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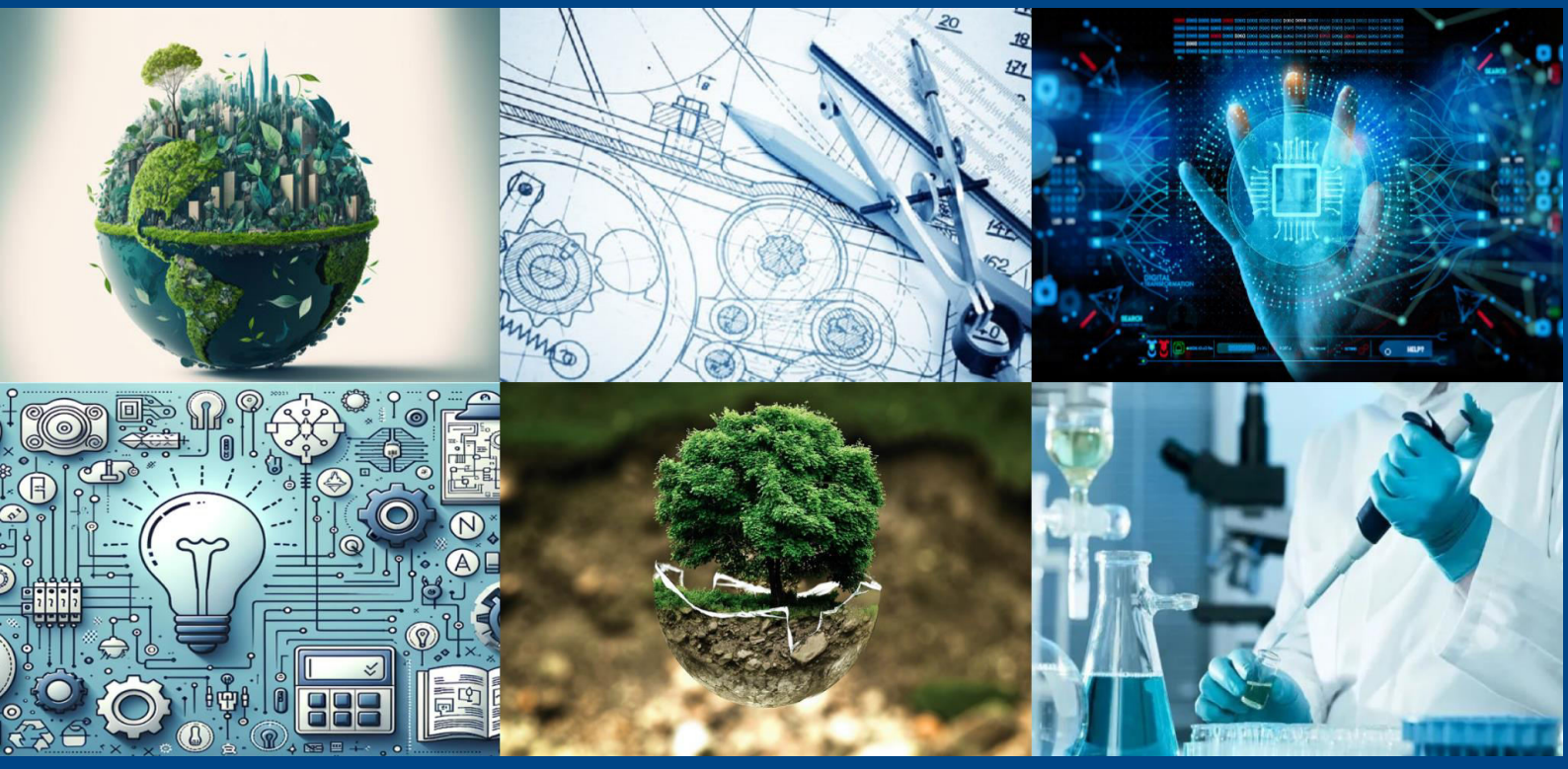

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Supply Chain Management System

Ashita Singh Solanki, Swati Singh, Vikhyat Gupta

Department of Electronics and Communication Engineering Lakshmi Narain College of Technology and Science, Bhopal, India

Dr. Soheb Munir, Prof. Rahul Sharma

Project Guide, Department of Electronics and Communication Engineering Lakshmi Narain College of Technology and Science, Bhopal, India

Project In-charge, Department of Electronics and Communication Engineering Lakshmi Narain College of Technology and Science, Bhopal, India

ABSTRACT: The Supply Chain Management System (SCMS) project is designed to optimize and streamline end-to-end supply chain operations, improving efficiency, transparency, and overall performance. In today's competitive business environment, effective supply chain management is essential for meeting customer demands, reducing costs, and sustaining a competitive advantage. The SCMS project offers a comprehensive suite of functionalities to manage procurement, production, distribution, and logistics. In the area of procurement management, the system enables organizations to track and evaluate supplier performance, automatically generate purchase orders based on inventory levels and demand forecasts, and integrate with supplier databases for accurate and up- to-date information. For inventory management, it provides real-time monitoring to prevent stockouts or overstocking, automated alerts for replenishment, and the use of RFID or barcode technology for efficient goods tracking. The system also includes data analytics and reporting tools that analyze historical data, identify trends, and present insights through customizable dashboards and reports to support informed decision-making. On the backend, the system handles tax calculations in accordance with product categories and jurisdictional regulations. Additionally, a user-friendly point-of-sale (POS) interface allows users to efficiently manage customer transactions, apply discounts or promotions, and finalize sales, enhancing the overall usability and effectiveness of the system.

I. INTRODUCTION

An IoT-based surveillance robot is a cutting-edge technology that merges robotics, the Internet of Things (IoT), and artificial intelligence (AI) to revolutionize security and monitoring systems. These autonomous or remotely controlled robots are equipped with a variety of sensors, cameras, and communication capabilities, enabling them to gather real-time data from their surroundings and transmit it to a central monitoring station. With the various and fast advancements in the field of Automation and Robotics, robots are playing a vital role in simplifying the lives of human beings by reducing human errors and human labour. A surveillance robot is a robot used for spying/monitoring purposes. Any remote/inaccessible areas can be monitored using surveillance robots. Surveillance is the method of systematic close observation of a person or area of suspicion. Surveillance is mainly required in the area of defence, intelligence gathering, disaster affected areas and in public places. Nowadays, tracing, tracking and attacking enemy troops in different areas proves to be a tedious task for army personnel. There is always a chance of loss of the lives of soldiers on the battlefield and during emergencies. To develop a technology that serves the high speed and advanced capacity to control the robots and to devise new methods of control theory. To realize the above standards, some technical improvements along with the need for high performance systems are required to create a faster, reliable, accurate and more intelligent robot. This can be devised by advanced control algorithms, robot control devices and new drivers. To meet the requirements, we can use multimedia to control the user-friendly robot. Earlier, the robots were being controlled through wired networks. But now, to make robots more user-friendly, they are framed to make user commanded work. The design of our project i.e., IOT based Multipurpose Surveillance robot encourages the development of a robotic vehicle based on Wi-Fi technology for remote operations connected with the phone that acts a camera mounted on the robot for monitoring/surveillance purposes.

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II. LITERATURE SURVEY

Shetty Yashaswi [1], in 2018 in the advancement of traffic administration frameworks, Smart Parking Systems(SPS) were invented to decrease the cost of contracting individuals and for ideal utilization of assets for the car-park proprietors. Presently, the basic technique for finding a parking spot is manual where the driver for the most part finds a space in the road through fortune and experience.

Suruthi Mano [2], in 2018, in current environment there are many parking areas which use ground sensors to determine the status of the various parking spaces. This requires the installation and maintenance of sensors in every parking space.

Bharathi, V.C. [3] in 2021 in the modern age, many people have vehicles. Vehicle is now a primary need. Every place is under process of urbanization. There are many supermarkets and shopping centers etc

Kumar, Madhumita Manish [4] in 2021 investigated the discourse surrounding food aid and the stigmatization of individuals living in poverty, the extent of malnutrition, and the experiences of food bank users.

Jung, In Hwan, Jae Moon Lee [5] in 2022 This paper is aimed to introduce a smart parking lot management system using multiple cameras and artificial intelligence technique. When a vehicle enters a parking lot, it recognizes the vehicle number using embedded camera, tracks which parking space the vehicle is parked .

III.TOOLS & TECHNOLOGIES

The above figure shows that main block diagram of our project. The Raspberry Pi is used as a small-card sized. computer capable of performing various functionalities. Gas sensor is useful for leakage detecting (in home and Industry).PIR sensor detects human being moving around with in approximately 10m from the sensor PIR. Metal detector aims to disclose an underground metal surface for particular navigation area. It detect only Iron. Humidity and temperature sensor is used to detect differences in temperature present in environment.

3.1 HARDWARE USED :

3.1.1 ARDUINO:

Arduino microcontroller is based on UNO AtMega328. It is used to receive commands sent by the user via the internet and processes according to the code and also used to control the motors. Wi-Fi module ESP8266 is also connected with the Arduino so that Wi-Fi facility can be provided to the robot.

3.1.2 GAS SENSOR (MQ-2):

Gas sensor (MQ2) module is useful for leakage detecting (in home and industry). It can detect H2, LPG, CH4, CO, Alcohol, Smoke, and Propane Based on its fast response time. Measurements can be taken as soon as possible. Also the sensitivity can be adjusted by the potentiometer.

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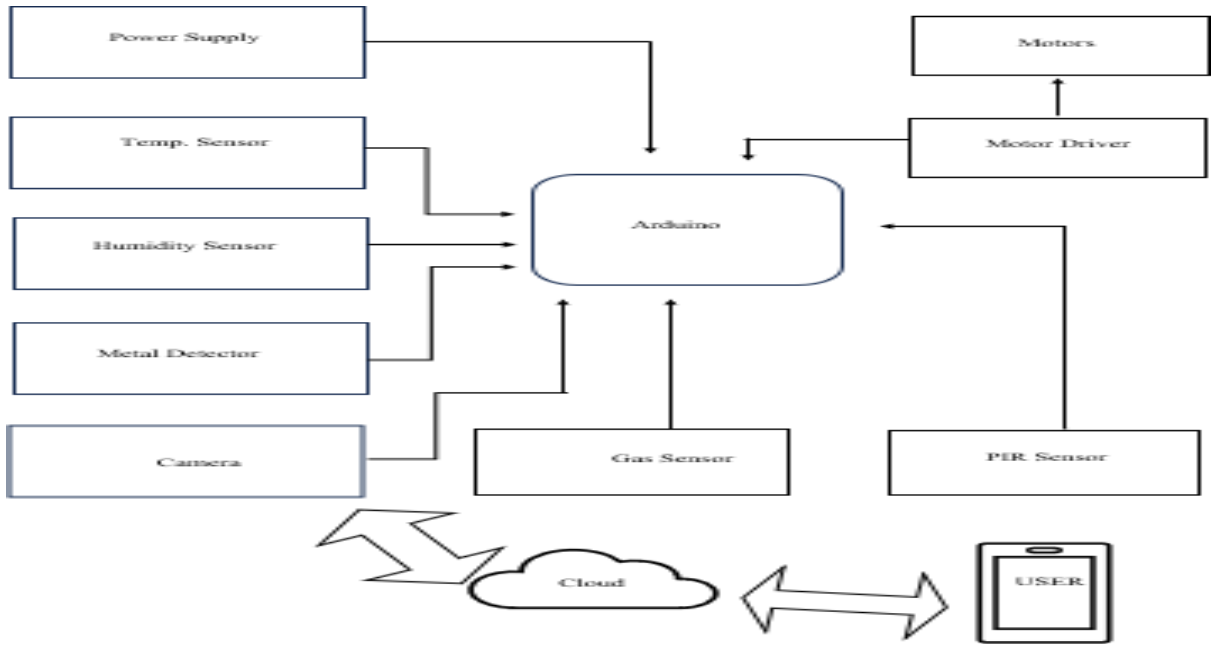

CIRCUIT DIAGRAM

IV. WORKING

An IoT-based surveillance robot combines Internet of Things (IoT) technology with robotics to create a system capable of remote monitoring and control. Here is a general overview of how an IoT-based surveillance robot might work:

4.1 Hardware Components:
Robot Chassis: The physical robot chassis or body.
Motors and Wheels: To enable movement and navigation.
Sensors: Various sensors for surveillance, such as cameras, infrared sensors, ultrasonic sensors, etc. Microcontroller/Processor: Typically, an embedded system like Arduino or Raspberry Pi to control the robot's movements and process sensor data.
Communication Module: A wireless communication module (like Wi-Fi or Bluetooth) to establish a connection with the Internet.

4.2 Sensors and Surveillance:
Camera: The robot may be equipped with one or more cameras for capturing live video or images. Infrared Sensors: These sensors can be used for detecting obstacles or intruders in low-light conditions. Ultrasonic Sensors: To measure distances and avoid collisions with obstacles.

4.3 Microcontroller/Processor:
Control Logic: The microcontroller processes data from sensors and makes decisions based on predefined algorithms or user inputs.
Motor Control: It controls the motors to navigate the robot in the desired direction.

4.4 Wireless Communication:
Establishing Connection: The robot establishes a wireless connection (e.g., Wi-Fi or cellular) to the Internet.
Data Transmission: Live video feed or sensor data is transmitted to a remote server or cloud platform

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V. SYSTEMS & MODULES

An IoT-based surveillance robot is a complex system integrating various hardware and software components. Here's a breakdown of the key systems and modules:

5.1 Hardware Components:
The mechanical components of an IoT-based surveillance robot form the foundation of its physical and functional structure. At the core is the chassis, which serves as the main body housing all other components. Motors are responsible for movement and steering, enabling the robot to navigate its environment, while wheels or tracks provide the means for locomotion depending on the terrain. For visual monitoring, cameras are integrated to capture real-time video and images. In low-light or dark conditions, infrared sensors help detect objects by sensing heat signatures. To avoid collisions, ultrasonic sensors are used to measure the distance to nearby obstacles. For location tracking, a GPS module provides accurate geolocation data, and an Inertial Measurement Unit (IMU) tracks the robot's orientation and acceleration, aiding in stable and precise navigation.

VI. RESULT

IoT-based surveillance robots offer a powerful solution for enhancing security, efficiency, and remote monitoring. By integrating robotics, IoT, and AI technologies, these robots can provide real- time surveillance, automated tasks, and data-driven insights.

Enhanced Security:
IoT-based surveillance robots provide several key security benefits that make them valuable tools in modern monitoring systems. Their ability to offer **24/7 surveillance** ensures continuous monitoring of critical infrastructure, remote locations, and expansive areas without the need for constant human presence. They enable **early detection** of anomalies, intrusions, and potential threats through real-time data analysis, allowing for prompt responses to security incidents. With **remote monitoring** capabilities, users can access live feeds and control the robot from virtually anywhere, enhancing situational awareness and responsiveness. Additionally, the **deterrent effect** of these robots should not be underestimated—their visible presence alone can discourage criminal activity and unauthorized access, adding an extra layer of preventive security.
Improved Efficiency and Productivity:

IoT-based surveillance robots significantly enhance operational efficiency through automation and intelligent data use. They are capable of performing automated tasks, such as routine patrolling and data collection, reducing the need for manual labor and ensuring consistent monitoring. By generating and analyzing large volumes of data, these robots provide data- driven insights that help optimize operations, improve decision-making, and identify trends or inefficiencies. Additionally, their remote operations capabilities allow users to control and manage multiple robots from a centralized location, streamlining surveillance efforts and increasing coverage without the need for physical presence.

VII. EXPECTATION & ACHIEVEMENTS

Expectations:
When IoT-based surveillance robots first emerged, they were envisioned as transformative tools for enhancing security, improving efficiency, and increasing safety in various environments. One of the primary expectations was enhanced security, achieved through 24/7 surveillance of critical infrastructure, remote areas, and large-scale facilities. These robots promised early detection of anomalies, intrusions, and potential threats, along with remote monitoring capabilities that allow users to access and control the system from anywhere. Additionally, their physical presence was expected to have a deterrent effect on criminal activities.

In terms of efficiency and productivity, these robots were designed to automate routine tasks such as patrolling, data collection, and inspection, significantly reducing the burden on human personnel. By analyzing sensor data, they could offer data-driven insights to optimize operations, maintenance schedules, and resource allocation. With remote operation capabilities, multiple robots could be controlled from a centralized command center, leading to streamlined processes and reduced labor costs.

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VIII. SHORTCOMING & LIMITATIONS

While IoT-based surveillance robots offer significant potential, they still face several challenges and limitations that can hinder their effectiveness and widespread adoption:

Technical Challenges:
IoT-based surveillance robots, while technologically advanced, still face several operational challenges that can hinder their performance. One significant limitation is **battery life**, which restricts the duration of operations, particularly in outdoor or long-term deployments. **Environmental factors** also play a critical role—adverse weather conditions like heavy rain, snow, or extreme temperatures can degrade the robot's functionality and reliability. In addition, **network connectivity** is essential for remote operation and data transmission, but poor signal strength or network outages can disrupt communication and compromise mission success.

Ethical Considerations:
The widespread deployment of IoT-based surveillance robots brings with it several important ethical and security concerns. **Privacy concerns** are paramount, as constant monitoring in both public and private spaces raises questions about the boundaries of surveillance and the potential for misuse. Additionally, the **AI algorithms** that power these robots may unintentionally introduce **bias and discrimination**, leading to unfair treatment or misidentification, particularly in sensitive environments. **Security vulnerabilities** also pose a significant risk; if these robots are not adequately protected, they can become targets for **cyberattacks**, which could compromise both the data they collect and the systems they are connected to. Addressing these concerns is essential to ensure that the adoption of surveillance robots remains responsible

IX. FUTURE SCOPE

We can use this system for military applications installing suitable sensors. Just by changing the robotic unit design we can use it in hospitals for patient monitoring. Using some chemical sensors we can detect harmful gas leakage in the chamber the time delay which occurs in the execution of commands can be reduced and thus we can have more real time access to the robot. With reduced time delay we can have faster operation and quick response to any illegal activities in the monitored area. Also it can be used as a spy robot. The robot is very economical. In this project, we have highly focused on exclusively to surveillance technique what is successful in surveillance. It will be possible to add face recognition and behavioranalysis and prediction so that it can secure safety of any high security places along with military or emergency situations to detect and predict unusual events. In future, it will be updated so that it can be accessed with IP what will give access to user to access it from any corner of the world. It will also be possible to detect possibility of aggressiveness or terrorist or criminal attack by behavioral analysis. Our dream is that one day our robot will be used in every field for surveillance and security. We are also hoping to make an upgraded version of the surveillance robot for agricultural uses. Our country economically mostly depends on agriculture. If we add some features to this robot, we will definitely be able to use it in the agricultural field like sowingseeds or even giving pesticides to the land. In future, this robot may be able to work on thefield side by side with the farmers. Our robot is mostly doing the surveillance, but we are also hoping to use this robotin the medical field like observing the neutralized patient or the patient staying in the ICUor even measuring blood pressure or performing ECG, EEG & EMG too.

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