Design and Analysis of IOT Based Intelligent Robot for Real Time Monitoring and Control

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***Abstract*— Nowadays development of IoT applications with robotics is an ongoing revaluation. This paper mainly focuses on the security, remote surveillance, and monitoring of our homes done by the surveillance robots. Remote surveillance has become the most important research topic over the past decade. Through this paper we put forward a surveillance robot that can be used in domestic areas and many other places. Robots are becoming important in our day to day life activities as they reduce the human labour and probability of error. We can control robots manually or they can be automatic based on the need of people. This paper focuses on design and implementation of mobile robot for obstacle detection and avoidance in a real-time basis.**.

I. INTRODUCTION

1.Innovation has gotten a dynamic and enormous change mechanical technology and mechanization field which runs in a wide range of regions. Surveillance is the procedure of close deliberate perception or supervision kept up over an individual, gathering, and so forth particularly one in care or under doubt. Traditionally surveillance is done by systems which are installed in every security critical areas. These systems mainly consist of high quality cameras, multiple computers for monitoring, servers for storing these videos. The installing of these systems everywhere is a complex task and also requires heavy maintenance. Thus surveillance is for the most part required in the territories where the frameworks cannot be introduced, for example, outskirt zones, open spots, workplaces and in ventures. Traditionally surveillance is done by system which are installed in every security areas.

EASE OF USE

A. Analysis of Intelligent Robot Based on Internet of Things technologies

This research uses Auto-ID Labs radio frequency identification system to realize the information dissemination from the destination node to the nodes in its neighbourhood. The purpose is to forward messages and explore typical applications. Realize the intelligent analysis and management of IoT devices and data. The more robots work in an unstructured environment, with different scenarios and tasks, the comparison shows that the FPP-SCA scheme is the optimal model

B. Designing of IOT-Based Intelligent Robot For Monitoring and Pick and Place of an Object.

The idea is to change the perception of remote controls for actuating manually operated Robotic-Hand. Well, this paper provides a way to eradicate the buttons, joysticks and replace them with some other more different technique, that is, controlling the complete Robotic Hand by the users hand movement or motion or gesture. In today's world, in almost all sectors, most of the work is done by robots or robotic arm having different number of degree of freedoms (DOF's) as per the requirement. This paper deals with the Design and Implementation of a "MEMS and voice Controlled Robotic Arm with Gesture".

C. Design and Implementation of IT-based Intelligent Surveillance Robot

Integration with mobile apps allows the system to notify users about parking space availability. Users receive timely information, reducing uncertainty and frustration associated with finding parking. Moreover, the system can enable users to reserve parking spaces in advance through the mobile app. This reservation feature enhances convenience for especially in busy urban areas or during peak hours, ensuring they have a guaranteed parking spot upon arrival.

A. Methods and Materials:

Methods:

1. IOT platform:

Choose a robust IOT platform(e.g., AWS IOT, Google cloud IOT) to manage data, device connections, and enable remote monitoring and control.

Communication protocols:

Implement efficient communication protocols, like MQTT or COAP to facilitate seamless data exchange between the robot and central monitoring system

Machine Learning Algorithms:

Integrate machine learning algorithms for tasks such as object recognition, navigations, and decision-making, enabling the robot to adapt and respond intelligently to its environment.

Materials:

Robot chassis:

Aluminum or plastic chassis for structural support. Motors and wheels for mobility.

Sensors:

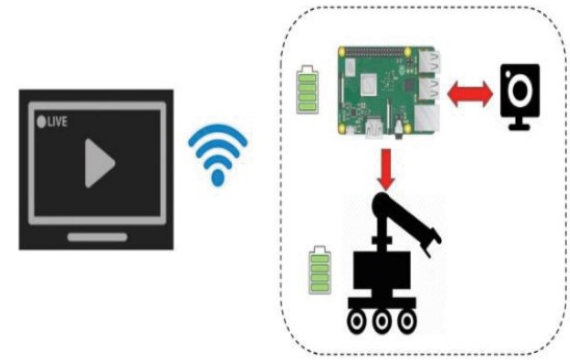
Cameras for visual perception. Ultrasonic sensors for proximity detection. Infrared sensors for obstacle avoidance. Gyroscopes and accelerometers for orientation and motion sensing.

Database Server:

Set up a dedicated server to host the database. The server should have sufficient storage capacity and processing power to handle the data generated by the readers.

User Interface:

Display modules(LCD, OLED) for real-time feedback. Button, Switches, or touchscreens for user interaction.



2. 4. Proposed Robot model

II. SYSTEM ARCHITECTURE

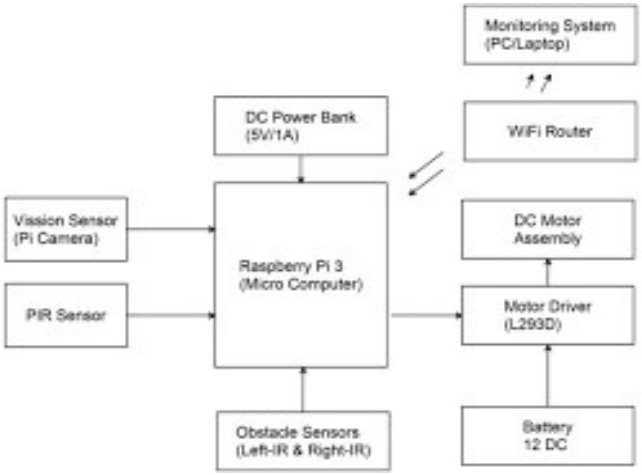
The system architecture for the IOT-based intelligent Robot for real-time monitoring and control is designed to seamlessly integrate hardware components, communication layers, and advanced processing capabilities. As its core, the robot's hardware includes a durable chassis with mobility features, an array of sensors for environment perception, actuators for controlled moments, and microcontroller or processor for data processing and decision-making. The communication layer facilitates connectivity, employing IOT communication modules like Wi-Fi or cellular technologies for data exchange with the IOT platform. The IOT platform manages device registration, data ingestion, storage, rule-based decision engines, and a security layer to ensure the integrity of communication. The user interface, typically a web or mobile applications, offers real-time

monitoring and control features, displaying data visualization and enabling users to send commands to the robot.

Sensor technology:

In the context of a IOT based real time monitoring and control project involve the integration of advanced sensor technologies to enable seamless interaction with a diverse array of sensor, including but not limited to camera, ultrasonic sensor, infrared sensor, and environmental sensors. These sensors collectively provide comprehensive data about the robot's surroundings, allowing it ti navigate, avoid obstacles, and gather relevant information and real-time. This integration of IOT technology enables remote monitoring and control of the robot through a centralized platform. This projects sensor technology plays a pivotal role in enhancing the robot's intelligence, enabling it to adapt to dynamic environments and perform task efficiently. The careful analysis of sensor data is crucial for making informed decisions and ensuring the robot's responsiveness to its surroundings, making it a valuable tool for application such as surveillance, industrial automation, and environment monitoring.

Block Diagram:



III. POWER EFFICIENCY AND SUSTAINABLITY

Energy-Efficient Components:

Utilize power efficient sensors, processors, and actuators to minimizing energy consumptions during real time monitoring and control operations. Opt for low power IOT communication protocols to ensure efficient data transmission.

Dynamic power Management :

Implement dynamic power management strategies to adapt the robot's power usage based on the operational context. utilize sleep modes for non-critical components during idle periods, optimizing power consumption without compromising responsiveness.

Renewable Energy Sources:

Explore the integration of renewable energy sources, such as solar panels or energy harvesting mechanisms, to supplement the robot's power needs.

Fig. 2 Overview of IoT based Robot

Case Studies:

Operational Deployment and Integration:

Location: The diverse location deployed for operational purpose.

Implementation: The technical implementation of the robot in each specific locations, emphasizing variations based on environment factors. Highlight how Iot technologies were tailored to suit the demands of different operational settings. Adaptations made to the robot's hardware or software to accommodate specific location based requirements.

Outcome: The system outcomes and lessons learned from deploying the intelligent robot in varied locations. Discuss how the robot's integration and impacted operational efficiency and responsiveness. Include insights gained for each locations, showcasing the adaptability of the system and its ability to perform in diverse scenarios.

IV. CONCLUSION

Location: Robot effectiveness and adaptability in diverse locations. Implementation: The technical aspects of assessing the robot's performance in real time monitoring and control activities. Discuss the metrics used to evaluate the effectiveness of the implemented IOT technologies and control mechanisms.

Outcome: The results and outcomes of the performance assessment in terms of enhanced monitoring capabilities and improved and control processes. Share quantitative data and qualitative insights regarding the robot's efficiency and responsiveness in different scenarios. Discuss any unexpected findings, successes. or challenges encountered during the performance assessment providing a holistic view of the project impact.

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