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CREATING TECHNOLOGY
LEADERS OF TOMORROW
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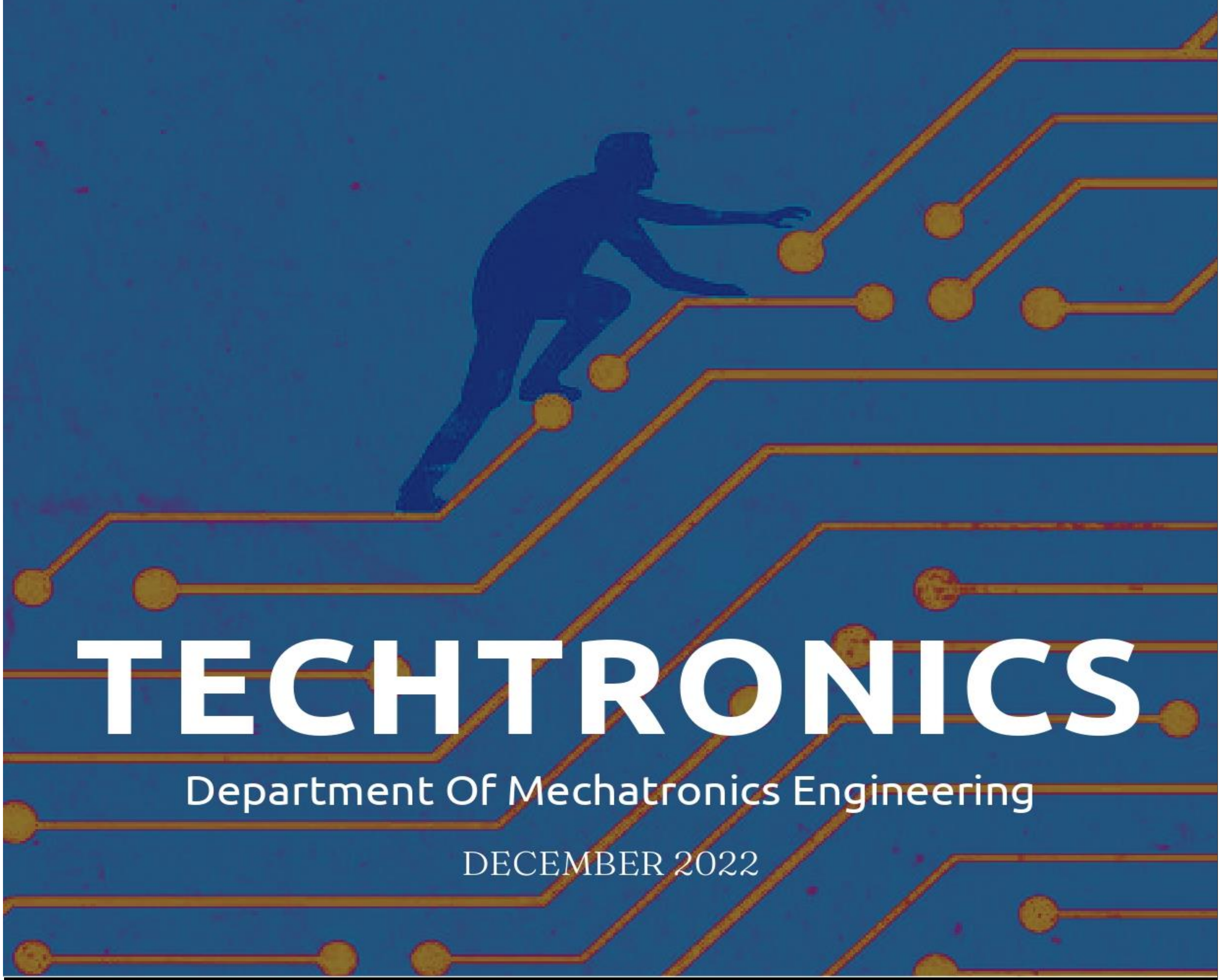

TECHTRONICS

Department Of Mechatronics Engineering

DECEMBER 2022

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CREATING TECHNOLOGY
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Department of Mechatronics Engineering

JYOTHI ENGINEERING COLLEGE, CHERUTHURUTHY

THRISSUR 679 531

VISION OF THE INSTITUTE

Creating eminent and ethical leaders through quality professional education with emphasis on holistic excellence.

MISSION OF THE INSTITUTE

- To emerge as an institution par excellence of global standards by imparting quality engineering and other professional programs with state-of-the-art facilities.
- To equip the students with appropriate skills for a meaningful career in the global scenario.
- To inculcate ethical values among students and ignite their passion for holistic excellence through social initiatives.
- To participate in the development of society through technology incubation, entrepreneurship and industry interaction.

VISION OF THE DEPARTMENT

Create eminent and ethical leaders committed to profession and society in the field of Mechatronics through quality professional education to excel in industrial automation and innovation.

MISSION OF THE DEPARTMENT

- To impart orientation to meet the challenges of the modern industry and provide motivation for research.
- To provide quality education to create graduates with professional and social commitment.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

PEO 1: Graduates shall have a good foundation in the fundamental and practical aspects of Mathematics and Engineering Sciences so as to build successful and enriching careers in the field of Mechatronics Engineering and allied areas.

PEO 2: Graduates shall learn and adapt themselves to the latest technological developments in the field of Mechanical & Electronics Engineering which will in turn motivate them to excel in their domains and shall pursue higher education and research.

PEO 3: Graduates shall have professional ethics and good communication ability along with entrepreneurial skills and leadership skills, so that they can succeed in multidisciplinary and diverse fields.

PROGRAMME SPECIFIC OUTCOMES (PSO's)

Graduate possess -

PSO 1: Professional skills: Associate the concepts related to electrical, electronics, Mechanical, Robotics, Control and Instrumentation to solve the challenges of modern industries.

PSO 2: Problem solving ability: Analyze and design systems with modern tools for the benefit of the society.

PROGRAMME OUTCOMES (POS)

Engineering Graduates will be able to:

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 environ-mental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and re- search 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 mod- ern 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.

HOD'S MESSAGE

Prof. Dr ANOOPA JOSE CHITTILAPPILLY

HOD

"The department of Mechatronics Engineering has consistently maintained an exemplary academic record. The well qualified faculty and courses of this department aid to prepare students for careers as professional engineers through an education in fundamental principles as well as in the context of real application and design environment. The department encourages all students to take advantage of the opportunities provided by the institute. I feel extremely proud and take this opportunity to congratulate the magazine committee in bringing out the platform TECHTRONICS in representation of the Mechatronics Department and wish them the very success in releasing it."

Magazine Committee Members

Ms. NYNI K. A. , AP, MR

Ms. ATHIRA P. , AP, MR

Mr. JOEL VARGHESE, LJEC19MC045

Ms. SAJNA SUNNY, JEC19MC039

“We would like to thank all the staff and students of the Mechatronics Department for their constant effort in the launching of the Magazine.

We are also thankful to our Management and Principal for their support and encouragement. We are grateful to our reviewers for their frank opinions and constructive suggestions, from our colleagues and students.”

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MAGNETIC LEVITATION

-Dr. ANOOPA JOSE CHITTILAPPILLY,
HOD, MR

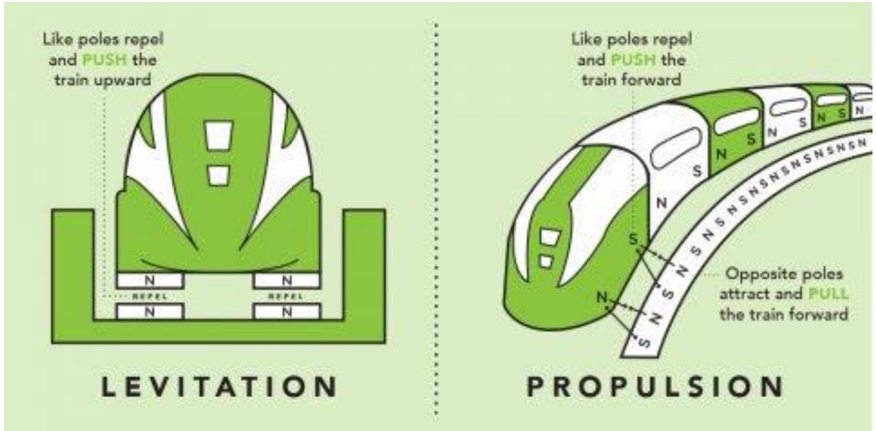
Magnetic levitation (Maglev) or magnetic suspension uses the principle of suspending an object with no support other than magnetic fields. Magnetic force counteracts the effects of the gravitational and other accelerations.

Magnetic levitation is used for maglev trains, contactless melting, magnetic bearings and for product display purposes.

With Maglev train it is possible to travel long distances in short duration without boarding a plane. Maglev train technology developed at Brookhaven National Laboratory. First patent for Maglev train was received by James Powell and Gordon Danby of Brookhaven in late 1960s. While in a traffic jam, Powell thought of a better way to travel on land and dreamt of using superconducting magnets to levitate a train car. The first Maglev train commercially operated in Shanghai in 2004.

Superconducting magnets are electromagnets that are cooled to extreme temperatures during use, which dramatically increases the power of the magnetic field. These superconducting magnets when cooled to less than 450 degrees Fahrenheit below zero, generate magnetic fields up to 10 times stronger than ordinary electromagnets. This is strong enough to suspend and propel a train.

Superconducting magnets suspend a train car above a U-shaped concrete guideway. Like ordinary magnets, these magnets repel one another when matching poles face each other. These magnetic fields interact with simple metallic loops set into the concrete walls of the Maglev guideway. The loops are made of conductive materials, like aluminum, and when a magnetic field moves past, it creates an electric current that generates another magnetic field.



Three types of loops are set into the guideway at specific intervals to do three important tasks: one creates a field that makes the train hover about 5 inches above the guideway; a second keeps the train stable horizontally. The third set of loops is a propulsion system run by alternating current power. Electrifying the propulsion loops generates magnetic attraction and repulsion that both pull the train forward from the front and push it forward from behind.

The two primary issues involved in magnetic levitation are lifting forces: providing an upward force sufficient to counteract gravity, and stability: ensuring that the system does not spontaneously slide or flip into a configuration where the lift is neutralized.

Another big benefit is safety. Since Maglev trains uses powered guideway, any two trains travelling the same route cannot catch up and crash into one another because they’re all powered to move at the same speed.

Maglev leads to a much more flexible transportation system in the future as computer algorithms can be used for routing things very efficiently and we could change the scheduling of the entire network on the fly. With Maglev, there is no driver and vehicles move where the network sends them.

MILESTONES IN THE HISTORY OF ROBOTICS

-Dr. VIVEK LUKOSE,
ASSOCIATE PROFESSOR, MR

Robot is a reprogrammable multifunctional manipulator designed to move material, parts, tools or specialized devices through various programmed motions for the performance of a variety of tasks.

The term robot was first introduced into our vocabulary by the Czech playwright Karel Capek in his 1920 play Rossum's Universal Robots, the word robota being the Czech word for work.

The robot was born out of the marriage of two earlier technologies: teleoperators and numerically controlled milling machines. Teleoperators, or master-slave devices, were developed during the second world war to handle radioactive materials. Computer numerical control (CNC) was developed because of the high precision required in the machining of certain items, such as components of high performance aircraft. The first robots essentially combined the mechanical linkages of the teleoperator with the autonomy and programmability of CNC machines.

Several milestones on the road to present day robot technology are listed below:

1770 – Mechanism-driven life-like machines that can draw, play instruments, and clocks made in Germany and Switzerland.

1830 – Cam programmable lathe invented.

1921 – Premier of Karel Capek's play R.U.R.

1942 – Asimov coins the word 'robotics' and gives his three laws of robotics.

1946 – ENIAC, the first electronic computer, developed at the University of Pennsylvania.

1947 – First electric powered tele-operated robot at MIT.

1948 - a teleoperator is developed incorporating force feedback

1948 – Book on feedback control, Cybernetics, written by Prof. Norbert Weiner of MIT.

1948 – Transistor invented at Bell Laboratories.

1949 - Research on numerically controlled milling machine is initiated

1952 – IBM's first commercial computer, IBM 701.

1954 – First programmable robot patented and designed by Devol.

1955 –Paper by J. Denavit and R. S. Hartenberg (1955) provides a convention to describe links and joints in a manipulator.
1956 - Joseph Engelberger, a Columbia University physics student, buys the rights to Devol's robot
1959 – Unimation Inc. founded by Engelberger; CNC lathe demonstrated at MIT.
1961 – General Motors buys and installs the first Unimate at a plant in New Jersey to tend a die casting machine.
1961 - the first robot incorporating force feedback is developed
1963 - the first robot vision system is developed
1968 – Shakey, first mobile robot with vision capability, made at SRI.
1970 – The Stanford Arm designed with electrical actuators and controlled by a computer.
1973 – Cincinnati Milacron's (T3) electrically actuated, mini-computer controlled industrial robot.
1973 - the first robot programming language (WAVE) is developed at Stanford
1975 - Unimation Inc. registers its first financial profit
1976 - the Remote Center Compliance (RCC) device for part insertion in assembly is developed at Draper Labs in Boston
1976 - Robot arms are used on the Viking I and II space probes and land on Mars and these arm scoops Martian soil for analysis.
1978 – Unimation Inc. develops the PUMA robot — even now seen in University labs!
1979 - the SCARA robot design is introduced in Japan
1981 - the first direct-drive robot is developed at Carnegie-Mellon University
1981 – Robot Manipulators by R. Paul, one of the first textbooks on robotics.
1982 – First educational robots by Microbot and Rhino.
1982 - Fanuc of Japan and General Motors form GM Fanuc to market robots in North America
1983– Adept Technology, maker of SCARA robot, started and successfully markets the direct drive robot.
1986 - the underwater robot, Jason, of the Woods Hole Oceanographic Institute, explores the wreck of the Titanic, found a year earlier by Dr. Robert Barnard.
1988 - Staubli Group purchases Unimation from Westinghouse
1988 - the IEEE Robotics and Automation Society is formed
1993 - the experimental robot, ROTEX, of the German Aerospace Agency (DLR) was flown aboard the space shuttle Columbia and performed a variety of tasks under both tele operated and sensor-based offline programmed modes
1995 - Intuitive Surgical formed to design and market surgical robots.
1996 - Honda unveils its P3 Humanoid robot; a project begun in secret in 1986.

1997 – the Sojourner mobile robot travels to Mars aboard NASA's Mars Path Finder mission and sends back pictures of Mars.

1997 - the first robot soccer competition, RoboCup-97, is held in Nagoya, Japan and draws 40 teams from around the world

2000 – Honda demonstrates Asimo humanoid robot capable of walking.

2001 – Sony releases second generation household robot, a robot dog named Aibo.

2001 - the Space Station Remote Manipulation System (SSRMS) is launched in space on board the space shuttle Endeavor to facilitate continued construction of space station

2001- first telesurgery is performed when surgeons in New York performed a laparoscopic gall bladder removal on a woman in Strasbourg, France

2001- robots are used to search for victims at World Trade Center site after September 11th tragedy

2002 - Honda's Humanoid Robot ASIMO rings the opening bell at the New York Stock Exchange on February 15th

2004 - Spirit and Opportunity explore Mars surface and detect evidence of past existence of water.

2007 – Humanoid robot Aiko capable of "feeling" pain.

2009 – Micro-robots and emerging field of nano-robots marrying biology with engineering. It is the computer brain that gives the robot its utility and adaptability. The so-called robotics revolution is, in fact, part of the larger computer revolution.

TECHNOLOGIES FOR OBSERVING AND MONITORING PLASTICS IN THE OCEANS

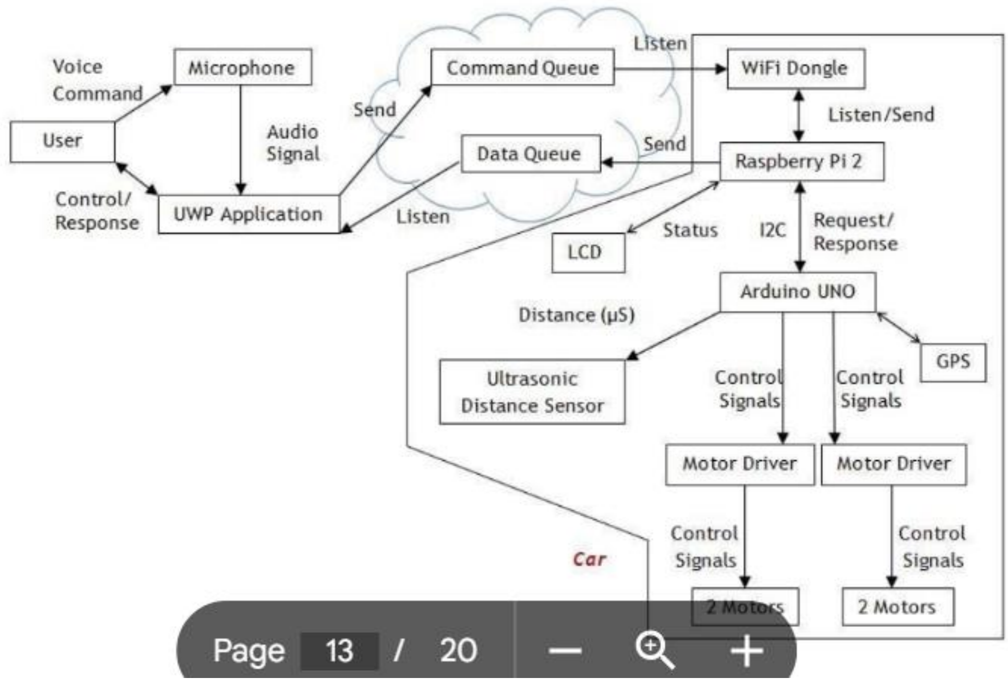
-AJIN K J, JEC19MC002

There are a number of independent projects focused on better monitoring plastics in the environment, including the ocean. In particular, projects in the EU, USA, and Japan have participated in working groups initiated by UN Environment. These projects are focusing on the monitoring of marine litter and plastics, management of information and knowledge, risks assessments, exploitation of opportunities and synergies, and, as far as possible, estimation of relevant costs and benefits. Measurements proposed include satellite and airborne remote sensing, surface and underwater in situ measurements, and crowd-sourcing observations. The need for extensive data processing and the use of deep learning techniques is acknowledged. The sensors considered range from multi- and hyperspectral sensing or other optical sensing to radar imaging aiming at a wide geo-spatial coverage. There is a need to develop global coordination mechanisms to ensure that societal knowledge needs are met and decisions on reducing plastic pollution in the ocean are informed by this knowledge. OES in collaboration with the Blue Planet Initiative of the Group on Earth Observations (GEO) and the UN environment, is leading an initiative aiming at this coordination. Plastics are integrated in almost everything we produce, trade and use from the cloths we wear to the houses and buildings we live and work in, the way our food and on-line orders are protected, the infrastructure that provides services for water, power, sewage, communication, and transportation to us, and the many electronic tools we utilize. In 2015, an estimated 448 million tons of plastics were produced and of that 161 million tons had a use time of less than 6 months. This massive production of plastics, along with an estimated average use time of 5 years compared to a plastics life-time of between 500 and 5000 years has led to a steady and potentially catastrophic burden of plastics in all flows in the Earth's life-support system. And many of these flows in air and water transport plastics into the ocean. In fact, an estimated 10the plastics produced end up in the ocean. If the current trajectory continues, then by 2050 there would be more plastics than fish in the world's oceans . Plastics have been found in the guts of marine megafauna and humans and in the tissues of fish. The mounting global challenge of plastic pollution is impacting the marine biosphere and the food web . Over time, plastics in the environment break down into smaller pieces. Impacts of plastics on the biosphere including humans depend on the particle size and the additives incorporated during production. Macroplastics (larger than 5 mm) can physically hurt animals and clog the digestive systems if consumed. Microplastics (less than 5 mm) can accumulate in organism throughout the food web with health impacts currently not well understood. Nanoplastics (less than 1 m in size) have been integrated at the cellular level in some organisms, and they can cross the blood-brain barrier. The growing plastic pollution in the ocean comes with a high risk for the marine biosphere and with unknown risk for humanity. Information on the quantity of plastic in the ocean and its impacts on marine life and beyond is limited. There is an urgent need to establish an integrated information system that meets the societal knowledge needs for decision and policy making addressing this global challenge. While there are many promising observation techniques and approaches for in situ and remote sensing, many of these techniques need to be adapted and improved to provide useful observations. A wide range of sensorbased, harvested, and crowd-sourced observations need to be integrated with a global modeling system. IEEE/OES in collaboration with the Blue Planet Initiative of the GEO and UNEP is leading an initiative aiming to bring together experts and social agents to co-develop the information and modeling system.

MULTIPLE MOTION CONTROL SYSTEM OF ROBOTIC CAR USING IOT

-ALBIN DAVID C, JEC19MC004

The proposed system consists of a robotic car equipped with multiple motors and sensors, which are controlled through a central processing unit (CPU). The system utilizes an IoT platform to communicate with the CPU, enabling real-time monitoring and control of the robotic car. The IoT platform also enables the collection of sensor data, which can be used to make informed decisions about the control of the robotic car. The multiple motion control system allows for precise control of the robotic car, with the ability to control each motor independently. This enables the robotic car to perform complex maneuvers, such as turning and reversing, with high accuracy. The system also includes obstacle detection sensors, which enable the robotic car to navigate around obstacles in its path. The proposed system has significant potential applications in a variety of fields, including manufacturing, agriculture, and transportation. For example, the system could be used in a manufacturing facility to transport goods from one location to another, or in an agricultural setting to perform tasks such as planting or harvesting. The system could also be used in transportation settings, such as in self-driving cars or delivery vehicles. Overall, the multiple motion control system of a robotic car using IoT technology presents a promising avenue for the development of advanced robotic systems. The system has the potential to

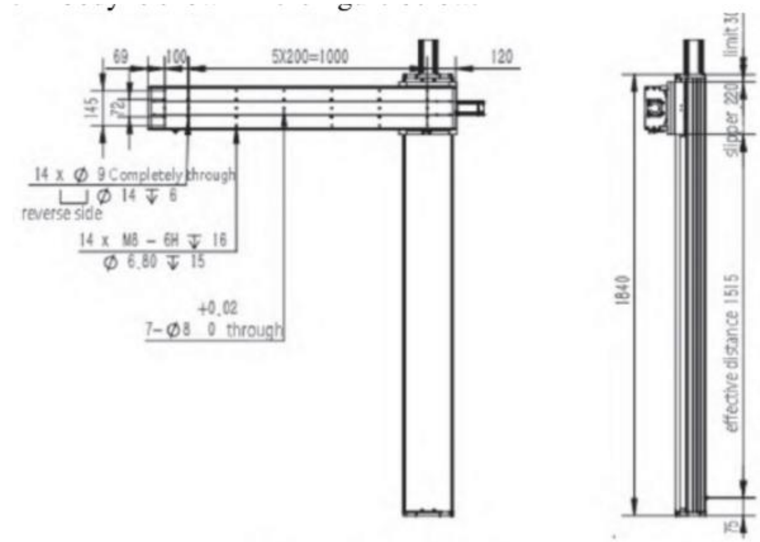


revolutionize the way we approach robotics, enabling precise control and monitoring of robotic systems from remote locations. The multiple motion control system of a robotic car using IoT technology is an advanced control system for a robotic car that utilizes an IoT platform to achieve real-time monitoring and control. This system is particularly useful in the field of robotics, as it enables precise control and navigation of robotic systems from remote locations. The system consists of a robotic car with multiple motors and sensors that are controlled by a central processing unit (CPU). The CPU is connected to an IoT platform, which enables communication between the system and the user interface. The user interface can be a computer or a mobile device, and it allows the user to control and monitor the robotic car remotely. The system utilizes multiple motors to achieve precise control of the robotic car's motion. Each motor can be controlled independently, which enables the robotic car to perform complex maneuvers such as turning and reversing. The system also includes obstacle detection sensors, which allow the robotic car to navigate around obstacles in its path. The IoT platform used in this system enables the collection of sensor data, which can be used to make informed decisions about the control of the robotic car. This data can also be used for analytics and optimization, allowing the system to improve its performance over time. The multiple motion control system of a robotic car using IoT technology has significant potential applications in a variety of fields, including manufacturing, agriculture, and transportation. It can be used in manufacturing facilities to transport goods from one location to another, in agriculture to perform tasks such as planting and harvesting, and in transportation settings, such as self-driving cars and delivery vehicles. In summary, the multiple motion control system of a robotic car using IoT technology is an innovative and sophisticated control system that has significant potential for the development of advanced robotic systems. The proposed approach provides the ability to control multiple devices in multiple ways, increasing the convenience of handling a system. The cloud service helps to reduce the memory load, and the stored messages are automatically removed after a certain amount of time. The results from our performance analysis demonstrate that if the incorporation is efficient enough, multiple controlling methods have less effect on time and performance compared to a single control system. However, the system has some limitations that need to be addressed to enhance its capabilities. Firstly, no video surveillance system has been incorporated, which can be a significant limitation to its security and monitoring capabilities. Secondly, the wireless range of the system is limited, which can be improved by incorporating wireless communication technologies such as GPRS and Zigbee modules. Finally, including object detection methods can help the system detect and react to obstacles in its path, improving its navigation and control capabilities.

DESIGN AND IMPLEMENTATION OF AUTOMATIC APPLE CRATING ROBOT TECHNOLOGY

- ARUN SAJI, JEC19MC012

This research paper proposes a novel intelligent lithium-ion battery-charging management system is proposed. The system integrates the battery monitoring and balance platform (BMBP) and charging station. According to the battery information of BMBP and the user needs, a proposed dual charging method (DCM) is used to control the charging voltage or current of charging station.. The DCM contains the rapid and the smart multi-stage charging methods. In addition, the smart multi-stage charging methods depress the temperature rising during charging to protect the batteries. On the other hand, the system also provides a friendly graphic user interface on PC or smart devices for user to select the charging method and monitoring the state of batteries. The system proposes a convenient solution for both quickly or safely charging needs. Designing a battery-charging management system to realize the dual charging method. The architecture of the system and the charging algorithm will be introduced in the following sentence. In recent years, there has been a growing interest in using robotics to automate various processes in the agricultural industry. One such process is the packing of apples into boxes. This task is typically performed manually, but it can be labor-intensive and prone to errors. To address this challenge, we have designed an automatic apple packing robot system that aims to improve efficiency and reduce the need for manual labor. The system consists of an assembly line for transporting apples and completed boxes, and a robot with a grasping mechanism and control system for picking up apples and placing them into boxes. The automatic apple packing robot is a piece of equipment designed to automate the process of picking and packing apples. It is capable of picking apples that are placed on round trays in a single row and can grasp up to 5 apples at a time with a high success rate. The robot is equipped with an electric cylinder slide and an end multi-functional fixture, and is able to move and operate flexibly. It also has the ability to identify empty trays and selectively grasp apples, which helps to minimize damage to the fruit during the packing process. The robot is suitable for use in large-scale apple packing operations and can help to improve efficiency and automation in the apple industry. In conclusion, the design and implementation of a robotic arm for handling and sorting apples can provide a flexible, efficient, and safe solution for the mechanization and automation of the apple industry. Through careful consideration of factors such as payload capacity, reach requirements, actuator selection, arm structure, sensors, and end effector design, it is possible to create a robotic arm that is able to handle and sort apples with a high degree of precision and accuracy. By conducting experiments and analysis, and making any necessary adjustments or improvements to the design, it is possible to optimize the performance of the arm and ensure that it is well-suited for the demands of the production process. With the ability to handle and sort apples all-weather and around the clock, a well-designed robotic arm can help to improve efficiency, productivity, and safety in the apple industry

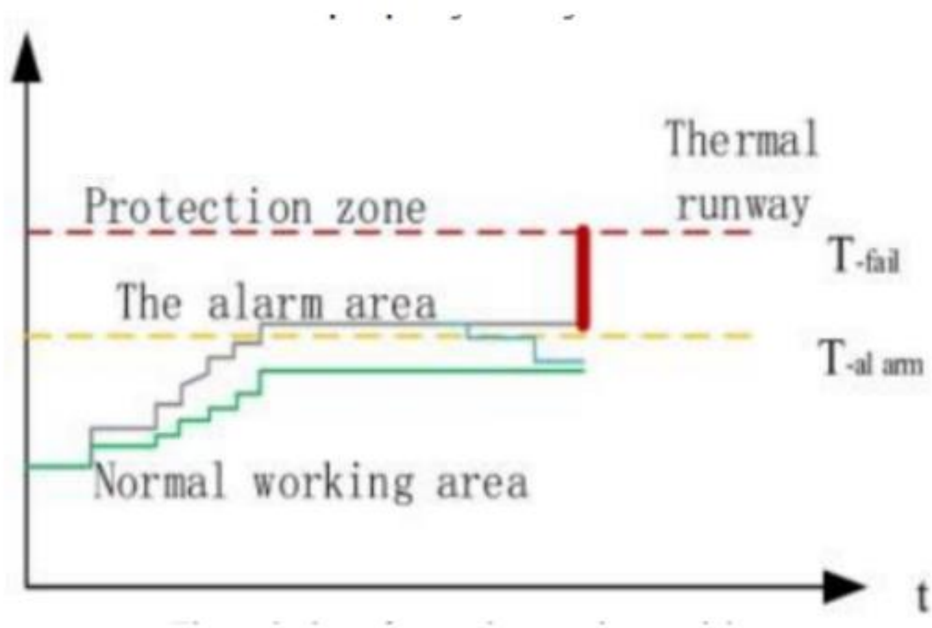


ANALYSIS ON CHARGING SAFETY AND OPTIMIZATION OF ELECTRIC VEHICLES

-BENAT JOSE, JEC19MC015

This paper aims to optimize the design of electric vehicle charging equipment by analyzing different charging modes, with a focus on charging safety. It considers both power grid side charging safety and equipment side charging safety, and proposes a strategy for optimizing the safety of charging electric vehicles in the power grid. The feasibility of improving the power quality of electric vehicle charging is also studied, and the internal temperature of the battery system is regulated by a heat management system to ensure that the battery charging and discharging process occurs within a suitable temperature range to avoid safety hazards caused by high and low temperature operations. The results of experiments show that increasing the charging load and improper design of the charging equipment can increase the operating pressure on the power grid, but electric vehicles still have energy saving and emission reduction benefits compared to fuel vehicles. This study provides a comprehensive and systematic solution to the safety accidents of electric vehicles, which can effectively control the charging safety of electric vehicles and reduce potential dangers, and has implications for the widespread use of electric vehicles. The increasing of charging load and the discordance of structure designing can increase the operating pressure on the power grid. However, this paper also considers the energy saving and emission reduction benefits of EVs compared to fuel vehicles, and how these benefits can be maximized. Overall, this paper provides a comprehensive and systematic solution to the safety accidents of EVs and has significant implications for the widespread use of EVs. By optimizing the design of charging equipment, improving the power quality of EV charging, and regulating the internal temperature of the battery system, the safety of EV charging can be effectively controlled and potential dangers can be eliminated. This study is therefore of great value for the popularization of EVs. The charging process is divided into four aspects: power grid side safety, charging equipment side safety, vehicle side safety, and platform side system safety. The power grid side safety concerns the impact of electric vehicle charging on power quality, including the production of harmonics and the potential loss and damage to the power network.

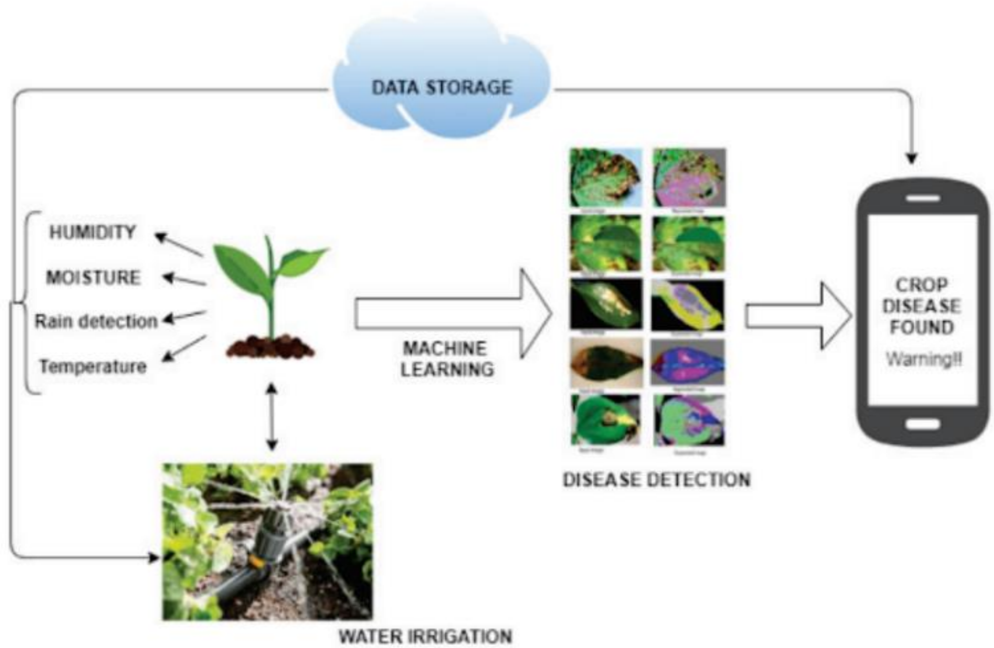
Charging equipment side safety issues include the potential for equipment leakage, charging equipment failure, charging incompatibility, charging start failure, and the lack of abnormal protection measures. Vehicle-side safety concerns the impact of charging on personal safety and charging facilities, and platform-side system safety involves the safety of the charging system as a whole.



CROP HEALTH MONITORING SYSTEM

-MIKHIL MANOJ, JEC19MC030

There are several methods for monitoring crop health, including visual inspection, soil analysis, and the use of sensors and remote sensing technologies. Visual inspection involves physically inspecting the crops for signs of stress or damage, such as wilting or discoloration. Soil analysis involves collecting and analyzing soil samples to determine the nutrient content and pH levels, which can impact crop growth. Sensors and remote sensing technologies, such as drones or satellite imagery, allow for the monitoring of crops from a distance, providing a comprehensive overview of the health of the crops. Crop health monitoring is important not only for improving crop production, but also for preserving the environment and ensuring food security. By identifying and addressing issues early on, farmers can reduce the need for chemical treatments and protect the surrounding ecosystem. Additionally, monitoring crop health helps to ensure that crops are producing high-quality and safe food for consumers. This system can be connected to the internet which provides the means for the farmers to know about and control their crops from far-off place. Thus, the system will monitor environmental conditions near the plant and help in detection of disease in early stages.

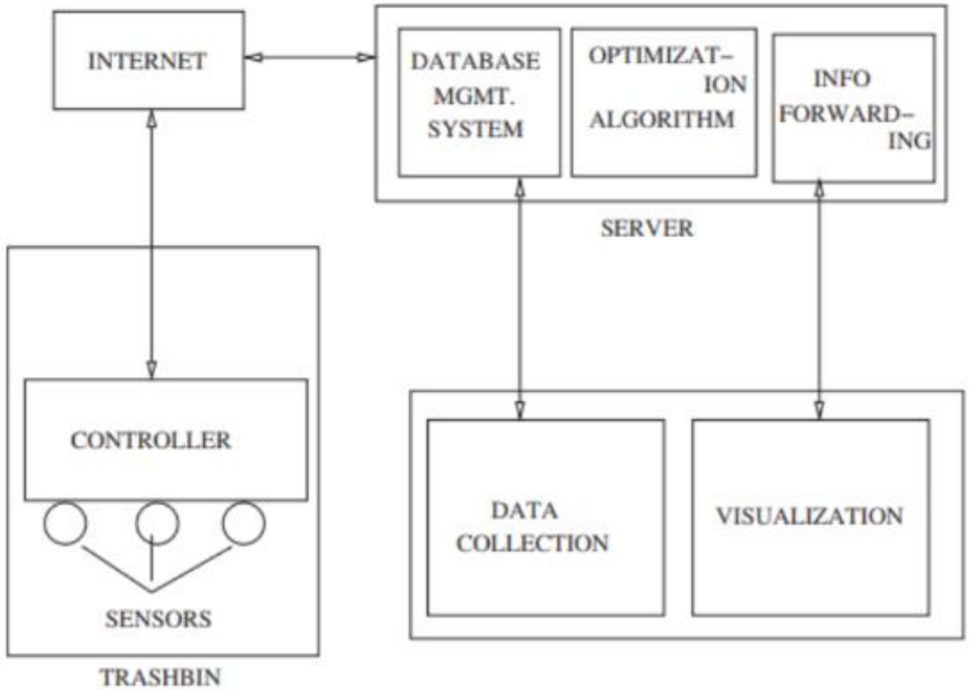


Additionally there is a web application where the farmer can upload a picture of infected plant's leaf, to find out the disease. All these sensors will collect the data in real time and send it to the microcontroller in same module. If any of these parameters cross the predefined threshold (which is different for different plant), that will be unfavorable for plant growth and farmer will get such an alert on his mobile through a GSM message. Thus, the system will monitor environmental conditions near the plant and help in detection of disease in early stages. Additionally there is a web application where the farmer can upload a picture of infected plant's leaf, to find out the disease. A crop monitoring system using image processing can be a powerful tool for improving crop production and quality. By using cameras or other imaging technologies to capture and analyze images of crops, farmers and agricultural professionals can gain valuable insights into the health and growth of their crops. Image processing algorithms can be used to identify and classify different features of the crops, such as pests, diseases, or nutrient deficiencies, and to provide alerts when issues are detected. This can help farmers to identify and address problems early on, improving crop yield and quality and reducing the need for chemical treatments. Overall, a crop monitoring system using image processing can be an invaluable resource for modern agriculture, helping to improve crop production and protect the environment.

SMART WASTE MANAGEMENT USING INTERNET-OF-THINGS (IOT)

-MOHAMMED FAHIM, JEC19MC032

Internet of Things (IoT) has a significant role to play in making cities more efficient, secure, and environmentally friendly. Connecting all of the devices, cars, and other city infrastructure can improve safety and quality of life. Smart cities may obtain the best technical solutions by bringing together many stakeholders. In order to provide smart solutions, system integrators, network operators, and technology vendors must collaborate with governments. However, it can be difficult to provide such solutions on an ongoing communications platform that is open and based on standards. They demonstrate an IoT prototype with sensors-based trash bin intelligence system for garbage collection management. It is capable of reading, gathering, and sending vast amounts of data across the Internet. Such data can be used to dynamically manage garbage collecting mechanisms when placed in a spatiotemporal context and processed by intelligent and optimized algorithms. Investigations on the advantages of such a system over a conventional system involve running simulations for a number of scenarios. Using open data from the city of Pune, India, we attempt to recreate the situation, highlighting the opportunity afforded by such initiatives for many parties to innovate and contribute to the development of Smart waste management systems. The idea of a ”smart city” is nothing more than the integration of various ICTs and IoTs in order to manage the resources of a city. The municipal departments, information systems, libraries, schools, hospitals, waste management systems, transit systems, etc. are only a few examples of the city’s assets. Indian cities currently house close to 31 percent of the country’s population and generate 63 percent of its GDP (Census 2014). By 2030, 40 percent of India’s population and 75 percent of its GDP are anticipated to reside in urban regions. Infrastructures in the social, economic, physical, and institutional areas must be developed completely in order to accomplish this. All are crucial for raising the standard of living, luring investment, and attracting people. Smart city development is a step in that direction.   We demonstrated a sophisticated garbage collection system. The IoT sensor prototype is the system’s foundation. It is in charge of measuring the amount of rubbish in the trash cans and sending that information to a server for storage and processing later on (through the Internet). This information aids in calculating the best collection routes for the workers. In the future, we want to improve the system for diverse waste types, specifically solid and liquid wastes.

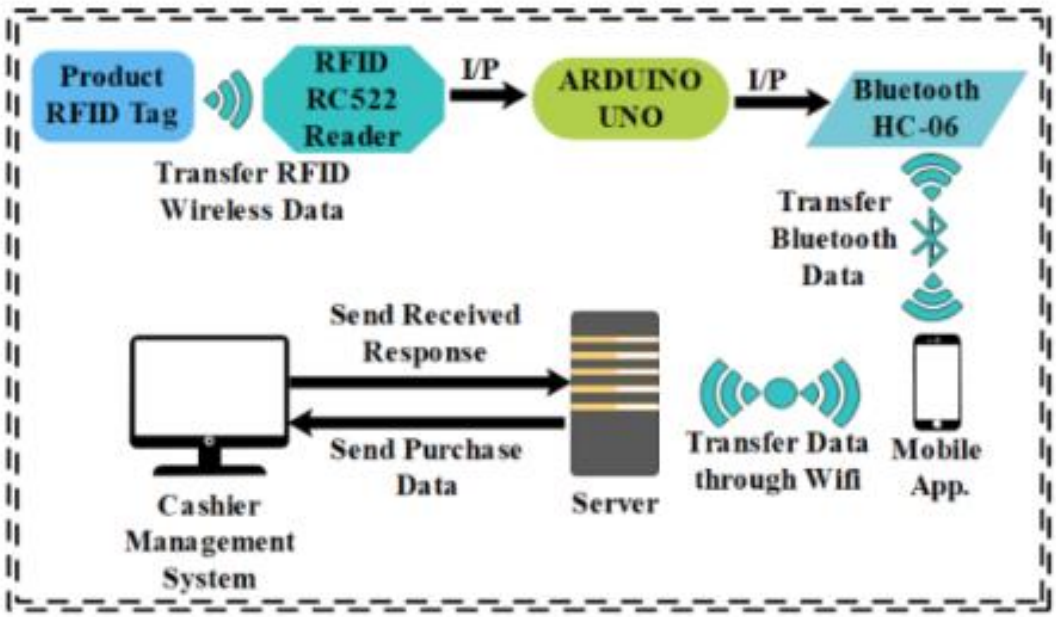


IOT-BASED SMART SHOPPING CART USING RADIO FREQUENCY IDENTIFICATION

-JOSEPH .K.A. JEC19MC028

The modern age of technology in which most of the customer needs to wait in the supermarket for shopping because it is a highly time-consuming process. A huge crowd in the supermarket at the time of discount offers or weekends makes trouble to wait in long queues because of a barcode-based billing process. In this regard, the Internet of Things (IoT) based Smart Shopping Cart is proposed which consists of Radio Frequency Identification (RFID) sensors, Arduino microcontroller, Bluetooth module, and Mobile application. RFID sensors depend on wireless communication. One part is the RFID tag attached to each product and the other is RFID reader that reads the product information efficiently. After this, each product information shows in the Mobile application. The customer easily manages the shopping list in Mobile application according to preferences. Then shopping information sends to the server wirelessly and automatically generates billing. This experimental prototype is designed to eliminate time-consuming shopping process and quality of services issues. The proposed system can easily be implemented and tested at a commercial scale under the real scenario in the future. That is why the proposed model is more competitive as compared to others. In the aforementioned paper, the intended system design for automation of the shopping process by merging different technologies like Arduino Uno, RFID, and Android mobile application. That can be divided into two major categories Electronic components and Software components. In Electronic Components, Arduino Uno operating as an intermediary microcontroller, which controls the RFID technology and Built, communication between RFID technology and software components like android mobile application through Bluetooth module. In software components, there is an android mobile application in which customers login to the proposed system by using different proposed methods that can secure customer privacy. Searching for the product in the shopping mall becomes easy because of the searching module based on product position allocation on the map. The proposed system prevents the customer to get an expired or undesired product by providing an android mobile application. Customer directly interacts with the product information.

This information affects the preferences of the customer about the product and helps them to get the best quality product. Shopping products can be displayed in a current shopping list of the customer that helps the customer to maintain its shopping list

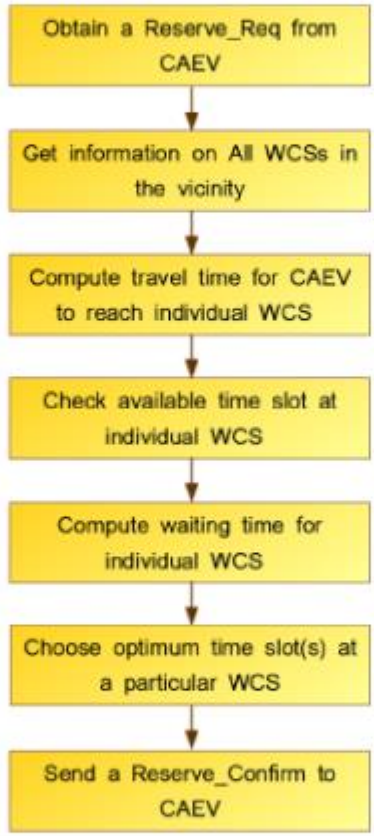


according to need or budget. That also helps to remind the remaining products to purchase. Besides, there is a server as a data center of the supermarket, which also connected with the smart shopping cart. When an android mobile application needs to extract data from the server, according to the customer RFID card for verification of the customer login or extract information of the product according to the product RFID tags, then the mobile application can communicate with the server wirelessly. This feature of wireless information extraction helps the customer to move freely and can easily interact with information of products anywhere in the supermarket. Those technologies are programmed to work together to entertain the customer most efficiently. BY using proposed technology customers can search and effectively get the best quality product. As a lesson receive a proposed system can easily be implemented in real-life scenarios to support the shopping process by automation of shopping cart.

AUTOMATED RESERVATION MECHANISM FOR CHARGING CONNECTED AND AUTONOMOUS EVS IN SMART CITIES

-NEVIL GEO, JEC19MC034

This research paper proposes a novel intelligent lithium-ion battery-charging management system is proposed. The system integrates the battery monitoring and balance platform (BMBP) and charging station. According to the battery information of BMBP and the user needs, a proposed dual charging method (DCM) is used to control the charging voltage or current of charging station.. The DCM contains the rapid and the smart multi-stage charging methods. In addition, the smart multi-stage charging methods depress the temperature rising during charging to protect the batteries. On the other hand, the system also provides a friendly graphic user interface on PC or smart devices for user to select the charging method and monitoring the state of batteries. The system proposes a convenient solution for both quickly or safely charging needs. Designing a battery-charging management system to realize the dual charging method. The architecture of the system and the charging algorithm will be introduced in the following sentence.

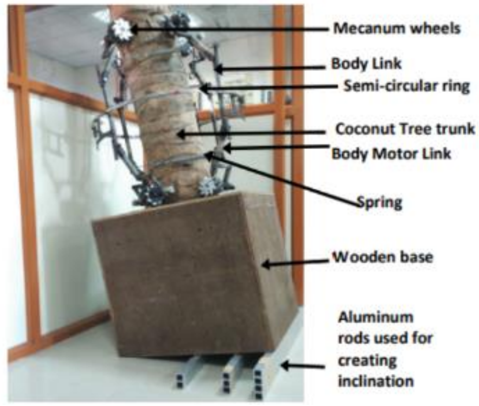


In coming years, attraction to alternative urban mobility paradigms such as Connected and Autonomous Electric Vehicles (CAEVs) will increase since CAEVs can significantly contribute to not only optimize traffic flow and improve road safety but also minimize dependence on fossil fuel and reduce carbon emission in urban areas. Nonetheless, there are several barriers towards widespread adoption of CAEVs. In order to have significant growth of CAEVs in urban areas, adequate number of charging facilities in urban areas is needed as well as an efficient smart CAEV charging management is required for managing and allocating charging station resources. In this paper, we have designed and implemented a system utilizing automated reservation based charging strategies that include effective reservation management and efficient allocation of time slots of wireless charging stations   Alternative urban mobility paradigms such as Connected and Autonomous Electric Vehicles (CAEVs) are appealing since CAEVs can significantly contribute to not only optimize traffic flow and improve road safety but also minimize dependence on fossil fuel and reduce carbon emission in urban areas. For large deployment of CAEVs, the sufficient number of available charging facilities will be required in urban areas. And an efficient and smart CAEV charging management is required for managing and allocating the charging station resources from different WCSOs. We have designed a system utilizing automated reservation based charging strategies that include effective reservation management and efficient allocation of time slots of wireless charging stations. In this system, charging strategies based on automated reservation are used, which encompass optimum WCS selection scheduling including reservation slot allocation and preauthorized payment.

AMARAN: AN UNMANNED ROBOTIC COCONUT TREE CLIMBER AND HARVESTER

-AWIN SAJU, JEC19MC014

In India and other developing nations, there is a severe lack of workers to climb coconut trees and collect coconuts. The urgent necessity for an unmanned coconut tree climber as a backup solution is highlighted by the resultant decrease in the number of skilled tree climbers who can pass on their trade secrets to future generations. This study introduces Amaran, a cutting-edge robotic climber and harvester for coconut trees. Amaran is made up of a cutter that can be fitted to a ring-shaped frame that can be fastened to a coconut tree and a harvester with a characteristic robotic arm (RA). Through a wireless interface, Amaran can be operated by a person on the ground or by using an app on a smartphone. After being placed close to the coconut bunch, the cutter is given the order to harvest the coconuts by severing the stem holding the bunch to the tree. Tests carried out on a coconut tree arrangement in the design lab verified the viability of the Amaran robot. Field experiments on a coconut farm later served to validate the Amaran robot's design. We go through the harvester and Amaran body designs in this essay. The height, circumference, and slant of the tree might pose a challenge to Amaran's skill when climbing and collecting coconuts. This research study outlines a novel design strategy for Amaran, an autonomous robot equipped to scale coconut trees and gather coconut clusters. Amaran has undergone successful field tests, which attest to the fact that the proposed approach is well suited to replace human coconut tree climbers. The remainder of the essay is structured as follows: Sections presents the Amaran system architecture, design, and implementation. further, they examine the climber's (body's) dynamic analysis and the power needed to remove the coconut bunch's stem. The climber has eight Mecanum wheels, a spring, and a harvester with four degrees of freedom. By producing the harvested with a lightweight material, such as carbon fibre, the weight of the harvested can be decreased. A thorough investigation of the climber, the climb, and the body's dynamic analysis was conducted.

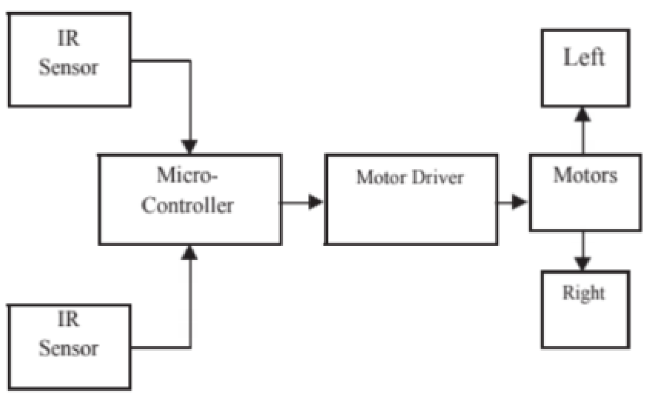


As Amaran was instructed to climb tree trunks with uniform circumference, varying circumference, and inclined trunks, various forces operating on the robot's body were also examined. The highest trunk inclination at which the Amaran body may successfully climb the tree was discovered to be 30 degrees from the vertical axis. The results of the field tests with 10 different coconut trees demonstrate that Amaran successfully climbs and harvests the coconuts if the height, circumference, and angle of inclination of these trees are well within the design limits, providing a practical replacement for the dwindling number of human tree climbers.

LINE FOLLOWER ROBOT: DESIGN AND HARDWARE APPLICATIONS

-AKSHAY P G JEC19MC003

The main objective of this paper is to automate the existing system in the library which includes the operations like search, detect, pick and place the book from shelves, which will help the readers in seeking the book in less time and quite efficiently. The paper emphasis on how a robot can issue and return a book in the library. The robotic system includes a robot that uses a LAN network with static IP for accessing the robot from anywhere in the campus. The robot is capable of picking the book and placing it with the help of a Robotic arm to the library counter.. This robot introduces the Multiple Source Multiple Destination Robot, which is capable of detecting the target line through several color lines via a color sensor for its movement in the library which solves the problem in tracking the path to the shelves. Each line is colored differently, as its identity.This robot can be called a fully autonomous line follower robot that has the ability to train voice commands through an easy procedure, unlike any other specific line follower robot.



The robot senses a line through a color sensor and therefore strives towards the desired target by using a simple feedback mechanism to correct the wrong moves, but still a very efficient closed-loop system. The Line follower robot is a mobile machine that can detect and follow the line drawn on the floor. Generally, the path is predefined and can be either visible like a black line on a white surface with a high contrasted color or it can be invisible like a magnetic field.Therefore, this kind of Robot should sense the line with its Infrared Ray (IR) sensors that installed under the robot. After that, the data is transmitted to the processor by specific transition buses. Hence, the processor is going to decide the proper commands and then it sends them to the driver and thus the path will be followed by the line follower robot. In this work, LiPo batteries are used due to their longer lifespan and faster charging as compared to conventional lead acid batteries. Lithium Polymer batteries are recent and modern batteries being used in many electronic devices, radio control industry and gaining popularity due to long-term operation and high-power needs. A LiPo battery uses a polymer electrolyte (high conductivity semisolid-gel) instead of a liquid electrolyte. The main advantages of LiPo batteries are- (i) lighter in weight (ii) Low maintenance (iii) Variety of shapes and size (iii) Higher energy storage capacity and higher discharge rates.