noise Urban Maps: Sound monitoring in bar areas and centric zones in real time.

d. Smartphone Detection: Detect iPhone and Android devices and in general any device which works with Wi-Fi or Bluetooth interfaces.

e. Electromagnetic Field Levels: Measurement of the energy radiated by cell stations and Wi-Fi routers.

f. Traffic Congestion: Monitoring of vehicles and pedestrian levels to optimize driving and walking routes.

g. Smart Lighting: Intelligent and weather adaptive lighting in street lights.

h. Waste Management: Detection of rubbish levels in containers to optimize the trash collection routes.

i. Smart Roads: Intelligent Highways with warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams. Smart Environment

j. Forest Fire Detection: Monitoring of combustion gases and pre-emptive fire conditions to define alert zones.

k. Air Pollution: Control of CO2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

l. Snow Level Monitoring: Snow level measurement to know in real time the quality of ski tracks and allow security corps avalanche prevention.

RAVI KOKILA
(19731A0470)

13. SOLAR ROOF SHINGLES

Solar shingles are a relatively invention that mimic the appearance of standard asphalt roof tiles. They safeguard your roof, possess the same resilience and adaptability as standard shingles, and use solar energy from the sun to power your house. Depending on the solar shingle brand, each solar shingle will generate between 13 and 63 watts of energy.

Like regular shingles, solar shingles are lightweight, simple to install and are made to endure rain, wind, and hail. They could be an excellent solution for your home's roof in terms of energy efficiency. Depending on size of your home and average energy usage, the number of solar shingles required to power your house may vary.

You can include solar shingles into your current roof, negating the need to replace the entire structure. However, if you already need to overhaul your roof, investing in a new roof is not a bad idea. Solar shingles lasts more than 20 years but efficiency is reduced.

Reference:https://www.makode-sign.com/blog/2022/03/08/new-technology-inventions-mako- wants-in2022/#section-9

CHENGA PRASANNA
(20731A0411)

14. SPACE BASED SOLAR POWER PROJECT

Pollution is one of the biggest concerns humans are facing. The major cause of the pollution is that we are unable to satisfy our needs with the energy that we currently possess. At present, solar energy is the most sustainable form of energy we possess. To make the most out of the solar energy, scientists are developing a new of absorbing solar energy from space and transmitting it to earth as microwave.

Recently, an experiment has been conducted between the mountains of Hawaii where they captured solar energy and beamed it about 92 miles to the main island of Hawaii. This demonstrates how we can transmit power wirelessly. In addition to microwaves, lasers also can carry energy for long distances as one of the features of laser is collimation (can travel long distances).

The reflectors collect he solar energy from the space and transmit that collected energy to earth. The energy is received with the help of a microwave antenna.

This project was discontinued when proposed in 1980 as the scientists knew too little to research on and couldn't invest in this idea as it was new. Currently, 100 million dollars is funded in research from all around the globe.
Reference: https://en.wikipedia.org/wiki/Space-based_solar_power

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15. THE BLUETOOTH TECHNOLOGY

Bluetooth is universal for short-range wireless voice and data communication. It is a Wireless Personal Area Network (WPAN) technology and is used for exchanging data over smaller distances. This technology was invented by Ericson in 1994. It operates in the unlicensed, industrial, scientific, and medical (ISM) band from 2.4 GHz to 2.485 GHz. Maximum devices that can be connected at the same time are 7. Bluetooth ranges up to 10 meters. It provides data rates up to 1 Mbps or 3 Mbps depending upon the version. The spreading technique that it uses is FHSS (Frequency-hopping spread spectrum). A Bluetooth network is called a Pico net and a collection of interconnected Pico nets is called scatter net.

Bluetooth technology has the ability of data tethering and apps which allows the handset to share its Internet connection with a connected device, so, you can answer e-mails with a laptop as Bluetooth technology is very useful in wireless communications. FM radio, mobile phones & television all use the radio waves to send the information wirelessly, and while Bluetooth technology also uses the radio waves, it transmits them over a shorter distance.

It operates in the unlicensed industrial, scientific, and medical (ISM) band at 2.4 to 2.485 GHz by using a spread spectrum, the frequency hopping and the full-duplex signal at a nominal rate of 1600 hops/sec.
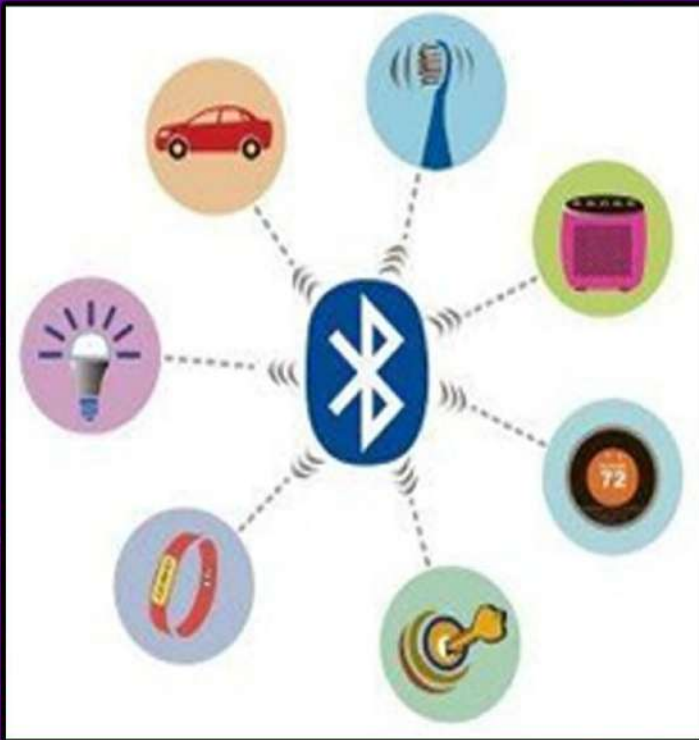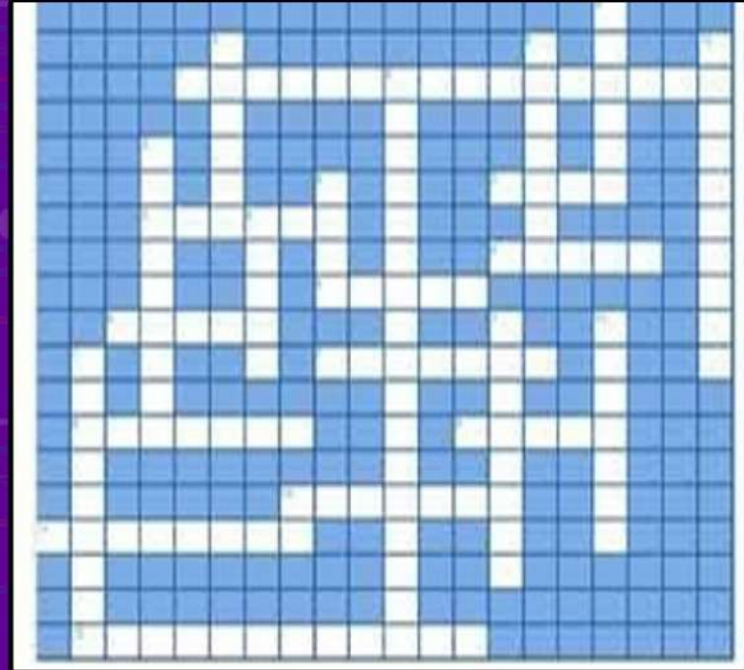
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ELECTRONICS CROSS WORD

Across

1. Two resistors connected together, across a power supply (9, 7)
2. Process used to remove unwanted copper from a PCB (4)
3. Color band used to indicate the number 7 (6)
4. Color band used to indicate the number 0 (5)
5. Connects the components together on a PCB (5)
6. A component which allows current to flow only in one direction (5)
7. Makes a sound (7)
8. A collection of components, connected together (7)
9. The L in LED (5)
10. Flows through a circuit (7)
11. Electronics that works with real voltages (9)
12. Type of capacitor, which is polarized (12)

Down

1. Shape of the schematic symbol for a resistor (9)
2. Stores charge (9)
3. Electrically joints components to a PCB (6)
4. Energy that allows the electronics to work (5)
5. Check the board works, after construction (4)
6. A chip / part with two row of pins (10, 7)

7. Component with colored bands to determine it's value (8)

8. Something that can only be true / false, 0 or 1 (7)

9. Used to turn things on and off (6)

10. Letters used to mark commercial electronics sold in Europe (2)

11. Measured across components such as batteries (7)

12. A component that acts like an electronic switch (10).

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TECHNICAL QUIZ

1. The velocity factor of a transmission line depends on
A. temperature
B. skin effect
C. relative permittivity of dielectric
D. none of the above

2. A loss less line of characteristic impedance Z0 is terminated in pure reactance of -jZ0 value. VSWR is
A. 10   B. 2   C. 1   D. infinity

3. In a klystron amplifier the input cavity is called
A. buncher   B. catcher
C. Pierce gun   D. collector

4. In a circular waveguide the dominant mode is
A. TE01   B. TE11   C. TE20   D. TE21

5. The reflection coefficient on a line is 0.2 ∠45°. The SWR is
A. 0.8   B. 1.1   C. 1.2   D. 1.5

6. Microwave resonators are used in
A. microwave oscillators
B. microwave narrow band amplifier
C. microwave frequency meters
D. all of the above

7. Assertion (A): TWT uses a focusing mechanism to prevent the electron beam from spreading.
Reason (R): In a TWT the electron beam has to travel a much longer distance than in klystron.
A. Both A and R are correct and R is correct explanation of A
B. Both A and R are correct but R is not correct explanation of A
C. A is correct but R is wrong
D. A is wrong but R is correct

8. In a TWT the amplitude of resultant wave travelling down the helix
A. increases exponentially
B. increases linearly
C. decreases exponentially
D. is almost constant

9. Which of the following is not a travelling wave?
A. $e = E_m \sin(\beta x - \omega t)$
B. $e = E_m \cos(\beta x - \omega t)$
C. $e = E_m \sin(\omega t - \beta x)$
D. $e = E_m \sin(\beta x)$

10. Both Impartt and Trapatt devices use avalanche effect
A. True
B. False

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