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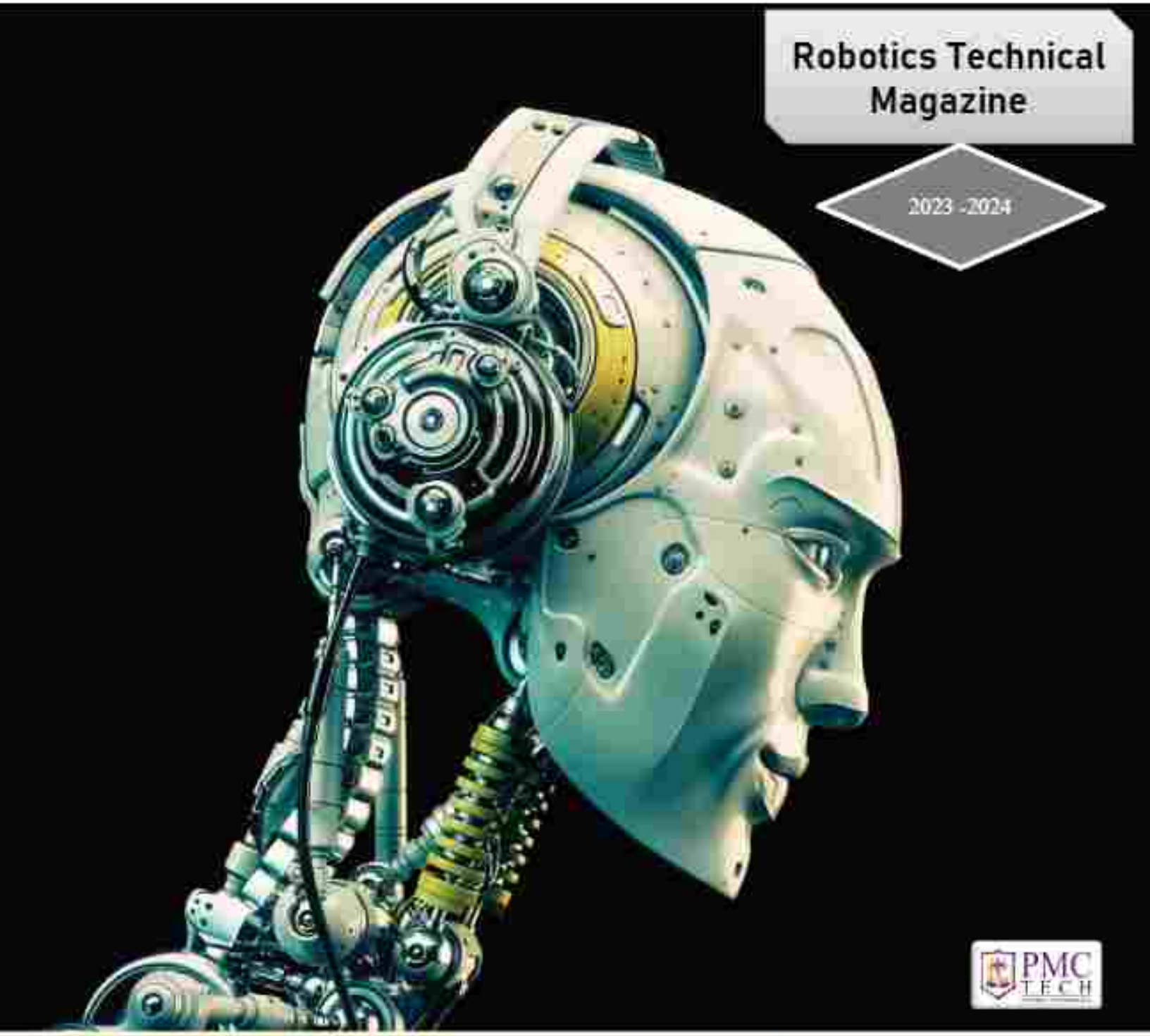
Robotics Technical Magazine

2023 -2024



Er, PERUMAL MANIMEKALAI POLYTECHNIC COLLEGE

Koneripalli, Hosur -635117

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DEPARTMENT OF ELECTRONICS ROBOTICS ENGINEERING

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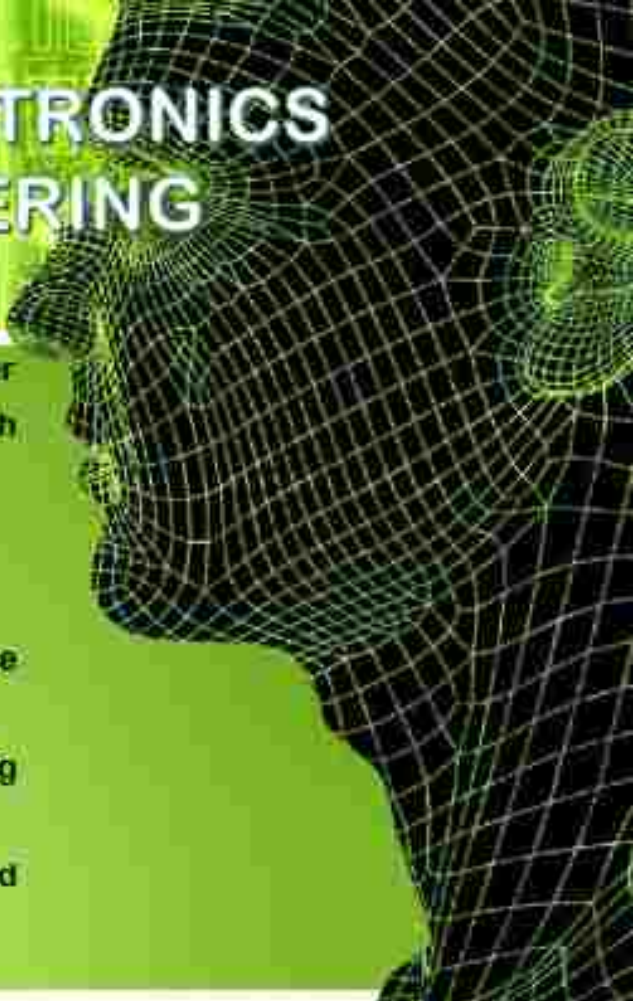

VISION OF THE INSTITUTE

"PMC Tech Polytechnic College shall emerge as a premier Institute for valued added technical education coupled with Innovation, Incubation, Ethics and Professional values".

MISSION OF THE INSTITUTION

To foster the professional competence through excellence in teaching and learning.

To nurture overall development of students by providing Quality Education & Training.

To provide innovative environment to learn, innovate and create new ideas for the betterment of oneself and society

VISION OF THE DEPARTMENT

To develop Electronics (Robotics) Engineering diploma holder's to meet the growing needs of industry and society.

MISSION OF THE DEPARTMENT

To provide goal-oriented, quality-based and value-added education through state of art teaching & training method.

To provide Environment to promote practical knowledge on robotics to meet the needs of the industry and society.

To provide a platform to learn leadership, ethics and entrepreneurship experience among students for their sustained growth.

DEPARTMENT OF ELECTRONICS ROBOTICS ENGINEERING

Programme Educational Objectives (PEO's):

PEO 1: Core competence – exhibit the knowledge in Mathematics, science, fundamentals if Mechanical, Electrical, Electronics and Computer Engineering to solve Engineering problems in Robotics.
PEO 2: Breadth – design and create novel products and solutions for real life problems.
PEO 3: Professionalism: Exhibits professional and ethical attitude, effective communication skills and teamwork over multidisciplinary areas.
PEO 4: Higher students and employability – succeed in industry / technical profession by creating an environmental of excellence and a higher order of ethics and a zeal for life-long learning.

PROGRAM SPECIFIC OUTCOMES:

PSO 1: Ability to understand the integration of engineering applications such as electronic, mechanical, electromechanical, control and computer systems that contain software and hardware components including sensors, actuators and controllers.

PSO 2: Ability to exhibit the knowledge of electrical and electronics circuits, hydraulic & Pneumatic control system, logic design and image processing using hardware and soft programming for automation.

DEPARTMENT OF ELECTRONICS ROBOTICS ENGINEERING

PROGRAMME OUTCOMES:

PO1: Basic and Discipline specific knowledge: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

PO2: Problem analysis: Identify and analyse well-defined engineering problems using codified standard methods.

PO3: Design/ development of solutions: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

PO4: Engineering Tools, Experimentation and Testing: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

PO5: Engineering practices for society, sustainability and environment: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

PO6: Project Management: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

PO7: Life-long learning: Ability to analyse individual needs and engage in updating in the context of technological changes.

Messages

FOUNDER'S MESSAGE

Er.P.Perumal Founder
PMC TECH Group of Institutions

"Any place that anyone can learn something useful from someone with experience is an Educational Institution"

Time has now come to realize your dream to be in the main stream of your professional career and must be a great feeling to be a part of most prestigious one. PMC TECH has a history of more than 15 years. In recent years degree in the technical education like Engineering has become the foremost academic qualification for all leading Industries, Government and Non-Government sectors. Academicians and Industrialists alike have recognized the value of the degree in the developing challenges of the rapidly changing technical environment. One of the strength of our campus is the diversity of programs and members background and experience. The range of functional, professional and vocational skills and knowledge that participants bring to the program allow the lecturing faculty to test the validity of theoretical concept against of rich background of personal and organizational outlooks. The Campus environment and work culture will encourage individuals from all walks of life and from all special and economic backgrounds. To be Engineers and other technical – based professionals, can all benefit from this experience at this beautiful campus.

CHAIRMAN'S MESSAGE

Shri P Kumar
Chairman

"The object of education is to prepare the young to educate themselves throughout their lives"

True Education indeed paves the path for the children to learn new things in a correct manner. It heals them, broadens their perspectives and enriches their knowledge to face the globally competitive era. PMC TECH- Polytechnic started in 1956 with an objective to provide quality education and excellence in ever changing field of technical education. Technology is moving at a very fast pace. What was breakthrough yesterday is obsolete today. This has made it imperative that future technocrats must be familiar not only with technical skill but also with the technology of tomorrow. The maxim "survival of fittest" is more relevant now than ever before. We believe in value based quality education and faculty Members at PMC TECH – Polytechnic are striving hard for it, so that product of our Polytechnic college is well received by the industry, public and private sector organization and others. I hope young Diploma engineers passing from the institute will create difference in Indian and Global scenario.

SECRETARY'S MESSAGE

Smt. P. MALLAR
Secretary

"Education is a progressive discovery of our own ignorance" At PMC TECH, we value every individual and it is our aim to provide the best possible environment where students can succeed. Our campus has grown from its inception in 2002 to accommodate almost 3000 pupils in first-class teaching facilities which are amidst beautifully kept grounds. We are fortunate to have a talented, highly committed teaching and supporting staff here to ensure the learning environment of our students is the best it can be. We seek to prepare our young men and women with the very best preparation for life after PMC TECH. Our departing Collegians should be well rounded individuals who are grounded in the Anglican way of faith, hope and love. We seek to instill in our students a passion for learning which brings knowledge and makes them to understand that they need to make a positive contribution to the community where they live and work. The likelihood of achieving this is strengthened by the fact that we offer an academic program that includes in-depth, rigorous coaching and which can be tailored to individual needs. We encourage high academic standards and have high expectations of personal
Discipline and motivation from our students.

Director Message

Prof. N Santhakaran
Director

Er.Perumal Manimekalai Polytechnic College is an institution that aims at the complete development of the student and our staff are a hand picked and trained to ensure that the students are given every possible support in all their Endeavour's academic or otherwise it is a multi disciplinary institution and this also ensures that the students have ready access to a wide range of academic material.

Our brand of education does not have narrow horizons, we believe in exposure. Our students are encouraged to widen their knowledge base and study beyond the confines of the syllabus.

Principal Message

ProfN. Balasubramanam
Principal

Er.Perumal Manimekalai Polytechnic College is continuously strive to impart Quality Education along with high ethical and Moral values which enable us, not only to mould our students as successful Diploma Engineers but also as disciplined citizens of our Nation. Also, we continuously upgrade and maintain world class infrastructure keeping in pace with the rapid technological developments.

We are committed to innovation and continuous improvement. We seek to work closely in partnership with the students and their parents to maximize student performance and success regardless of their ability levels.

Creative Desk

"Robotics Engineering is the division of Engineering science and Technology of robots. It includes the manufacture, functions, design and structural disposition of robots".

"Robotics engineering is a sub-field of Mechanical & Electronics engineering. Robotics engineers usually design robots and develop new applications for them to make them functional in a broad range of industries".

"Robots are used in industries for speeding up the manufacturing process. Robots are also used in variety of Automation Fields such as Sea-Exploration, Servicing of Transmission Electric Signals, Nuclear science and Designing of Bio-Medical Equipment's".

CREATIVE DESK

Mr.C.VEERAMANI .M.E, HOD REVIEWER,

Mr.J.STUART KIRUBHAKARAPANDIAN .M.E, LECTURER CONVENOR,

Mr. SINGARAVELAN M .M.E, LECTURER EDITOR INCHARGE,

Mr.M.MOHAMED JINNA, M.E, LECTURER EDITOR MEMBER,

Mrs.V.DHIVYA.M.Tech, LECTURER

EDITOR MEMBER

SELVAN PAVAN KUMAR G, III YEAR STUDENT MEMBER

SELVAN SRI MAHESH B, II YEAR

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COBOTS ENHANCED WITH R2R COMMUNICATION IN ELECTRONICS - ROBOTICS ENGINEERING

By Mr.VEERAMANI C, M.E., /HOD

Abstract:

Collaborative robots (cobots) are increasingly becoming a part of modern industrial environments, designed to work alongside human workers to enhance productivity and safety. With the integration of robot-to-robot (R2R) communication, the efficiency and adaptability of cobots can be significantly enhanced. This project explores how R2R communication allows cobots to share data, synchronize tasks, and perform collaborative functions without human intervention. The report discusses the architecture, benefits, and practical applications of R2R-enabled cobots in industries such as manufacturing, warehousing, and assembly lines. The ultimate goal of the project is to demonstrate the effectiveness of R2R communication in improving operational efficiency, reducing downtime, and increasing flexibility in industrial workflows.

Introduction:

Collaborative robots, or cobots, are designed to work safely alongside human operators, making them an essential part of modern smart manufacturing systems. Cobots differ from traditional robots in that they can be integrated into human-centric workspaces without requiring safety barriers. This adaptability has led to their increased use in diverse industries such as automotive, electronics, and logistics.

A recent advancement in this field is the inclusion of Robot-to-Robot (R2R) communication technology. This enables multiple cobots to communicate in real-time, allowing them to coordinate and share information related to tasks, positioning, and environmental conditions. R2R communication makes cobots smarter and more autonomous, enhancing their efficiency in tasks such as material handling, packaging, and assembly.

The objective of this project is to investigate how cobots enhanced with R2R communication can improve industrial operations by:

- Reducing human intervention in task synchronization.
- Improving task efficiency through optimized cobot collaboration.
- Enhancing the adaptability and scalability of automation systems.

Mini Project Report:

1. Literature Review

Cobots have revolutionized automation by providing safer and more flexible automation options for industries. However, as the complexity of tasks grows, it becomes necessary for cobots to work collaboratively. R2R communication allows for real-time data sharing and decision-making between robots, reducing the need for centralized control. This feature has been applied in automated warehouses and manufacturing lines where multiple robots need to coordinate with each other to complete tasks more efficiently.

2. System Architecture:

The R2R-enabled cobot system involves the following components:

- **Cobots with Integrated Sensors:** Each cobot is equipped with sensors (such as vision systems, LIDAR, or force sensors) to perceive its environment.
- **Communication Protocol:** Cobots are connected via wireless or wired networks (e.g., Ethernet, Wi-Fi) using an R2R communication protocol. This protocol enables robots to share task-specific data, such as their position, speed, and task status.
- **Controller Module:** A decentralized or distributed controller architecture is implemented, allowing each cobot to make decisions based on the information it receives from other cobots.
- **Safety Systems:** Each cobot has built-in safety mechanisms to avoid collisions and ensure smooth operation in a shared workspace.

3. Project Design:

- **Simulation Environment:** The project utilized a simulation environment to model multiple cobots interacting in a shared workspace. Simulations tested the effectiveness of R2R communication in different scenarios, such as synchronous material handling and collaborative assembly tasks.
- **Task Allocation:** Using a task allocation algorithm, the cobots communicated task statuses and autonomously divided work based on their availability and proximity to the task.
- **Data Sharing:** Real-time data was shared between cobots, such as location, task completion status, and environmental changes, to ensure smooth task handovers and collaborative effort.

4. Benefits of R2R Communication:

- **Increased Efficiency:** R2R communication allows cobots to operate continuously without the need for human intervention to assign tasks. This reduces downtime and improves overall efficiency.
- **Scalability:** More cobots can be added to the system without requiring major changes to the infrastructure, as the communication allows for self-organizing cobot teams.
- **Error Reduction:** Communication between cobots can help in early detection of errors or issues in the task workflow, reducing the probability of operational failures.

5. Applications:

- **Manufacturing:** Cobots working on assembly lines can coordinate their movements to improve precision in parts assembly.
- **Warehousing:** Multiple cobots equipped with R2R communication can work in tandem to organize inventory, pick and place items, and optimize storage.
- **Logistics:** Cobots can autonomously manage loading and unloading operations at distribution centers by collaborating in real-time.

6. Challenges:

- **Network Latency:** The speed and reliability of communication networks are critical for real-time R2R collaboration. Any latency can lead to synchronization issues.
- **Cybersecurity Risks:** The more robots are interconnected, the greater the risk of cyber attacks. Ensuring secure communication channels is a critical challenge.

- **Complex Programming:** The development of algorithms for dynamic task allocation and coordination between cobots remains complex and requires significant computational resources.

7. Conclusion:

The integration of R2R communication in cobots represents a significant leap forward in automation. By enabling robots to work together without human intervention, industries can achieve greater operational efficiency, reduced downtime, and increased adaptability. However, challenges such as network latency and security need to be addressed for large-scale implementation.

8. Future Work

Future developments in this area could focus on improving the robustness of communication networks, developing more advanced algorithms for task allocation, and incorporating machine learning to make cobots even more autonomous and efficient.

AI BASED SMART IDLER FOR ELECTRIC VEHICLES IN ELECTRONICS - ROBOTICS ENGINEERING

By Mr. SINGARAVELAN M, M.E., LECTURER

Abstract:

The increasing demand for electric vehicles (EVs) requires innovative systems to improve their performance, energy efficiency, and maintenance. An AI-based Smart Idler system is designed to address these challenges. The idler, a passive component in the drive train, can be enhanced with AI to dynamically adjust the tension in belts or chains, monitor wear, and optimize energy usage. This project focuses on designing a smart idler equipped with sensors and AI algorithms that can predict potential failures, adapt tension for optimal efficiency, and reduce maintenance costs. The system's effectiveness in enhancing vehicle performance and longevity is demonstrated through simulations and prototype testing.

Introduction:

Electric vehicles (EVs) are gaining popularity due to their efficiency and environmental benefits. However, to maximize the benefits of EVs, it is crucial to improve the efficiency of various subsystems, including the drivetrain. Traditional idlers in EVs are passive components that guide and tension belts or chains in the drivetrain. The AI-based Smart Idler enhances this role by actively monitoring and adjusting the system in real time.

An intelligent idler system can contribute to energy conservation, reduce wear and tear on the vehicle components, and provide predictive maintenance. The AI algorithms can analyze real-time data from the idler to dynamically optimize belt tension, preventing unnecessary energy loss and enhancing the longevity of the system. This system can be particularly useful in high-demand situations, such as rapid acceleration, regenerative braking, and varying loads.

The project aims to design and implement an AI-powered smart idler system that:

1. **Monitors drivetrain conditions** using sensors.
2. **Optimizes tension** in real-time to improve efficiency.
3. **Predicts maintenance needs** by analyzing wear patterns.
4. **Improves energy efficiency** by minimizing mechanical losses.

Project Report:

1. Literature Review:

The development of AI-based systems for electric vehicles has grown rapidly. Most research focuses on optimizing battery management systems, autonomous driving, and regenerative braking. However, less attention has been paid to components like the idler, which, although passive, play a crucial role in energy efficiency and maintenance. Smart systems incorporating AI and sensor technology have been successfully applied in other industries for predictive maintenance and system optimization. This project draws from these successes to create a smart idler system for EVs.

2. System Design:

The AI-based smart idler consists of the following components:

- **Sensors:** The idler is equipped with multiple sensors to monitor belt tension, temperature, vibration, and wear. These sensors provide real-time data to the AI system.
- **AI Controller:** The controller processes sensor data using AI algorithms, adjusting belt tension dynamically to optimize performance. It can predict when maintenance is required based on wear patterns and operational conditions.
- **Actuator Mechanism:** The idler is connected to an actuator that adjusts its position to maintain optimal tension on the belt or chain.
- **Data Communication System:** The smart idler communicates with the vehicle's main control system, providing real-time performance data and diagnostics.

3. AI Algorithms:

The AI system uses a combination of machine learning and optimization algorithms:

- **Predictive Maintenance Algorithm:** This algorithm analyzes data from the sensors to predict when the idler or other drivetrain components need maintenance, minimizing unexpected failures and reducing downtime.
- **Optimization Algorithm:** This algorithm ensures that the idler maintains optimal belt tension, which can vary depending on the vehicle's speed, load, and other conditions. It continuously adjusts the idler to reduce energy loss and wear.
- **Failure Detection Model:** Machine learning models are trained to detect unusual patterns in the sensor data, indicating potential mechanical failures or misalignments.

4. Working Principle:

- **Real-time Monitoring:** The sensors continuously collect data related to the belt's tension, idler position, temperature, and vibrations. This data is transmitted to the AI controller.
- **Dynamic Adjustment:** Based on the sensor input, the AI controller evaluates the tension in the belt or chain. If the tension is not optimal, it sends a signal to the actuator, which adjusts the idler's position to restore the proper tension.
- **Predictive Maintenance:** As the system operates, the AI tracks the wear and tear on the belt and idler components. It predicts when maintenance is required and alerts the vehicle operator before a failure occurs.
- **Data Analysis:** The AI controller stores operational data for further analysis, allowing it to improve its prediction models over time.

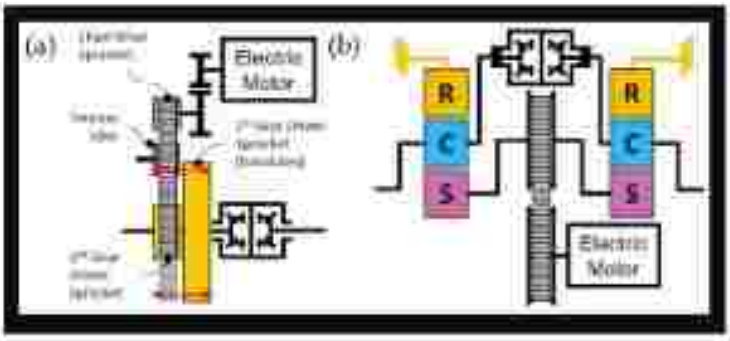
5. Benefits of AI-Based Smart Idler:

- **Increased Efficiency:** By maintaining optimal belt tension, the system reduces mechanical losses in the drivetrain, improving overall vehicle efficiency.
- **Extended Component Lifespan:** The smart idler minimizes wear and tear on the drivetrain, extending the lifespan of the belt and other components.

- **Reduced Maintenance Costs:** Predictive maintenance reduces unexpected breakdowns and ensures that maintenance is performed only when necessary, avoiding costly repairs.
- **Enhanced Performance:** The real-time adjustment of the idler improves vehicle performance, especially during demanding conditions such as acceleration and regenerative braking.

6. Challenges:

- **Sensor Accuracy:** The performance of the system heavily relies on the accuracy of the sensors used for monitoring the idler's condition. Low-cost sensors may introduce errors, leading to suboptimal performance.
- **AI Training Data:** The AI algorithms require a significant amount of data to train effectively. Gathering enough data from a wide range of operational conditions can be a challenge.
- **System Complexity:** Adding a smart idler system introduces complexity to the vehicle's drivetrain, which may complicate vehicle design and increase production costs.



7. Applications:

- **Electric Cars:** In electric cars, where energy efficiency is critical, the smart idler can help reduce power consumption by minimizing mechanical losses.
- **Electric Buses and Trucks:** For larger EVs, the benefits of optimized drivetrain components become even more significant due to the higher loads and operational demands.
- **Hybrid Vehicles:** The system can also be applied in hybrid vehicles, where optimizing both the internal combustion engine and the electric motor is essential for energy savings.

8. Conclusion

The AI-based smart idler system for electric vehicles presents a novel approach to improving the efficiency and reliability of drivetrain components. By dynamically adjusting belt tension and providing predictive maintenance, the system enhances vehicle performance and reduces maintenance costs. The project's findings suggest that AI-based components can play a critical role in the future of electric vehicle development, contributing to better energy management and sustainability.

9. Future Work

Further work can focus on refining the AI algorithms to make them more adaptive to a wider range of vehicle models and operational conditions. Integrating more advanced sensors and improving communication between vehicle subsystems will also enhance the system's capabilities.

ARDUINO BASED COST EFFECTIVE FLOOR CLEANING ROBOT IN ELECTRONICS - ROBOTICS ENGINEERING

By, MR.STUART KIRUBAKARA PANDIAN, M.E., /LECTURER

Abstract:
With increasing demand for automated cleaning solutions, a cost-effective floor cleaning robot based on Arduino is proposed. This robot is designed to perform basic cleaning functions like sweeping and mopping while maintaining affordability. It is equipped with sensors for obstacle detection, a motorized cleaning system, and a water dispensing mechanism for mopping. The robot can autonomously navigate a predefined area, avoiding obstacles and efficiently covering the floor space. The project focuses on developing a functional prototype that balances cost, efficiency, and simplicity, making it an ideal solution for household and small commercial spaces.

Introduction:

Automation in household tasks, such as cleaning, has gained significant attention in recent years. Commercial robotic vacuum cleaners are available, but they are often expensive and inaccessible to a large portion of the market. This project proposes a floor cleaning robot that is based on an Arduino microcontroller, offering a budget-friendly alternative to existing cleaning robots.

The primary objective of this project is to design and build a cost-effective, functional robot capable of performing basic floor cleaning tasks. The robot combines simple hardware components with Arduino programming to achieve the following functionalities:

- **Sweeping and mopping floors** using motorized brushes and a water dispensing system.
- **Autonomous navigation** with obstacle detection using ultrasonic sensors.
- **Rechargeable power system** to ensure continuous operation.

This project aims to make robotic cleaning accessible to a wider range of users by simplifying the design and using affordable components.

Project Report:

1. System Components:

- **Arduino Uno:** The brain of the robot, responsible for controlling all the other components. The Arduino receives inputs from sensors and sends signals to motors to navigate the robot.
- **Motors:** Two DC motors are used for the wheels, allowing the robot to move in different directions. Another motor is used for rotating the cleaning brushes.
- **Ultrasonic Sensors:** These sensors are mounted on the robot to detect obstacles and help in navigating the room. They measure the distance from objects to avoid collisions.
- **Brushes and Mop System:** A set of rotating brushes is used for sweeping the floor, while a simple water tank with a dispensing system is used for mopping.
- **Motor Driver (L298N):** This component allows the Arduino to control the speed and direction of the motors.

- **Battery:** A rechargeable battery powers the robot. The battery can be recharged using a simple charging circuit.

2. Design and Working Principle:

- **Chassis Design:** The robot's body is built using a lightweight but sturdy material like acrylic or plastic. The wheels are attached to the DC motors, which provide forward and backward motion. The cleaning brush is attached underneath the chassis and powered by a separate motor.
- **Sensor Placement:** Ultrasonic sensors are placed at the front of the robot. They continuously emit sound waves and calculate the time taken for the waves to return after hitting an obstacle, thus allowing the robot to detect and avoid collisions.
- **Navigation System:** The robot follows a simple programmed algorithm to move around the room while avoiding obstacles. The basic movement logic is as follows:
  - The robot moves forward until it detects an obstacle.
  - Upon detecting an obstacle, it stops, turns in a different direction, and continues moving.
  - This process repeats, allowing the robot to navigate the entire room.
- **Cleaning Mechanism:**
  - **Sweeping:** A motorized brush rotates as the robot moves, sweeping dust and debris into a small compartment in the robot.
  - **Mopping:** A water dispensing system connected to a small reservoir releases water onto the floor in small amounts. A mop pad is attached to the rear of the robot to wipe the floor as it moves.

3. Programming:

The robot's behavior is controlled through Arduino code, which defines how it responds to sensor input and controls motor actions. The key functions include:

- **Obstacle Avoidance:** The ultrasonic sensors provide input to detect objects. If an obstacle is detected within a predefined distance (e.g., 10 cm), the Arduino instructs the robot to stop, turn, and move in a different direction.
- **Cleaning Routine:** The motors controlling the brushes and mop system operate continuously as the robot moves, ensuring that cleaning is done in real-time.
- **Battery Monitoring:** The Arduino monitors the robot's battery level, alerting the user when the battery is low so it can be recharged.

4. Advantages of Arduino-Based Floor Cleaning Robot:

- **Cost-Effective:** By using readily available and inexpensive components like the Arduino board and basic motors, the overall cost of the robot is significantly lower than commercial cleaning robots.
- **Customizable:** Users can modify the code and hardware to suit their cleaning needs or add additional features like voice control, mobile app integration, or advanced sensors.
- **Easy to Build:** The robot uses simple components that are easy to assemble, making this project accessible even for beginner hobbyists.
- **Eco-Friendly:** The use of rechargeable batteries makes this robot environmentally friendly and sustainable for long-term use.

5. Challenges:

- **Limited Cleaning Area:** The robot lacks advanced mapping capabilities like those in high-end models, meaning it may miss some areas during cleaning.
- **Basic Obstacle Avoidance:** The robot's obstacle detection system works well for large objects but may struggle with smaller or low-profile items.
- **Mopping Efficiency:** The mopping system is simple and may not provide deep cleaning like commercial robots with pressurized water systems.

6. Applications

- **Home Cleaning:** The robot can be used in households to automate routine cleaning tasks like sweeping and mopping.
- **Small Offices:** In small office spaces with hard floors, the robot can help maintain cleanliness with minimal human intervention.
- **Workshops and Garages:** The robot can also be used to clean workshops or garages where dust and debris accumulate.

7. Future Improvements:

- **Improved Navigation:** Incorporating more advanced sensors, such as infrared or camera-based systems, could allow for more accurate navigation and coverage of the floor area.
- **Enhanced Cleaning Efficiency:** Upgrading the cleaning components to include a vacuum system or better mopping mechanism would improve the robot's overall performance.
- **Mobile App Integration:** Adding a Wi-Fi or Bluetooth module would enable users to control the robot via a smartphone app, giving them more control over cleaning schedules and modes.

Conclusion:

The Arduino-based floor cleaning robot is a practical, cost-effective solution for automating household cleaning tasks. By combining affordable components with simple yet effective programming, the robot can autonomously sweep and mop floors, making it a valuable tool for those looking for budget-friendly cleaning automation. While there are limitations in navigation and cleaning performance compared to commercial models, this project successfully demonstrates the potential of DIY robotics in everyday applications.

WI-FI CONTROLLED ROBOT USING BLYNK IN ELECTRONICS - ROBOTICS ENGINEERING

By Mr.B.SHANMUGAM, M.E., /LECTURER

Abstract:
In this project, a Wi-Fi-controlled robot is developed using the Blynk platform and an ESP8266/NodeMCU microcontroller. The robot can be controlled remotely via a smartphone app connected to the Blynk cloud server. The system utilizes a motor driver to control the movement of the robot and connects to a Wi-Fi network for communication. This cost-effective and easy-to-build robot can be used for educational purposes, surveillance, or as a base for more complex robotic applications. The project focuses on implementing wireless control through a user-friendly interface, allowing real-time navigation of the robot.

Introduction:

Robotics and automation are becoming increasingly accessible due to the widespread availability of affordable microcontrollers and communication modules. Controlling robots remotely via Wi-Fi opens up various possibilities, from home automation to surveillance and IoT applications.

The primary goal of this project is to design and build a Wi-Fi-controlled robot using the Blynk app and ESP8266/NodeMCU microcontroller. Blynk is a popular platform for IoT projects, providing a simple way to create interfaces for controlling microcontrollers over the internet. The project integrates this capability with basic motor control to create a robot that can be controlled remotely via a smartphone.

Project Report:

1. System Components:

- **ESP8266/NodeMCU Microcontroller:** This Wi-Fi-enabled microcontroller serves as the brain of the robot, handling both the Wi-Fi connection and motor control.
- **Blynk App:** A smartphone app that communicates with the robot via the Blynk cloud server, allowing real-time control through a graphical interface.
- **Motor Driver (L298N):** A motor driver used to control the robot's motors, allowing forward, backward, left, and right movements.
- **DC Motors:** Two DC motors attached to the robot's wheels, enabling movement.
- **Power Supply:** A rechargeable battery powers both the ESP8266 and motors.
- **Chassis and Wheels:** A basic robot chassis with two driving wheels and one caster wheel for support.

2. System Design:

The robot's design consists of the ESP8266 microcontroller connected to a motor driver, which controls the two DC motors attached to the wheels. The microcontroller is programmed to receive commands from the Blynk app over a Wi-Fi connection. Based on these commands, it sends appropriate signals to the motor driver to control the robot's movement.

- **Wi-Fi Setup:** The ESP8266 connects to the local Wi-Fi network and communicates with the Blynk cloud server. This allows the smartphone app to send control signals to the robot from anywhere, as long as both the app and the robot are connected to the internet.
- **Motor Control:** The L298N motor driver controls the speed and direction of the DC motors. It receives commands from the ESP8266, which are then translated into motor actions such as forward, backward, left, and right movements.

3. Blynk App Configuration:

The Blynk app is used to create a custom control interface for the robot. The steps to configure the app include:

1. **Download and Install Blynk:** Download the Blynk app from the App Store or Google Play.
2. **Create a New Project:** Create a new project and choose ESP8266 as the device. You will receive an authentication token that you need to include in the code for the ESP8266.
3. **Add Widgets:** Add widgets such as buttons, sliders, or joysticks to control the robot's movement. Each widget will be linked to specific GPIO pins on the ESP8266 to control motor actions.
4. **Connect to Blynk Cloud:** Ensure the robot and smartphone are both connected to the internet for seamless control.

4. Programming the ESP8266:

The ESP8266 is programmed using the Arduino IDE. The Blynk library is included in the code, along with the Wi-Fi credentials and the authentication token from the Blynk app. The code configures the ESP8266 to receive commands from the Blynk app and control the robot's movement accordingly.

Key Features in the Code:

- **Wi-Fi Connection:** The ESP8266 connects to the local Wi-Fi network using the SSID and password defined in the code.
- **Motor Control:** Commands received from the Blynk app are translated into motor control signals, allowing the robot to move forward, backward, and turn.
- **Real-time Feedback:** The app can be configured to show real-time data, such as the robot's speed or direction.

5. Working Principle:

1. **Connect to Wi-Fi:** When powered on, the ESP8266 connects to the Wi-Fi network and communicates with the Blynk cloud server.
2. **Receive Commands:** The Blynk app sends control commands (via the cloud) to the ESP8266, which interprets the signals and sends the appropriate instructions to the motor driver.
3. **Motor Actions:** The motor driver controls the two DC motors to move the robot in the desired direction.
4. **Real-time Control:** The user can adjust the robot's direction and speed in real time using the Blynk app.

6. Advantages of Wi-Fi Controlled Robot Using Blynk:

- **Remote Control:** The robot can be controlled from anywhere in the world as long as there is internet access, making it suitable for surveillance or remote monitoring.
- **User-Friendly Interface:** The Blynk app provides an intuitive interface for controlling the robot, requiring no complex programming for the user.
- **Cost-Effective:** Using readily available components like ESP8266 and DC motors makes the robot affordable and accessible to hobbyists and students.
- **Scalability:** The system can be expanded to include additional sensors or features such as a camera for remote video monitoring.

7. Challenges:

- **Wi-Fi Dependency:** The robot relies on a stable Wi-Fi connection for control. Poor connectivity can result in delayed or unresponsive controls.

- **Limited Range:** While Wi-Fi control offers a large range compared to Bluetooth, the robot is still limited by the range of the local Wi-Fi network unless connected to a portable hotspot.
- **Power Management:** The robot requires a steady power supply, and battery life can be a limitation, especially when using multiple components.

8. Applications:

- **Home Automation:** The robot can be used for simple tasks such as home surveillance or transporting small items around the house.
- **Education:** This project serves as an excellent learning tool for students to explore robotics, IoT, and wireless communication.
- **Surveillance:** By adding a camera or additional sensors, the robot can be used for remote surveillance of areas that are difficult to access.

9. Future Enhancements:

- **Camera Integration:** A camera module can be added to the robot, allowing for live video streaming via the Blynk app.
- **Autonomous Navigation:** Additional sensors, such as ultrasonic or infrared, can be added to enable the robot to navigate autonomously without human input.
- **Voice Control:** By integrating Google Assistant or Amazon Alexa, the robot can be controlled using voice commands.
- **Battery Monitoring:** Adding a battery monitoring system to alert the user when the battery is low would improve the usability of the robot.

Conclusion:

The Wi-Fi-controlled robot using Blynk offers an affordable and simple solution for remote-controlled robotics. The project demonstrates how easily available components, such as the ESP8266 microcontroller and the Blynk app, can be used to build a functional robot. With real-time control via Wi-Fi, the robot has practical applications in home automation, education, and surveillance. Future enhancements can expand the robot's capabilities, making it a versatile tool for various use cases.

DESIGN AND FABRICATION OF LIDAR BASED OBJECT DETECTION FOR MILITARY SPYING IN ELECTRONICS - ROBOTICS ENGINEERING

By Mr.M.MOHAMEDHUSSAIN, M.E., LECTURER

LIDAR (Light Detection and Ranging) is a remote sensing method that uses light in the form of a pulsed laser to measure ranges. It has numerous applications in military and aerial contexts. Let's delve into the details of the **LIDAR-based military spying project**:

1. **Project Overview**:
   - The goal of this project is to create an advanced LIDAR-based system for military surveillance.
   - The system continuously scans an area and detects objects within a specified range.
   - When an intruder enters this range, the system produces a beep sound and displays the exact position and angle of the detected object on an LCD display.
2. **Components**:
   - **Atmega 328p**: Microcontroller used for processing.
   - **LiDAR**: The LIDAR sensor that emits pulsed laser light and measures distances.
   - **20×4 LCD**: Display for showing information.
   - **Resistors, Capacitors, Transistors**: Basic electronic components.
   - **Cables and Connectors**: Wiring components.
   - **Diodes**: Used for rectification.
   - **PCB and Breadboards**: Prototyping boards.
   - **LED**: Visual indicators.
   - **Transformer/Adapter**: Power supply.
   - **Push Buttons, Switch IC, IC Sockets**: User interface components.
3. **Functionality**:
   - The LIDAR system scans the area continuously.
   - If an object enters the specified range, the system:
     - Produces a beep sound.
     - Displays the exact position and angle of the object on the LCD.
   - This helps track the object's movement and path.
4. **Significance**:
   - Military applications: Enhances surveillance and security.
   - Prevents enemies from approaching critical targets.
   - Potentially saves lives by providing early detection.
5. **Project Report and Documentation**:
   - You can find a detailed project report, including the system design, implementation, and results, on the Electronics Project website.

Remember that LIDAR-based systems have broader applications beyond military spying, including autonomous vehicles, environmental monitoring, and 3D mapping. If you're interested in further research, there's a comprehensive survey of robust 3D object detection methods in LiDAR point clouds available on arXiv as well. Happy exploring! □

DESIGN AND FABRICATION OF IOT SOCIAL DISTANCING AND MONITORING ROBOT FOR QUEUE IN ELECTRONICS - ROBOTICS ENGINEERING

BY Mrs. DHIVYA V, M.E., /LECTURER

Let's delve into the details of the **IOT Social Distancing & Monitoring Robot for Queues**:

1. **Project Overview**:
   - During the current pandemic, **social distancing** is crucial to limit the spread of COVID-19 by maintaining a perceived distance between people who may transmit the disease.
   - However, it's not feasible to station someone in each queue row 24/7 to monitor social distancing violations in places like banks, shopping centers, schools, and theaters.
   - To address this, a **social distancing robot** has been developed. Its purpose is to mechanically observe pairs of people in crowded environments and ensure compliance with social distancing rules.
   - The robot continuously monitors queues and tracks behaviors that violate social distance norms.
2. **Robot Features**:
   - **Four-Wheel Frame System**: The robot uses a four-wheel frame system for mobility.
   - **Tail Tracking Principle**: It employs tail tracking to continuously monitor queues.
   - **Infrared Sensor**: The robot moves its stem left and right to detect social distancing violations.
   - **Ultrasonic Obstacle Detection Sensors**: These sensors help detect obstacles in the robot's path.
   - **Distance Measurement**: Another ultrasonic sensor determines the distance between two people.
   - **Immediate Warning**: If the distance between people is less than two meters, the robot beeps and alerts of potential violations.
   - **IoT Connectivity**: The robot sends violation notices and camera images via WiFi to notify relevant authorities or key workplaces[1].
3. **Significance**:
   - The robot contributes to maintaining social distancing in crowded places, reducing the risk of virus transmission.
   - It provides an automated solution for monitoring queues and ensuring compliance with safety guidelines.
4. **Project Reports**:
   - You can find detailed project reports on this topic:
     - International Journal of Engineering Trends and Applications (IJETA)
     - SSRN (IOT Based Social Distancing and Monitoring Robot for Queue)

Remember, innovative solutions like this robot play a vital role in safeguarding public health during challenging times. □□

DEPARTMENT OF ELECTRONICS-(ROBOTICS) ENGINEERING

Project Work 2023-2024

S. No.	REG.No.	NAME OF THE STUDENT	Batch No.	TITLE	GUIDE NAME	REMARKS
1	22405339	GNANESHWAR S	I	Cobots Enhanced with R2R Communication.	Mr.VEERAMANI C	
2	22405370	VIKAS S				
3	22405334	DEVESH B				
4	22405336	DHARMESH K				
5	22405347	LOHITH D				
6	22405358	PRADEEP P				
7	22405359	PRAVESH N	II	Self Nav-O Bot	Mr.VEERAMANI C	
8	22405345	KISHAN M				
9	22405324	ARUL MANI C				
10	22405342	JAYA PRAKASH S				
11	22405348	LOKESH S				
12	22405361	SANJAY REDDY M				
13	22492643	MANI R	III	Arduino based Cost effective floor cleaning robot	Mr.K.STUART KIRUBAKARA PANDIAN	
14	22405327	BALAJI G				
15	22405331	COUSHIK R				
16	22405338	GANESH MURTHY V				
17	22405350	MANOJ R				
18	22405364	SIVASAMY K				
19	22405344	KIRANRAJAN B	IV	ESP32 CAM Security System.	Mr.K.STUART KIRUBAKARA PANDIAN	
20	22405337	DHARSAN M				
21	22405328	BHARATH M				
22	22405351	MANOJKUMAR M				
23	22405368	THABRAZ PASHA A				

24	22405371	VISHAL RAJU S	V	IoT based Home Automation System.	Mr.M.SINGARAVELAN	
25	22405346	KOWSHIK U				
26	22405333	DEVAKUMAR T				
27	22405340	GURUNATHAN M				
28	22405367	TAWHIDH S				
29	22492645	VISHNUBAIRAVAN B	VI	AI based Smart Idler For Electric Vehicles.	Mr.M.SINGARAVELAN	
30	22405343	KARTHICK C				
31	22405335	DHARESH R				
32	22405352	MOHAMED MATHEEN A				
33	22405369	VIGNESH D				
34	22405341	INAYATH A	VII	Self balancing robot	Mr.S.SHANMUGAM	
35	22405360	ROHIT RAJBHAR B				
36	22405325	ARUL R				
37	22405357	NITHISH S				
38	22405372	VISHVAS P				
39	22405362	SHANMUGASARATHI S	VIII	Wi-Fi Controlled Robot using Blynk.	Mr.S.SHANMUGAM	
40	22405330	CHITTY BABU R				
41	22405332	DEEPAKKUMAR S				
42	22405349	MADHU N				
43	22492644	VEDIYAPPAN M				

DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING.

PROJECT WORK

TITLE : **COMPREHENSIVE ANALYSIS OF COBOTS ENHANCED WITH R2R COMMUNICATION.**

BATCH No.: **I**

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22405339	GNANESHWAR S	Rs: 9400/-	Mr.C.VEERAMANI HOD
2	22405370	VIKAS S		
3	22405334	DEVESH B		
4	22405336	DHARMESH K		
5	22405347	LOHITH D		
6	22405358	PRADEEP P		

SYNOPSIS:

Collaborative robots (cobots) have revolutionized industrial operations by seamlessly integrating into human workspaces, facilitating increased productivity, and ensuring safer work environments. This paper explores the integration of Robot-to-Robot (R2R) communication capabilities into cobots to further enhance their efficiency and collaborative potential. R2R communication empowers cobots to exchange real-time data, coordinate actions, and collaborate on tasks autonomously or within a networked environment.

The study delves into the technical aspects of R2R communication protocols, including wireless communication and Internet-of-Things (IoT) frameworks, emphasizing their role in enabling seamless data exchange among cobots. Moreover, the paper elucidates the benefits of this integration, such as heightened operational efficiency, adaptive task allocation, fault tolerance, and enhanced safety within dynamic industrial settings.

Real-world case studies and experimental findings illustrate the practical implications of cobots equipped with R2R communication, showcasing their ability to optimize workflow, handle complex tasks collaboratively, and mitigate potential operational disruptions. Furthermore, considerations for implementation challenges, cyber security aspects, and scalability are discussed, offering insights into the practical deployment of this technology. In conclusion, the integration of R2R communication into cobots represents a significant advancement in industrial robotics, fostering a synergistic relationship that amplifies their capabilities, adaptability, and overall contribution to efficient and safe industrial operations.

Existing method:

ROS (Robot Operating System) is often utilized for seamless data exchange and coordination.

Proposed method:

Enhanced cobots collaborate via R2R communication for efficient operations.

Hardware:

Proximity Sensors, Cameras, LiDAR, Force/Torque Sensors, Wi-Fi/Bluetooth Modules, Industrial Controllers, Robotic Arms, Single Board Computers (SBCs),Global Navigation Satellite System (GNSS),Inertial Measurement Units (IMUs) Odometry Sensors.

Software:

OPC Unified Architecture (OPC UA), Middleware and Communication Libraries, Simulation Software (e.g., Gazebo, V-REP).

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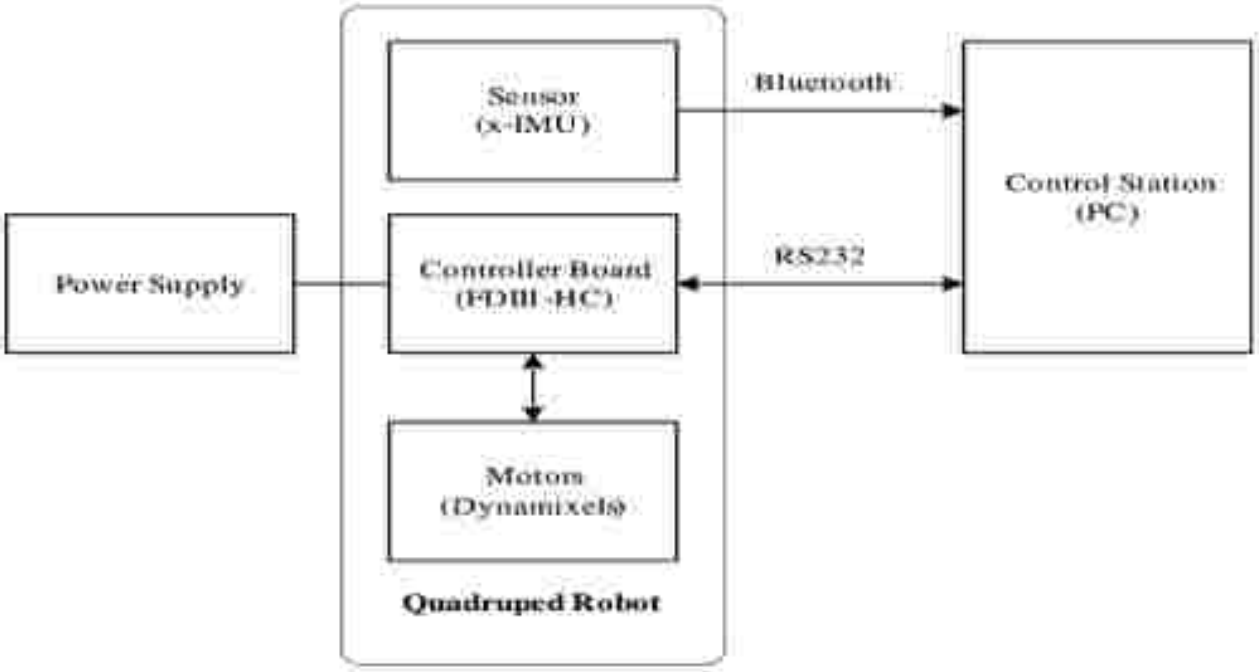

CERTIFICATE:

The project work is selected by the students based on norms prescribed by TNDTE.

DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING
PROJECT WORK

TITLE : **DEVELOPMENT OF SELF NAVIGATION ROBOT FOR SURVEILLANCE APPLICATION**

BATCH No.: II

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22405359	PRAVESH N	Rs: 9800/-	Mr.C.VEERAMANI HOD
2	22405345	KISHAN M		
3	22405324	ARUL MANI C		
4	22405342	JAYA PRAKASH S		
5	22405348	LOKESH S		
6	22405361	SANJAY REDDY M		

SYNOPSIS:

The "SelfNav-O Bot" is an autonomous navigation robot designed to operate and navigate independently in various environments without external intervention or human control. Equipped with advanced sensors, artificial intelligence, and navigation systems, the SelfNav-O Bot can perceive its surroundings, make real-time decisions, and maneuver through obstacles or changing terrains efficiently. This robot is built with a combination of technologies such as computer vision, LIDAR, GPS, and machine learning algorithms to analyze and interpret its environment.

It can create maps, identify obstacles, plan optimal routes, and adapt to dynamic surroundings, ensuring safe and efficient navigation. The primary objective of the SelfNav-O Bot is to perform tasks that require mobility and navigation, such as exploration, surveillance, delivery, or assisting in various industries like logistics, agriculture, healthcare, and more. Its autonomous nature reduces the need for constant human supervision, making it a valuable asset for scenarios where remote operation or continuous navigation is necessary. The versatility and adaptability of the SelfNav-O Bot make it a promising solution for various applications that demand reliable and autonomous navigation capabilities in diverse environments.

Existing method:

Sensor fusion, AI, mapping for autonomous navigation.

Proposed method:

Autonomous navigation using AI, sensors, and mapping technology.

Hardware:

LIDAR, cameras, GPS module, microcontroller, motors, and sensors for navigation and perception in the environment.

Software:

SLAM algorithms, machine learning models, and control software for mapping, navigation, and decision-making in various environments.

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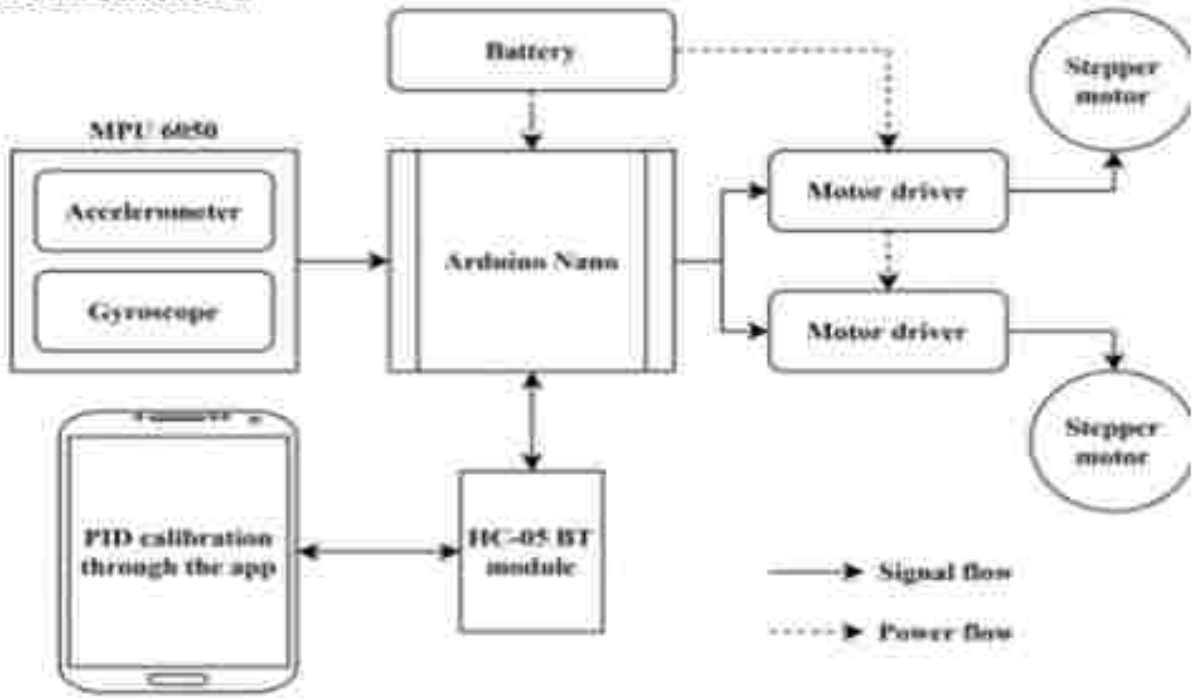

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DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING

PROJECT WORK

TITLE : **DESIGN AND DEVELOPMENT OF ARDUINO BASED COST EFFECTIVE FLOOR CLEANING ROBOT.**

BATCH No.: III

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22492643	MANI R	Rs: 8900/-	Mr.K.STUART KIRUBAKARA PANDIAN Lecturer
2	22405327	BALAJI G		
3	22405331	COUSHIK R		
4	22405338	GANESH MURTHY V		
5	22405350	MANOJ R		
6	22405364	SIVASAMY K		

SYNOPSIS:

The development of a cost-effective floor cleaning robot leveraging Arduino technology involves integrating affordable components for efficient functionality. The core hardware setup encompasses an Arduino microcontroller, DC motors for movement and cleaning mechanisms, sensors such as ultrasonic and IR for obstacle detection and navigation, and a rechargeable battery system for extended operation. Software development includes crafting algorithms for navigation, obstacle avoidance, and sensor-based control logic to govern the robot's movements and cleaning actions.

This project focuses on maximizing affordability by utilizing commonly available components while ensuring reliable performance. The assembly involves mounting these components onto a sturdy chassis to facilitate smooth movement across different floor surfaces. Software programming on the Arduino platform enables the synchronization of sensor data with motor control, optimizing the robot's cleaning capabilities. The goal is to showcase a practical, cost-effective solution for floor cleaning automation accessible to hobbyists, students, or small-scale applications. Through iterative testing and refinement, this project aims to demonstrate the feasibility of creating a functional and economical Arduino-based floor cleaning robot capable of autonomously navigating and efficiently cleaning indoor spaces.

Existing method:

Conventional robotic floor cleaners using proprietary systems.

Proposed method:

Efficient navigation, obstacle avoidance in Arduino-based cleaning robot.

Hardware:

Arduino microcontroller, DC motors, ultrasonic and IR sensors, rechargeable batteries for floor cleaning robot.

Software:

Arduino IDE programming, navigation algorithms, sensor integration for autonomous floor cleaning robot software.

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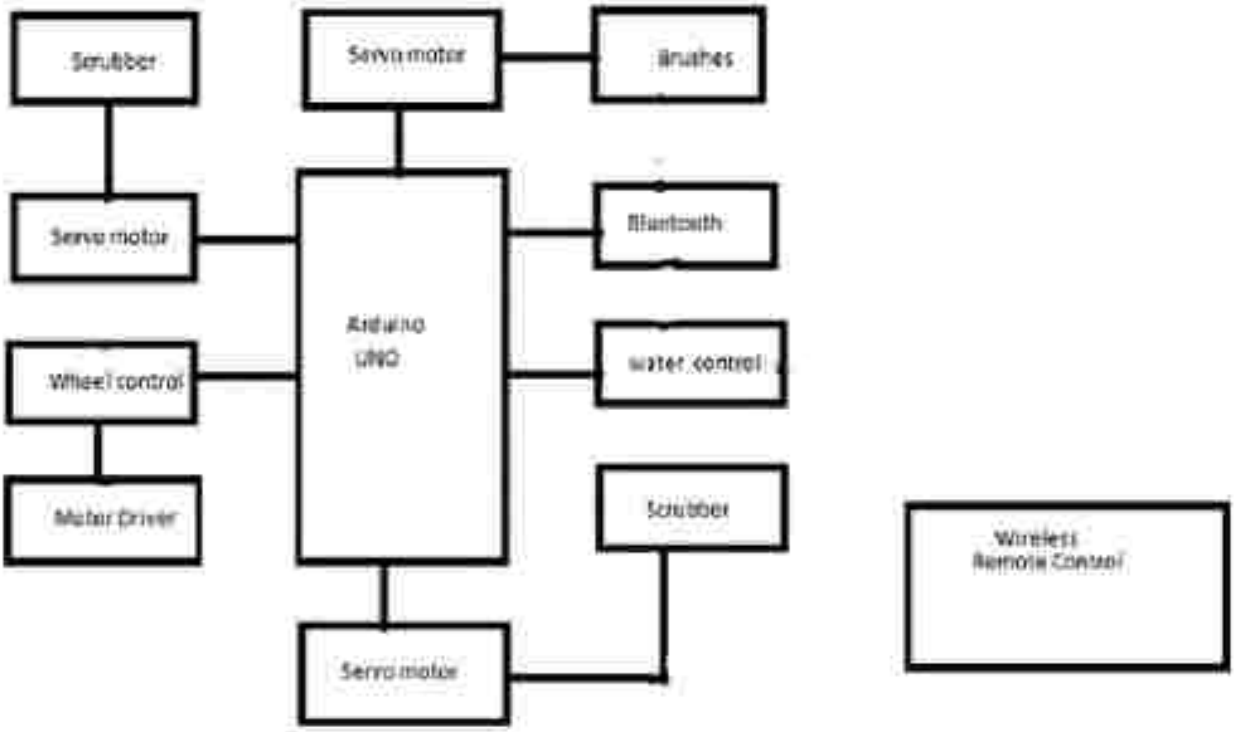

CERTIFICATE:

The project work is selected by the students based on norms prescribed by TNDTE.

DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING

PROJECT WORK

TITLE : **IMPLEMENTATION OF HOME SECURITY SYSTEM BASED ON ESP32 CAM**

BATCH No.: **IV**

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22405344	KIRANRAJAN B	Rs: 8400/-	Mr.K.STUART KIRUBAKARA PANDIAN Lecturer
2	22405337	DHARSAN M		
3	22405328	BHARATH M		
4	22405351	MANOJKUMAR M		
5	22405368	THABRAZ PASHA A		

SYNOPSIS:

The ESP32 CAM Security System is a comprehensive surveillance solution based on the ESP32 microcontroller and a camera module. This system combines advanced functionalities such as image capturing, motion detection, and wireless communication, making it an ideal choice for cost-effective security applications. Leveraging the ESP32's processing power, it performs real-time image processing and analysis for efficient monitoring. Its Wi-Fi connectivity facilitates remote access, enabling users to stream captured images or videos to a designated server or mobile device for monitoring purposes.

Equipped with motion detection capabilities, the system triggers alerts and captures images upon detecting movement, ensuring heightened security measures. Its compact design allows for seamless integration into diverse environments, making it suitable for home security setups, small business monitoring, or customizable do-it-yourself projects. Affordability and versatility define this system, offering an accessible yet robust solution for individuals seeking an adaptable and effective security system powered by the ESP32 microcontroller.

Existing method:

ESP32 CAM integrates Wi-Fi, camera, motion detection for security.

Proposed method:

Utilize ESP32 with camera for motion-based security.

Hardware:

ESP32 microcontroller, OV2640 camera module, and supporting components for surveillance and wireless connectivity.

Software:

Arduino IDE, ESP-IDF, or other compatible software for programming and managing ESP32 CAM functionalities.

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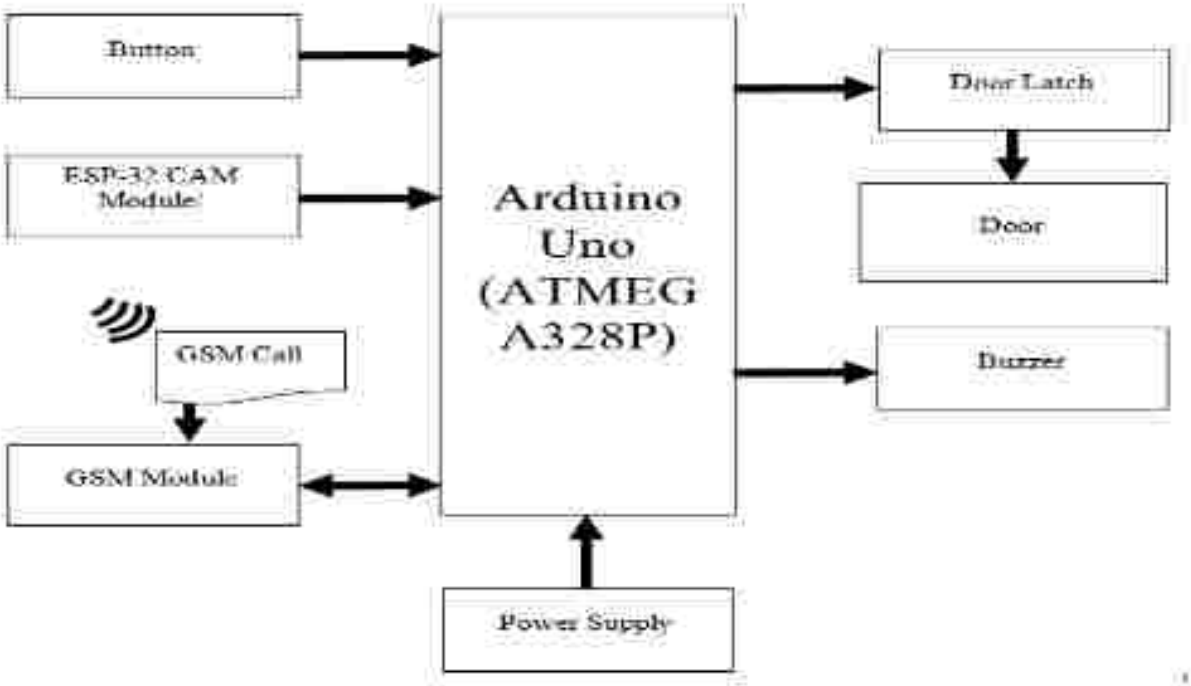

CERTIFICATE:

The project work is selected by the students based on norms prescribed by TNDTE.

DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING

PROJECT WORK

TITLE : **REAL TIME EXECUTION OF IoT BASED HOME AUTOMATION SYSTEM**

BATCH No:: **V**

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22405371	VISHAL RAJU S	Rs: 9450/-	Mr.M.SINGARAVELAN Lecturer
2	22405346	KOWSHIK U		
3	22405333	DEVAKUMAR T		
4	22405340	GURUNATHAN M		
5	22405367	TAWHIDH S		

SYNOPSIS:

The Internet of Things (IoT) has revolutionized the way we interact with our surroundings. In the context of home automation, IoT offers an interconnected ecosystem where various devices and appliances can communicate, be monitored, and controlled remotely. This abstract introduces an innovative IoT-based Home Automation System designed to enhance convenience, efficiency, and security within households. This system integrates sensors, actuators, and smart devices into a unified network, allowing homeowners to remotely manage various functionalities such as lighting, temperature, security, and entertainment systems via a central control interface.

Utilizing wireless connectivity protocols like Wi-Fi or Bluetooth, users can access and control these devices through dedicated mobile applications or web interfaces from anywhere with internet connectivity. Furthermore, the system employs machine learning algorithms to analyze usage patterns and adapt settings for optimized energy consumption and user preferences automatically. Security features such as real-time monitoring, encrypted communication, and authentication mechanisms ensure data privacy and safeguard against unauthorized access. The IoT-based Home Automation System aims to simplify daily routines, improve energy efficiency, and provide a seamless and secure living environment, thereby enhancing the overall quality of life for homeowners.

Existing method:

Traditional remote-controlled home appliances and switches.

Proposed method:

Interconnected IoT devices managed via a central interface.

Hardware:

Sensors, actuators, microcontrollers, Raspberry Pi, Arduino, Wi-Fi modules, and smart devices like lights, thermostats.

Software:

Mobile apps, web interfaces, IoT platforms, machine learning algorithms, and encryption protocols for remote control and security.

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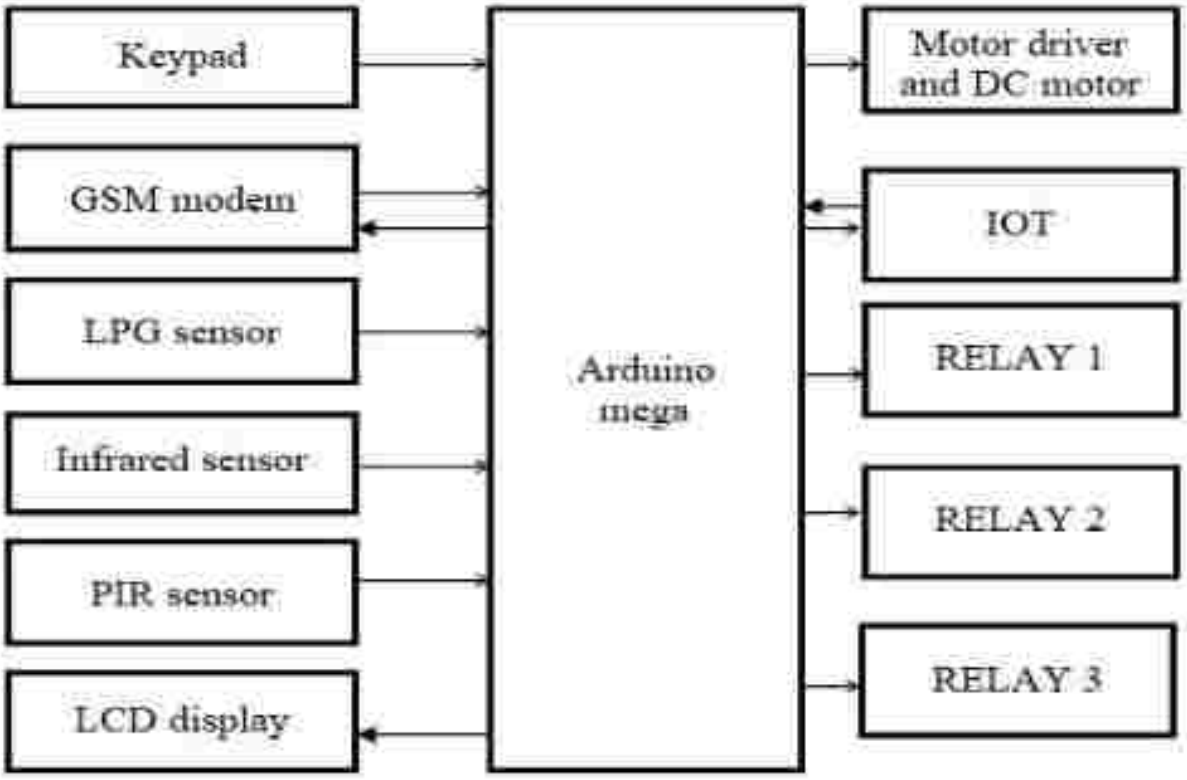

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DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING

PROJECT WORK

TITLE : **DESIGN OF AI BASED SMART IDLER FOR ELECTRIC VEHICLES.**

BATCH No:: **VI**

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22492645	VISHNUBAIRAVAN B	Rs: 9100/-	Mr.M.SINGARAVELAN Lecturer
2	22405343	KARTHICK C		
3	22405335	DHARESH R		
4	22405352	MOHAMED MATHEEN A		
5	22405369	VIGNESH D		

SYNOPSIS:

The proliferation of electric vehicles (EVs) has led to increased focus on developing efficient charging infrastructure. However, EV charging stations often experience congestion and inefficient use, leading to prolonged idling times. To address this challenge, an AI-based Smart Idler system for EV charging stations is proposed. The Smart Idler employs machine learning algorithms to predict charging patterns and user behaviour, optimizing the charging station's utilization. By analyzing historical data, the system anticipates peak usage times, thus allowing for proactive management of the charging resources.

Real-time monitoring and analysis of user preferences, traffic data, and energy demand enable the system to dynamically allocate charging slots, reducing wait times and idling periods for EV owners. The AI-driven system contributes to a sustainable and efficient charging ecosystem, minimizing energy wastage, and enhancing user satisfaction. Overall, the AI-based Smart Idler for EVs represents a significant advancement in optimizing charging station utilization, aligning with the growing demands of the electric vehicle industry and sustainable transportation initiatives.

Existing Method:

AI prediction optimizes electric vehicle charging station usage efficiently.

Proposed Method:

AI-driven allocation minimizes EV charging station idling periods.

Hardware:

Sensors, processors, and communication modules for data collection and analysis in charging stations.

Software:

Tens or Flow, PyTorch, scikit-learn for machine learning, and possibly custom-developed software for system management and optimization.

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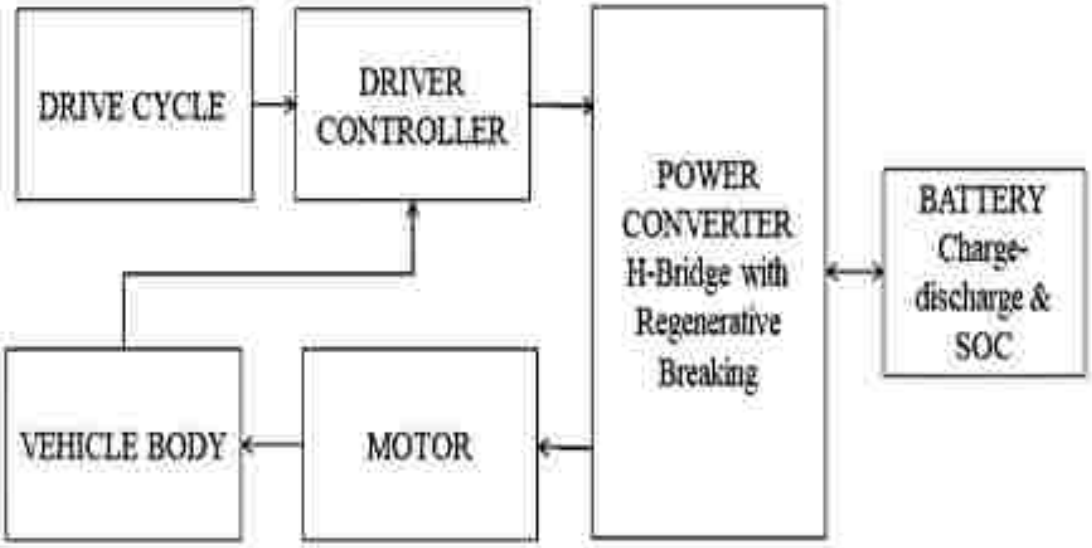

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The project work is selected by the students based on norms prescribed by TNDTE.

DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING

PROJECT WORK

TITLE : **PLAN AND EXECUTION OF SELF BALANCING ROBOT FOR AUTOMATED PRODUCTION PROCESS.**

BATCH No.: VII

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22405341	INAYATH A	Rs: 9300/-	Mr.S.SHANMUGAM Lecturer
2	22405360	ROHIT RAJBHAR B		
3	22405325	ARUL R		
4	22405357	NITHISH S		
5	22405372	VISHVAS P		

SYNOPSIS:

A self-balancing robot is an autonomous system designed to maintain an upright position by continuously adjusting its orientation. Utilizing sensors, typically gyroscopes and accelerometers, it gauges its tilt angle concerning the vertical axis and employs control algorithms to counteract deviations from equilibrium. This sophisticated control system processes sensor data, often employing PID (Proportional-Integral-Derivative) algorithms, to calculate corrective actions for balance maintenance. Actuators, usually motors, execute these commands to control the robot's movements.

Commonly, self-balancing robots come in two main configurations: those with an inverted pendulum design and those with two-wheeled structures. Inverted pendulum robots balance atop a single point, resembling the operation of a Segway, while two-wheeled variants dynamically adjust their position to remain upright. Construction of such robots involves integrating mechanical components for stability, electronic elements including sensors and microcontrollers for data processing, and sophisticated programming for control algorithms. These robots often serve as educational projects, allowing enthusiasts to delve into robotics, electronics, and programming concepts.

Existing Method:

PID control, sensors, and actuators maintain robot balance.

Proposed Method:

Enhanced sensor fusion for improved balance control.

Hardware:

Typically includes microcontrollers (Arduino, Raspberry Pi), IMU sensors, motors, and motor drivers for self-balancing robot construction.

Software:

Arduino IDE, Python, or C/C++ for programming control algorithms and motor/sensor interfacing in self-balancing robots.

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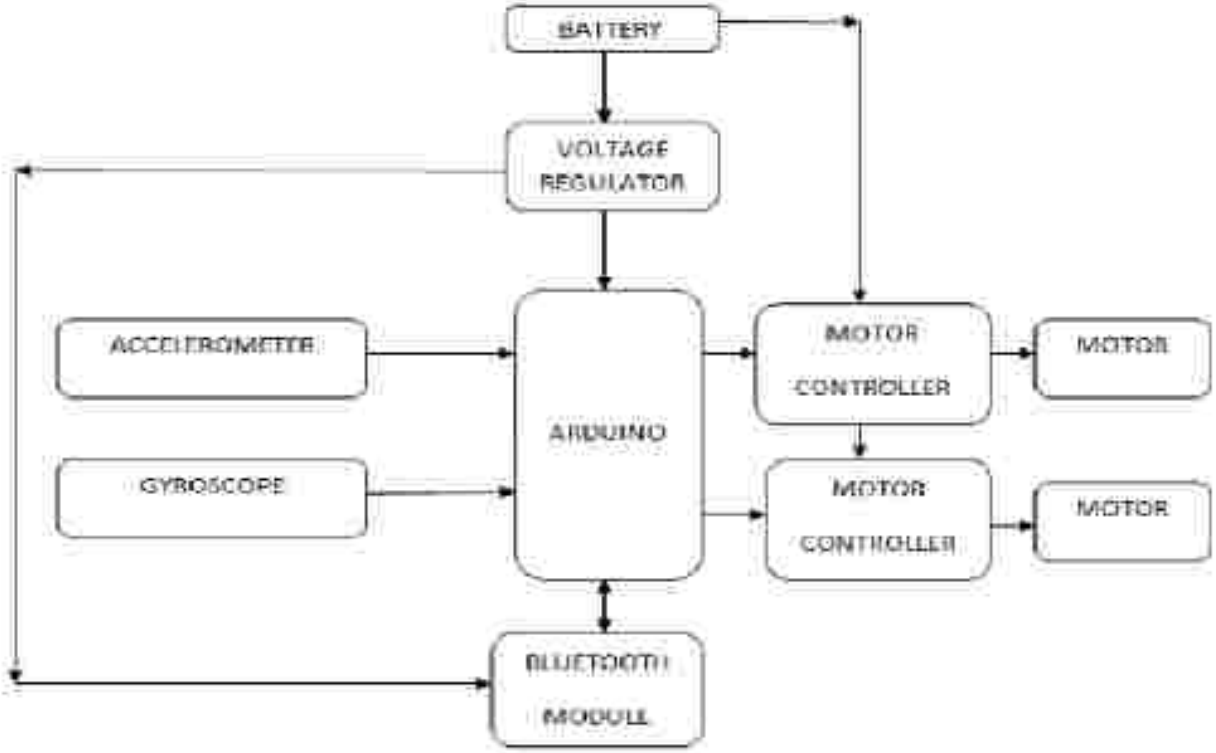

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DEPARTMENT OF ELECTRONICS (ROBOTICS) ENGINEERING

PROJECT WORK

TITLE : **IMPLEMENTATION OF WI-FI CONTROLLED ROBOT USING BLYNK IoT.**

BATCH No.: **VIII**

S. No.	REG No.	NAME	PROJECT COST (APPROX)	GUIDE NAME
1	22405362	SHANMUGASARATHI S	Rs: 9500/-	Mr.S.SHANMUGAM Lecturer
2	22405330	CHITTY BABU R		
3	22405332	DEEPAKKUMAR S		
4	22405349	MADHU N		
5	22492644	VEDIYAPPAN M		

SYNOPSIS:

The integration of Wi-Fi technology with robotics has enabled the development of innovative solutions for remote-controlled devices. This project focuses on creating a Wi-Fi controlled robot using the Blynk platform, offering a versatile and user-friendly interface for controlling the robot remotely through a Smartphone application. The project primarily involves the utilization of an Arduino-based microcontroller interfaced with a Wi-Fi module, enabling communication between the robot and the Blynk app. The Blynk app serves as a control centre, allowing users to maneuver the robot in various directions, monitor sensor data, and potentially incorporate additional functionalities through customizable widgets.

The implementation involves configuring the hardware components, establishing a connection between the microcontroller and the Blynk cloud server, and designing an intuitive user interface on the Blynk app. The robot's movement commands are transmitted via the Blynk app, which communicates these instructions to the microcontroller, enabling real-time control and feedback. This project showcases the feasibility and practicality of using Blynk as an efficient platform for creating Wi-Fi controlled robots, offering a seamless user experience for remotely operating robotic systems over a wireless network.

Existing Method:

Blynk app controls Wi-Fi robot via Smartphone interface.

Proposed Method:

Arduino integrates with Blynk app for remote robot control.

Hardware:

Arduino microcontroller, Wi-Fi module (e.g., ESP8266 or ESP32), motor driver, DC motors, chassis, wheels, and power source.

Software:

Arduino IDE, Blynk mobile app, Blynk library for Arduino, and potentially additional libraries for sensor integration or motor control.

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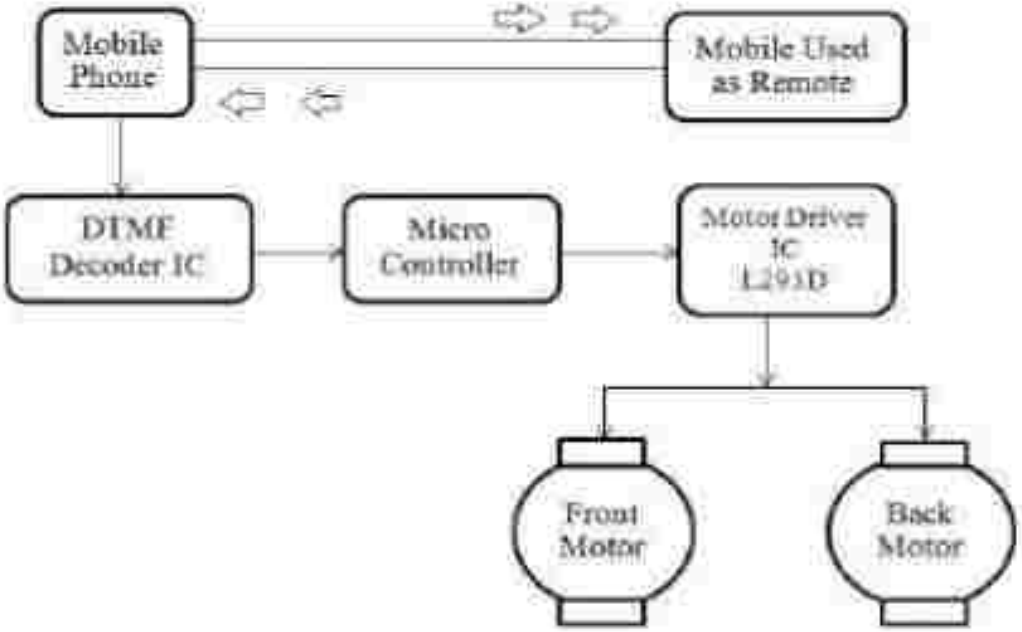
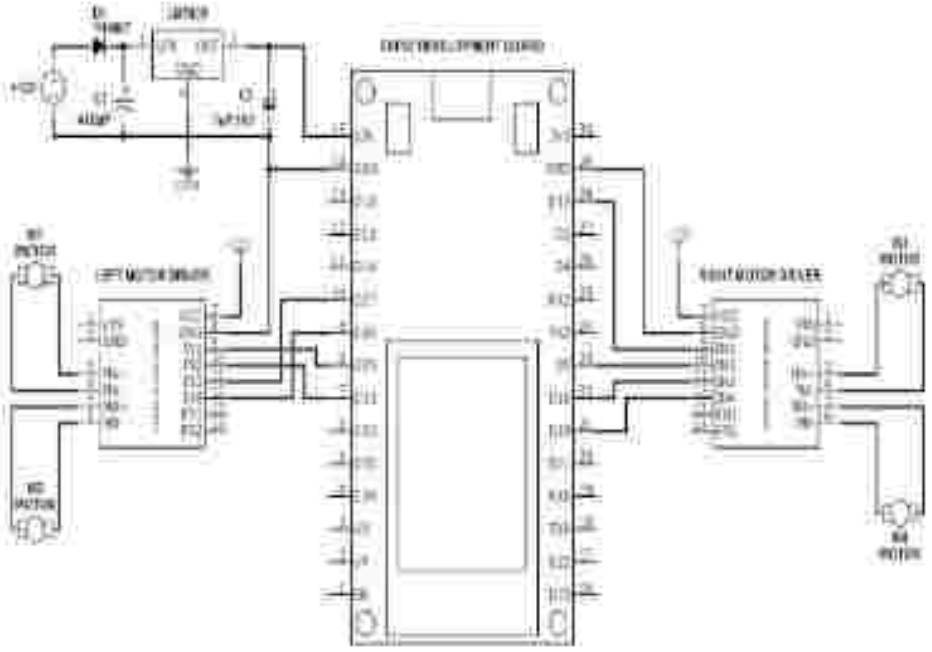




CERTIFICATE:

The project work is selected by the students based on norms prescribed by TNDTE.

AUTOMATIC STADIUM POWER MANAGEMENT WITH PARTICIPANT COUNTER

Aim:

To design and implement the stadium power management and participant calculator schemes by using artificial intelligence.

Methodology:

Existing methodology:

- Manual control for power management as well as counting process

Proposed Methodology:

With the advancement of technology intelligent devices are fast approaching the realm of necessity from the status of luxury.

With limited energy resources, it is the need of time to revolutionize the traditional methods of counting visitors or participants inside auditorium, recreational places and meeting rooms to control the electrical appliances.

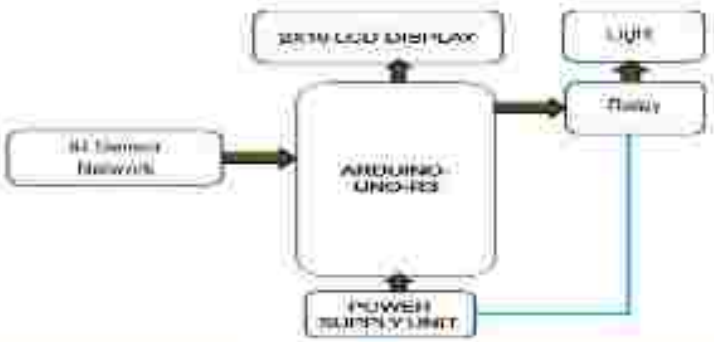
Moreover, the improved living standards demand developing circuits that would ease the complexity of life. Many systems have been developed to fill this technological gap but most of them are not applicable in real time scenarios due to their limitations.

This system describes the development and implementation of real time bidirectional visitor counter along with automatic power controller. The proposed system keeps track of visitors visiting a room as well as takes over the control of the room lights.

As a visitor enters the room, the count is incremented by one and the lights are switched on. While the count is decremented if a person leaves the room. Electrical devices of the room are switched off only if there is no person inside.

Though a number of systems have been developed in this field but most of them are not practically applicable due to outdated technology.

Block diagram:



LINE FOLLOWER ROBOT

Aim:

To design and implement the path or line following robotic structure without programming device.

SYNOPSIS

Methodology:

Existing methodology:

Most of the line or path finding robotic design based on programming controller.

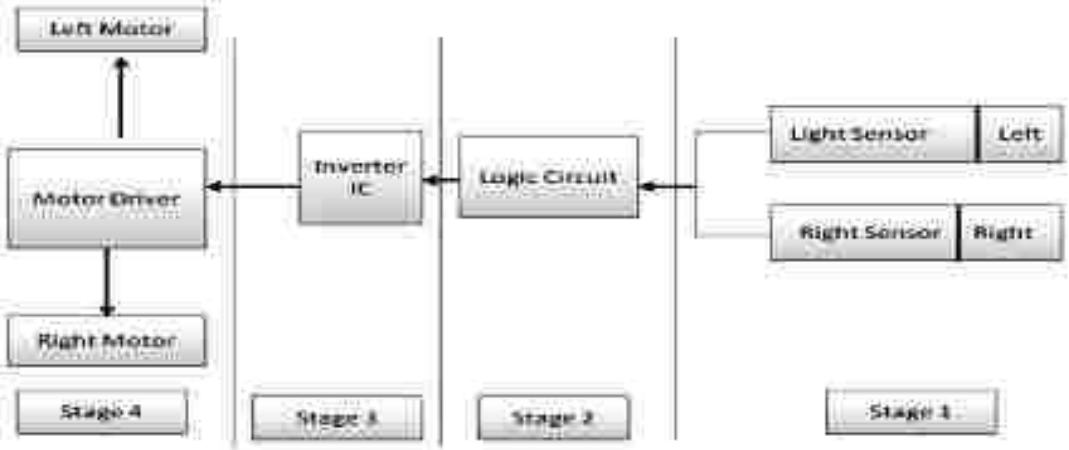
Proposed Methodology:

Line follower is an autonomous robot which follows either black line in white area or white line in black area. Robot must be able to detect particular line and keep following it. For special situations such as cross over's where robot can have more than one path which can be followed, predefined path must be followed by the robot. Line following is a task in which robot has to follow the line. It must be capable of taking various degrees of turns to follow the curved lines also.

The Line following Robot moves to follow a line drawn on the floor. This Robot follows the black line which is drawn over the white surface. The line sensors are used to sense the line. When the signal falls on the white surface, it gets reflected and if it falls on the black surface, it is not reflected this principle is used to scan the Lines for the Robot.

The Robot should be capable of taking various degrees of turns and must be insensitive to environmental factors such as lighting and noise.

Block diagram



DYNAMIC LOGIC CONSTRUCTION OF VEHICLE HEALTH MONITORING AND CONTROLLING SYSTEM USING CAN PROTOCOL

Aim:

To design and implement the monitoring of vehicle health condition to avoid the travelling risk.

Methodology:

Existing methodology:

General parameters such as Engine temperature and oil, seat belt and door lock.

Proposed methodology:

In modern days the technical growth of each field reaching peak to peak especially automobile technology.

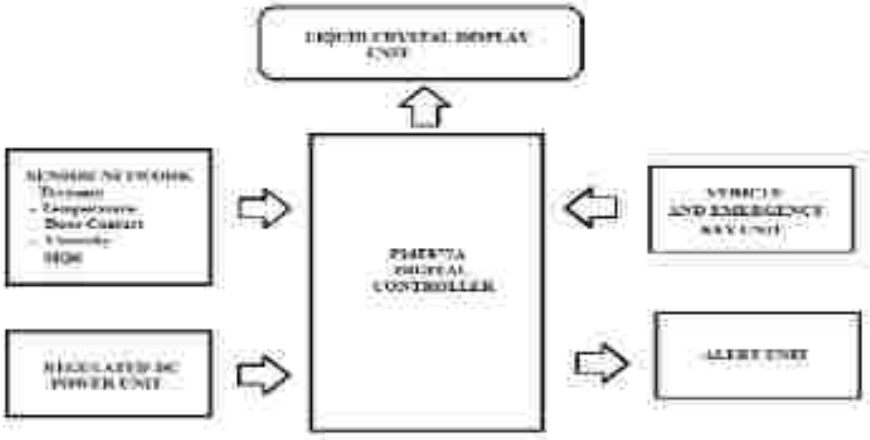
Networked Electronic Control Units (NECUs) are increasingly being deployed in automobiles to realize various functions and Controller Area Network (CAN) is deployed for the communications among ECUs. Our primary objective is to build both hardware and software that interface and communicate directly with CAN network and extract CAN messages for reliable vehicle health communications. Controller–area network (CAN or CAN-bus) is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer.

CAN is a text message-based protocol, designed specifically for automotive applications but now also used in other areas such as industrial automation and medical equipment. The hardware is a circuit board that is capable of capturing CAN signals released from an automobile.

The need was identified to perform a single step effort in order to avoid every project willing to use CAN to solve individually the existing gap between terrestrial and space applications. The software will be both the firm-wares programmed for the microcontroller found on the circuit board, as well as the Graphical User Interface on the LCD screen that enables users to monitor the functionalities of automobile via a few simple presses of the micro buttons.

With the help of these developed components, CAN messages can be used for reliable vehicle health communications. The proposed system is designed and focused towards monitoring and alerting to the user about the vehicle health parameters such as conditions of the break, air pressure on the wheel, door and engine oil, temperature conditions etc., while the user switched on the vehicle.

Block Diagram



A NEW MODELING OF CONTACTLESS HUMAN BIO WAVES MONITORING SYSTEM THROUGH ANDROID ENVIRONMENT

Aim:

To design a smart system for measuring multi bio-waves signals through android application.

Methodology:

Existing Methodology:

The manual and single window measurements have been made.

Proposed Methodology:

The novel device presented here for monitoring respiration and pulse meets all the aforementioned requirements of an ideal on-body sensor. A mobile device is presented for monitoring both respiration and pulse.

The device is developed as a bendable/flexible inlay that can be placed in a shirt pocket or the inside pocket of a jacket.

It combines two sensors, both of which work in a noncontact way allowing unobtrusive monitoring.

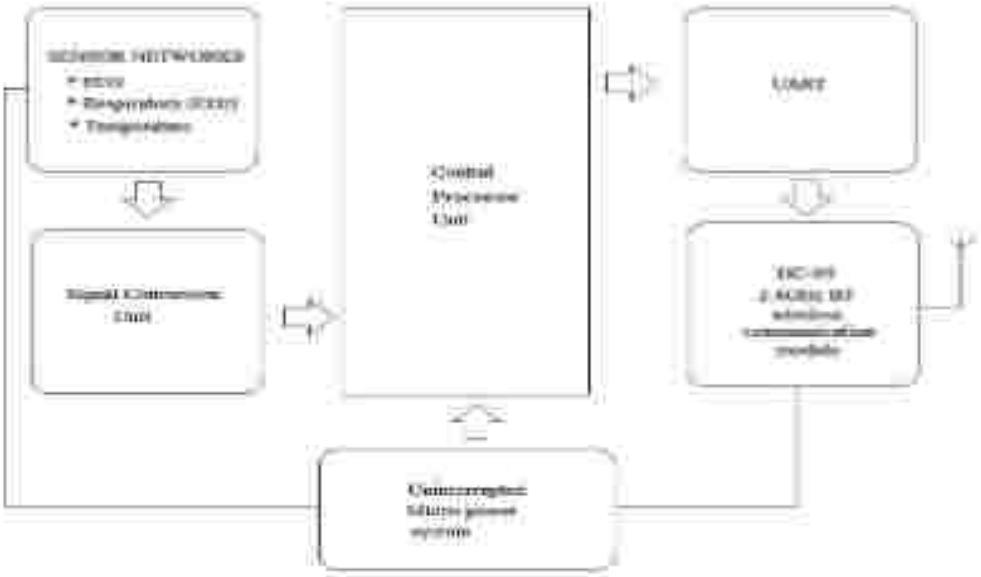
The device includes a microcontroller for data processing and a Bluetooth module for data tranamission. The MQ-6 can be used to sense the CO2 level of the breathing air and converted into electrical signal.

To achieve optimum monitoring performance, the device combines three sensor principles, which work in a safe noncontact way through several layers of cotton or other textiles.

One sensor, based on CO2 (MQ-6), is intended for respiratory monitoring, LM 35 transistor is used to sensing the body temperature and the other is a reflective IR (Infra Red) sensor intended for pulse detection.

Because each sensor signal has some dependence on both physiological parameters, fusing the sensor signals allows enhanced signal coverage

BLOCK DIAGRAM:



ENHANCEMENTS IN ROBOTICS TECHNOLOGY

Let's delve into the exciting developments in the field of robotics during 2022-2023. Here are some key insights from the **World Robotics Report**:

1. **Record Robot Installations**:
   - In 2021, the robotics industry achieved a significant milestone with a record **517,385 new robotic installations** worldwide.
   - Factors such as labor costs, skills shortages, and technological advancements have contributed to this surge in robot usage.
   - Countries worldwide are investing heavily in automation to remain competitive in the global economy.
2. **Robot Density**:
   - Robot density, which measures the number of robots per 10,000 employees, provides insights into robotic adoption.
   - The average robot density in the manufacturing industry was **141 robots per 10,000 employees** (equivalent to 1 robot for every 71 employees).
   - The top five countries with the highest robot density in 2022 were:
     - **South Korea**
     - **Singapore**
     - **Germany**
     - **Japan**
     - **Sweden.**
3. **Industrial Robots vs. Service Robots**:
   - Industrial robots continue to dominate, with almost **4 million operating globally**.
   - The electronics industry remains a major customer for industrial robots.
   - Collaborative robots (cobots) are steadily growing their market share, accounting for 10% of installations.
4. **Regional Trends**:
   - **China**: China leads the way, installing every other robot globally. Its electronics industry is a significant driver.
   - **Japan**: Japan has seen strong recovery, driven by demand in electronics and automotive sectors.
   - **United States**: The US recorded its second-highest installation count ever, with the automotive industry playing a key role.
   - **Korea**: Korean robot demand remained steady, particularly in the electronics industry.
5. **Forecast for 2023**:
   - Approaching the **600,000-unit mark** in robot installations.
   - Supply chain constraints are easing, but inflation remains high.
   - Global economic growth slowdown may impact robot installations.
   - Technological trends include cloud computing and 5G mobile networks, driving new business models.

TECHANICAL QUIZ

1. What is collaborative robotics (cobots), and how do they differ from traditional industrial robots?

- a) Cobots are designed to work alongside humans.
- b) Cobots are faster than industrial robots.
- c) Cobots are less expensive but require constant human supervision.
- d) Cobots are equipped with artificial intelligence for autonomous operations.

2. Which of the following is a key benefit of using artificial intelligence (AI) in robotics?

- a) Decreased complexity of robotic systems.
- b) Increased need for manual programming.
- c) Enhanced autonomy and decision-making ability.
- d) Reduced hardware costs.

3. Which company pioneered the development of autonomous warehouse robots?

- a) Boston Dynamics
- b) KUKA Robotics
- c) Amazon Robotics (formerly Kiva Systems)
- d) Fanuc

4. What is SLAM (Simultaneous Localization and Mapping)?

- a) A method for controlling robotic arms in factories.
- b) A technology used for navigation and mapping of environments by robots.
- c) A type of AI algorithm for humanoid robots.
- d) A programming language for robotics.

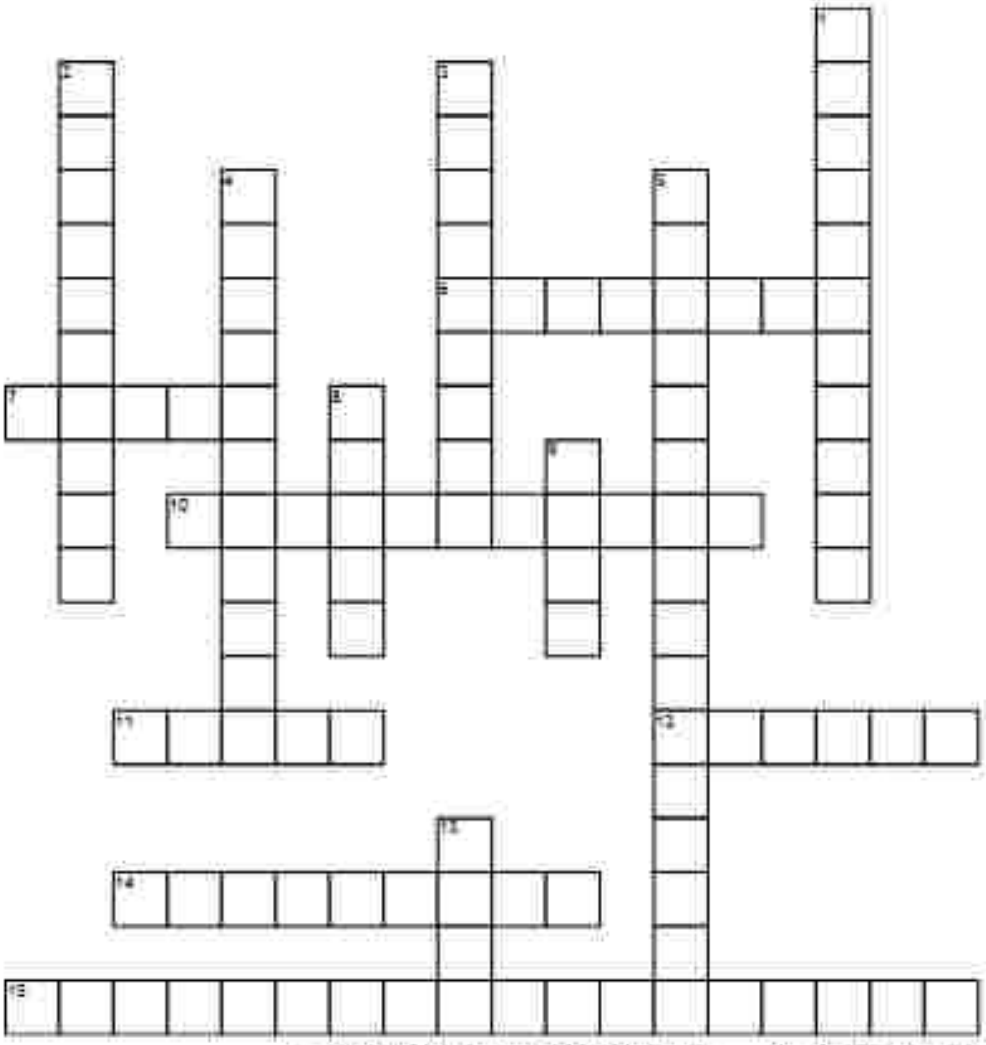
5. Which of the following sensors is commonly used for obstacle detection in autonomous robots?

- a) LiDAR
- b) Gyroscope
- c) Potentiometer
- d) Hygrometer

6. What is the primary function of a robotic gripper in the context of industrial robots?

- a) Moving robots.
- b) Vision processing.
- c) Object manipulation and handling.
- d) Speed control.

Robotics Crossword Puzzle



Across

6. the study of robots
7. the UltraSonic Sensor uses this type of technology when it sends a signal out to the object and it bounces back to the robot
10. this motor is typically used as a secondary motor
11. The specific areas for connecting sensors and motors to the EV3.
12. In Mindstorm, the name of the block used if you want the robot to do something when one condition is met and then another thing when a different condition is met
14. Robotics kits from Lego containing hardware and software to create EV3 robots
15. a person who writes computer code

Down

1. this sensor can tell if the robot hits into something
2. this motor is typically used to make the robot's wheels move
3. A list of instructions to do something
4. This sensor can detect something blue, red, green, white, black, etc.
5. this sensor detects distance from an object
8. the "brains" of the mindstorm robot
9. A term for any command or group of commands in a program.
13. In Mindstorm, the name of the block used to do something over and over

Word Bank

ports	Loop	sonar	algorithm
switch	mindstorm	color sensor	code
computer programmer	touchsensor	large motor	medium motor
robotics	brick	ultrasonic sensor	

IFR International Federation of Robotics

Pressemitteilung

Top 5 Roboter-Trends 2024
- International Federation of Robotics berichtet

Frankfurt, 15. Februar 2024 – **Der weltweite Bestand an Industrie-Robotern hat mit rund 3,9 Millionen Einheiten einen neuen Rekord erreicht. Die starke Nachfrage wird von einer Reihe spannender technologischer Innovationen getrieben. Die International Federation of Robotics berichtet über die wichtigsten Trends, die die Robotik und Automatisierung im Jahr 2024 prägen werden.**

1 - Künstliche Intelligenz (KI) und Machine Learning

In der Robotik und Automation nimmt der Einsatz Künstlicher Intelligenz weiter zu. Mit der Entwicklung generativer KI eröffnen sich neue Lösungen. Diese Untergruppe der KI ist darauf spezialisiert, über Trainings zu lernen und daraus etwas Neues zu schaffen – mit Online-Tools wie ChatGPT sind diese Lösungen bereits bekannt geworden. Roboterhersteller entwickeln generative KI-gesteuerte Schnittstellen, um Roboter intuitiver zu programmieren. Die Anwender programmieren mit natürlicher Sprache anstelle von Code. Die Arbeiterinnen und Arbeiter benötigen damit keine speziellen Programmierkenntnisse mehr, um die gewünschten Aktionen des Roboters auszuwählen und anzupassen.

Ein weiteres Beispiel ist die vorausschauende KI, die Leistungsdaten von Robotern analysiert, um den zukünftigen Zustand von Anlagen zu ermitteln. Durch vorausschauende Wartung können Hersteller Kosten für Maschinenausfallzeiten einsparen. In der Automobilzulieferindustrie kostet jede Stunde ungeplanter Ausfallzeit schätzungsweise 1,3 Millionen US-Dollar, wie die Information Technology & Innovation Foundation berichtet. Diese Größenordnung zeigt das enorme Kosteneinsparpotenzial der so genannten Predictive Maintenance. Mit Algorithmen des maschinellen Lernens lassen sich zudem die Daten von mehreren gleichlaufenden Robotern analysieren und die Prozesse auf dieser Basis optimieren. Im Allgemeinen gilt: Je mehr Daten ein Algorithmus für maschinelles Lernen erhält, desto besser ist seine Leistung.

2 – Cobots für neue Anwendungen

Die Mensch-Roboter-Kollaboration ist weiterhin ein wichtiger Trend in der Robotik. Die rasanten Fortschritte bei der Entwicklung von Sensoren, Bildverarbeitungstechnologien und intelligenten Greifern machen es möglich, dass Roboter in Echtzeit auf Veränderungen in ihrer Umgebung reagieren, um so sicher an der Seite von Menschen zu arbeiten.

Kollaborative Roboteranwendungen unterstützen menschliche Arbeitskräfte dabei in der täglichen Arbeit: Aufgaben wie schweres Heben, repetitive Bewegungen oder Arbeiten in gefährlichen Umgebungen entfallen.

Die Roboterhersteller bieten immer mehr Einsatzgebiete für kollaborative Anwendungen an. Eine aktuelle Marktentwicklung ist die Zunahme von Roboterschweißanwendungen, die in diesem Segment durch den Mangel an qualifizierten Fachkräften ausgelöst wurde. Diese

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Nachfrage zeigt, dass die Automatisierung nicht zu einem Arbeitskräftemangel führt, sondern umgekehrt als Mittel zur Lösung des Personalmangels beiträgt. Kollaborative Roboter werden in diesem Sinne Investitionen in klassische Industrieroboter, die mit viel höheren Geschwindigkeiten arbeiten, ergänzen - nicht ersetzen. Die herkömmliche Industrierobotik bleibt für die Verbesserung der Produktivität als Reaktion auf enge Produktmargen wichtig.

Zudem drängen neue Wettbewerber auf den Markt, die sich speziell auf kollaborative Roboter konzentrieren. Mobile Manipulatoren, die Kombination aus kollaborativen Roboterarmen und mobilen Robotern (AMRs), bieten neue Anwendungsfälle, die die Nachfrage nach kollaborativen Robotern erheblich steigern könnten.

3 - **Mobile Manipulatoren**

Mobile Manipulatoren - so genannte "MoMas" - automatisieren die Handhabung von Material in Branchen wie der Automobilindustrie, der Logistik oder der Luft- und Raumfahrt. Sie kombinieren die Mobilität von Roboterplattformen mit der Geschicklichkeit von Manipulatorarmen. Dadurch sind sie in der Lage, sich in komplexen Umgebungen zu bewegen und mit Objekten umzugehen. Das ist eine besonders wichtige Fähigkeit bei Anwendungen in der Fertigung. Ausgestattet mit Sensoren und Kameras, führen diese Roboter Inspektionen und Wartungsarbeiten an Maschinen und Anlagen durch. Einer der entscheidenden Vorteile mobiler Manipulatoren ist, dass diese Maschinen unmittelbar mit menschlichen Arbeitskräften zusammenarbeiten können. Der Fachkräfte- und Personalmangel für Fabrikarbeitsplätze dürfte die Nachfrage künftig weiter steigern.

4 - Digitale Zwillinge

Digitale Zwillinge werden zunehmend eingesetzt, um die Leistung physischer Systeme mit deren virtuellen Abbildern zu optimieren. Da Roboter in Fabriken zunehmend digital integriert sind, können digitale Zwillinge die erfassten realen Betriebsdaten nutzen, um Simulationen durchzuführen und wahrscheinliche Ergebnisse vorherzusagen. Als reines Computermodell lässt sich der Zwilling unter Stressbedingungen testen und verändern, ohne dass dabei Verschleiß oder ein Sicherheitsrisiko entsteht. Im Vergleich zu Tests mit physischen Systemen sparen solche virtuellen Simulationen erhebliche Kosten. Der Vorteil: Digitale Zwillinge überbrücken die Kluft zwischen der digitalen und der physischen Welt.

5 - Humanoide Roboter

In der Robotik gibt es bedeutende technologische Fortschritte bei den Humanoiden, die ein breites Aufgabenspektrum in verschiedenen Arbeitsfeldern übernehmen können. Das menschenähnliche Design mit zwei Armen und zwei Beinen ermöglicht es dem Roboter, flexibel in Arbeitsumgebungen eingesetzt zu werden, die eigentlich für Menschen geschaffen wurden. Er lässt sich beispielsweise leicht in bestehende Lagerprozesse und Infrastrukturen integrieren.

Chinas Ministerium für Industrie und Informationstechnologie (MIIT) veröffentlichte kürzlich detaillierte Ziele für die Ambitionen des Landes, bis 2025 Humanoide in Serie zu produzieren. Das MIIT geht davon aus, dass Humanoide eine weitere bahnbrechende Technologie sein werden, ähnlich wie Computer oder Smartphones, die die Art und Weise, wie wir Waren produzieren und wie wir leben, verändern könnten.

Die potenziellen Auswirkungen von Humanoiden auf verschiedene Sektoren machen sie zu einem spannenden Entwicklungsbereich. Die Einführung von Humanoiden auf dem Massenmarkt bleibt jedoch eine komplexe Herausforderung. Ein Schlüsselfaktor sind dabei die

Kosten: Der Erfolg wird davon abhängen, ob sie sich beispielsweise im Wettbewerb mit etablierten Roboterlösungen wie mobilen Manipulatoren rentieren.
„Die Top 5 Robotik- und Automationstrends 2024 zeigen, dass die Robotik ein multidisziplinärer Bereich ist, bei dem sich die Technologien gegenseitig unterstützen, um intelligente Lösungen für eine Vielzahl von Aufgaben zu schaffen", sagt Marina Bill, Präsidentin der International Federation of Robotics. „Diese Fortschritte werden weiterhin das Zusammenwachsen von Industrie- und Servicerobotik und die Zukunft der Arbeit prägen."

Downloads

Bilder sowie die Pressemeldung in englischer Sprache finden Sie auf unserer Webseite:
https://ifr.org/ifr-press-releases/news/top-5-robot-trends-2024

Humanoide erledigen eine Vielzahl von Aufgaben in verschiedenen Arbeitsumgebungen / Sozialer Roboter ARI von PAL Robotics

Über die IFR

Die International Federation of Robotics ist das Sprachrohr der weltweiten Robotikindustrie. IFR vertritt nationale Roboterverbände, Forschungseinrichtungen sowie Roboterhersteller aus mehr als zwanzig Ländern. IFR wurde 1987 als nicht gewinnorientierte Organisation gegründet. Mehr auf: www.ifr.org

Das IFR Statistical Department stellt Branchendaten für folgende statistische Jahrbücher bereit:

World Robotics - Industrieroboter: Dieser einzigartige Bericht liefert weltweite Statistiken über Industrieroboter in einheitlichen Tabellen und ermöglicht aussagefähige Ländervergleiche. Er enthält statistische Daten aus circa 40 Ländern, aufgeschlüsselt nach Anwendungsbereichen, Industriesektoren, Roboterarten und anderen technischen und wirtschaftlichen Aspekten. Für ausgewählte Länder sind Produktions-, Export- und Importdaten aufgeführt. Mit der Roboterdichte, d.h. der Anzahl von Robotern je 10.000 Beschäftigten, wird zudem ein Maß für den Automationsgrad angeboten.

World Robotics - Serviceroboter. Dieser einzigartige Bericht beschreibt marktfähige Produkte, Aufgaben, Herausforderungen und neue Entwicklungen zur Anwendung von Servicerobotern. Der Bericht enthält die Ergebnisse der jährlichen IFR-Serviceroboter-Erhebung zum weltweiten Absatz von professionell und privat genutzten Servicerobotern sowie eine Branchenstrukturanalyse mit einer vollständigen Liste aller dem IFR bekannten Serviceroboterhersteller. Die Studie wird gemeinsam mit den Robotik-Experten des Fraunhofer IPA, Stuttgart, erstellt.

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International Federation of Robotics

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