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Wi-Fi Controlling Car with an App Connected to the Internet

K. Harini[1], K. Shivamani Kiran[2], S. Prem Sumith Kumar[3], M. Chand Bhasha[4], T. Tharun[5]
[1]*Assistant Professor, Department of Computer Science & Engineering, Raghu Engineering College, Visakhapatnam, India*
[2, 3, 4, 5]*Department of Computer Science & Engineering with specialisation in Internet of Things, Raghu Engineering College, Visakhapatnam , India*

Abstract: This project aims to develop a mobile robotic system that uses IoT to monitor environmental parameters such as temperature, humidity, air quality. The robot can be remote controlled using IOT, which is equipped with sensors to collect real-time data and transmits it to a cloud-based IoT platform for storage and analysis. The system includes user-friendly dashboards for remote monitoring and control, making it suitable for applications in agriculture, urban planning, disaster management, and industrial monitoring. This advanced approach combining mobility, connectivity, and intelligence can provide an efficient and scalable solution for environmental management.
Keywords: Smartphone-controlled robot, IoT-enabled monitoring, live video streaming, obstacle detection, NodeMCU, ESP8266, DHT11 sensor, MQ135 sensor, ultrasonic sensor, remote-controlled vehicle.

I. INTRODUCTION

The world is currently undergoing rapid technological advancements that are reshaping the way we interact with and manage the environment. One of the most promising areas of innovation involves the integration of Internet of Things (IoT) technology to address complex challenges in monitoring and predicting environmental parameters. This technology holds immense potential, especially when applied to autonomous robotic systems that can move across diverse environments to gather real-time data. The IoT Integrated Moving Robotic System for Monitoring and Predicting Environmental Parameters represents a leap forward in this domain, offering a smart, adaptive, and scalable solution for monitoring the health of the environment and predicting future environmental conditions.

In recent years, the demand for environmental monitoring systems has grown exponentially due to the increasing concerns over climate change, pollution, and resource depletion. The ability to accurately measure and predict environmental parameters such as air quality, temperature, humidity, pollution levels, and soil moisture is crucial for sustainable development and disaster management.

Traditional environmental monitoring systems often require manual data collection, limited geographic coverage, and delayed analysis, making them inadequate for real-time decision-making. To overcome these limitations, an integrated approach that combines IoT sensors, machine learning algorithms, and mobile robotic platforms is required.

II. EXISTING SYSTEM

Existing environmental monitoring systems are primarily static, meaning they are fixed in specific locations and unable to adapt to changing conditions. These systems use stationary sensors to measure parameters like temperature, humidity, and air quality, but they have limitations such as restricted coverage, high installation and maintenance costs, and an inability to respond dynamically to environmental changes. Because they are confined to fixed points, they may not effectively capture real-time variations in conditions.

III. PROPOSED SYSTEM

To address the need for effective surveillance, we propose the development of IoT-enabled surveillance robots equipped with cameras and obstacle detection systems. These robots will be able to autonomously navigate their environment, capture real-time video feeds, and transmit the data over a Wi-Fi network for remote monitoring.

By integrating features like automated obstacle detection, the robots can ensure safe navigation while covering large areas efficiently. This solution enhances security operations, reduces the need for fixed camera installations, and allows for a more responsive and flexible approach to surveillance.

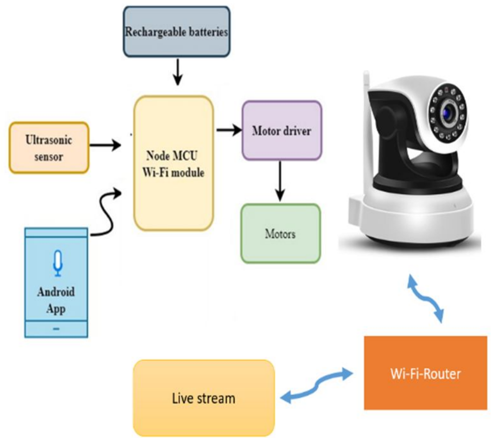

Fig.1. General Block diagram

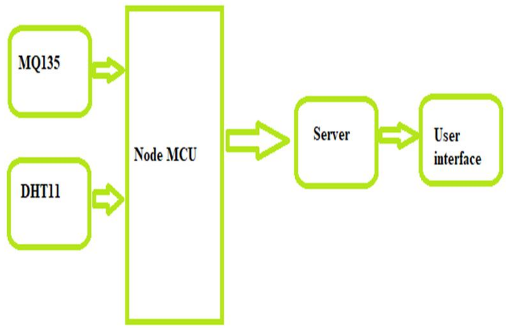

Fig.2. General Block diagram

IV. COMPONENTS USED AND DESCRIPTION

A. NodeMCU Microcontroller (ESP8266)

The NodeMCU microcontroller serves as the central processing unit of the system. It is based on the ESP8266 Wi-Fi module, which enables wireless communication for data transmission. The NodeMCU is responsible for coordinating data flow between the sensors (ultrasonic sensor and camera) and the cloud platform, where machine learning models process the data.

1) Data Collection: The NodeMCU reads data from both the ultrasonic sensor and the camera. The ultrasonic sensor measures distance to obstacles, while the camera captures images or video for environmental analysis.
2) Data Transmission: The microcontroller sends the collected data via Wi-Fi to a cloud-based server or edge computing platform for real-time processing.
3) Control Operations: The NodeMCU also controls the movement of the robotic platform, adjusting its trajectory based on sensor data, such as avoiding obstacles detected by the ultrasonic sensor.

Fig.3. NodeMCU

B. Power Supply

Either an external power source or a USB cable can be used to power the NodeMCU. An AC to DC converter is the most common external power source; batteries used to give power to other NodeMCU present in the project. The adapter can be connected to the NodeMCU by plugging into the power jack of the NodeMCU. The Vin and GND pins of the POWER connector can also be used to connect the battery leads. Seven to twelve volts is the recommended voltage range.

C. DHT11

DHT11 is also called temperature and humidity sensor. It is used for measuring temperature and humidity. And is used in various IoT applications. It can measure temperature with built-in thermistor and can measure humidity with built-in capacitive humidity sensor.

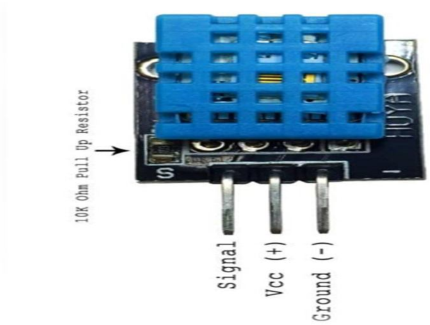

Fig.4. DHT11 Sensor

D. MQ135

The MQ-135 gas sensor is primarily used in systems for monitoring air quality and detecting harmful gases in the environment. Also used to detect a variety of harmful gases present in the environment and monitor the presence of gases like ammonia (NH_3), nitrogen oxides (NO_x), alcohol, benzene, smoke, and carbon dioxide (CO_2).

Fig.2.MQ135 Sensor

E. Ultrasonic Sensor

An apparatus that uses sound waves to determine an object's distance is called an ultrasonic sensor. By emitting a sound wave at a certain frequency and watching for its return, it calculates distance. It is feasible to determine the distance between the sonar sensor and the item by timing the interval between the sound wave's generation and returning.

Fig.4. Ultrasonic Sensor

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F. Wi-Fi Router

The Wi-Fi router facilitates communication between the smartphone, the NodeMCU module, and the Wi-Fi camera. It ensures stable and reliable connectivity, allowing seamless control and video streaming.

Fig.5. Wi-Fi Router

G. Web Cam

The Wi-Fi-enabled camera captures live video and transmits it over the Wi-Fi network, allowing users to monitor the robot's surroundings in real time through the mobile application. This feature enhances security and surveillance capabilities by providing a dynamic video feed.

Fig.6. Web cam

H. Rechargeable Batteries

A rechargeable battery pack (Li-ion or NiMH) is used to power the NodeMCU module, and motors. It ensures long operational time and provides the necessary voltage and current for stable performance.

Fig.7.Rechargeable Batteries

I. BLYNK App

The Blynk mobile application serves as the user interface for controlling the robot. It allows users to send movement commands and monitor the live video feed from the camera. The app interacts with the NodeMCU module via the Wi-Fi network, providing a seamless remote control experience.

Fig.8. Blynk App

V. WORKING

The proposed system operates based on the following step-by-step process:

1) *Powering the System:* The system is powered using rechargeable batteries, which supply energy to the NodeMCU, motor driver, and Wi-Fi camera. Once powered on, the components initialize, and the system prepares for operation by setting up essential connections.
2) *Establishing Wi-Fi Connection:* The NodeMCU module connects to a Wi-Fi router, enabling communication between the mobile application and the robot. Simultaneously, the Wi-Fi camera also connects to the router, ensuring a seamless live video streaming experience for remote monitoring.
3) *Mobile App Control Activation:* The Android application (Blynk App) on the user's smartphone is used to control the robot. The app communicates with the NodeMCU module via Wi-Fi, allowing the user to send movement commands wirelessly.
4) *Sending Movement Commands:* When the user inputs a command in the mobile app (e.g., move forward, backward, left, right, or stop), transmits the command to the NodeMCU. The NodeMCU processes the instruction and controls the motor driver (L298N), which activates the DC motors, causing the robot to move accordingly.
5) *Obstacle Detection and Avoidance:* The ultrasonic sensor continuously scans the environment for obstacles. If an obstacle is detected within a certain range, the NodeMCU either stops the robot or changes its direction to avoid collisions, ensuring safe navigation.
6) *Live Video Streaming:* The Wi-Fi camera mounted on the robot captures real-time video footage and transmits it via the Wi-Fi router. The live feed is then displayed on the mobile application, allowing users to monitor the robot's surroundings remotely.
7) *Data Collection :* The data is collected from the sensors which are present on robot car i.e., DHT11 sensor and MQ135 sensor.After the data collection the data is sent to cloud for the data analysis.
8) *Remote Monitoring;* The user can control the movement of the robot while watching the live video feed on the mobile application. This enables real-time monitoring, making it easier to monitor large areas.
9) *System Shutdown:* Once surveillance is completed, the user can stop the robot through the mobile application. The system remains idle until further commands are received or until it is manually powered off.

VI. RESULTS

The implementation of the Smartphone-Controlled Wi-Fi Robot Car with Live Video Streaming and Obstacle Detection successfully demonstrated its effectiveness in real-time surveillance and remote monitoring. The system was able to establish a stable Wi-Fi connection between the NodeMCU module and the Android application, allowing seamless control of the robot car using a smartphone. The mobile app efficiently transmitted commands to the robot, ensuring smooth movement in all directions.

The live video streaming feature, powered by the Wi-Fi camera, provided real-time visuals of the robot's surroundings. The video feed was accessible through the mobile application, enabling users to monitor remote locations effectively. The latency of the video transmission was minimal, ensuring a clear and uninterrupted view. This feature proved useful for surveillance applications, allowing users to navigate the robot based on real-time footage.

The obstacle detection mechanism using the ultrasonic sensor functioned as expected. The robot successfully identified obstacles in its path and either stopped or changed direction based on programmed logic. This feature enhanced safety and prevented collisions, ensuring that the robot could operate autonomously without external intervention. Additionally, in cases where Wi-Fi connectivity was lost, the system was programmed to stop the robot, preventing unintended movements.

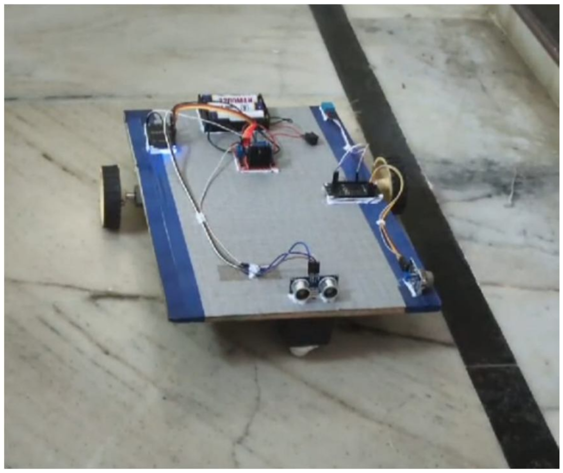


Fig.7. architecture

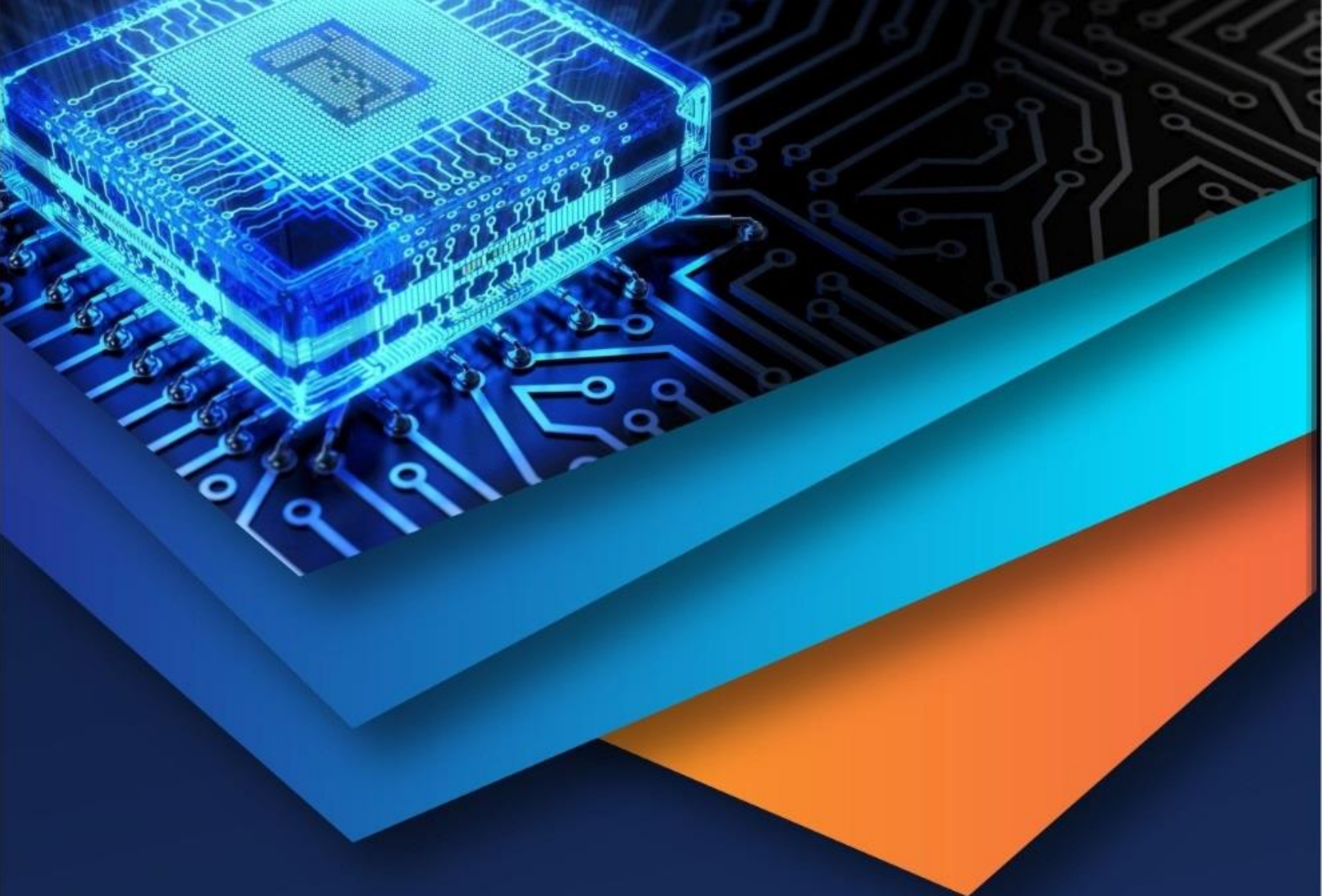
VII. CONCLUSION

The IoT Integrated Moving Robotic System for Monitoring Environmental Parameters represents a significant advancement in environmental monitoring and predictive analytics. By leveraging the power of Internet of Things (IoT) technologies the system enables real-time data collection, analysis, and prediction of environmental conditions, such as temperature, humidity, gas levels, and other critical parameters.

The integration of sensors like the DHT11, MQ135, ultrasonic sensors, and WiFi cameras into a robotic platform provides a comprehensive and versatile solution for continuous monitoring in dynamic environments. The moving robotic system allows for flexible coverage of large or hard-to-reach areas, which is a limitation for stationary sensor systems. This mobility, combined with the ability to predict environmental trends using machine learning models, enhances the system's ability to proactively address potential hazards and maintain optimal conditions in real-time.

REFERENCES

[1] The Design and Implementation of Smart Agricultural Management Platform Based on UAV and Wireless Sensor Network, Anqi Rao, Hanqin Shao, Xiaotong Yang, 2019
[2] Scareduino: Smart-Farming with Iot ,Lim, I,J, Sambas, H., marcusgoh, N.C., Kawada, T., josephng, 2017
[3] Sensor networks data acquisition and task management for decision support of smart agriculture, SinungSuakanto, Ventje J. L. Engel, Maclaurin Hutagalung and Dina Angela, 2016 4. April 2017, Volume 4, Issue 04 JETIR (ISSN-23495162), IOT BASED SMART FARMING SYSTEM, Akshay Atole, Apurva Asmar, Amar Biradar, Nikhil Kothawade, Sambhaji Sarode, Rajendra G. Khope.
[4] Chetan Dwarkani M, R Ganesh Ram, S Jagannathan and R. Priyatharshini, ”Smart agriculture system using sensors for agricultural task automation”, 2015 IEEE International Conference on Technological Innovations in ICT for Agriculture and Rural Development (TIAR 2015).
[5] Nikesh Gondchwar and R. S. Kawitkar, ”IOT based smart agriculture”, International journal Of Advanced research in computer and Communication Engineering (IJARCCE), vol. 5, no. 6, Jun. 2016.
[6] P. Li and Y. Wu, "A wireless data acquisition system designed for greenhouse based on ZigBee", Proceedings of the 10th World Congress on Intelligent Control and Automation, pp. 4405-4408, 2012.
[7] J. Zhang, A. Li, J. Li, Q. Yang and C. Gang, "Research of real-time image acquisition system based on ARM 7 for agricultural environmental monitoring", 2011 International Conference on Remote Sensing Environment and Transportation Engineering, pp. 6216-6220, 2011.
[8] L. Ping, "Agricultural Drought Data Acquisition and Transmission System Based on Internet of Things", 2014 Fifth International Conference on Intelligent Systems Design and Engineering Applications, pp. 128-132, 2014.
[9] N. Soontranon, P. Tangpattanakul, P. Srestasathiern and P. Rakwatin, "An agricultural monitoring system: Field server data collection and analysis on paddy field", 2014 14th International Symposium on Communications and Information Technologies (ISCIT), pp. 597-601, 2014.
[10] J. He and J. Xia, "Design of a Configurable Remote Data Acquisition System", 2018 7th International Conference on Energy and Environmental Protection (ICEEP 2018), 2018.
[11] B. Shi.B, V. Sreeram, D. Zhao, S. Duan and J. Jiang, "A wireless sensor network-based monitoring system for freshwater fishpond aquaculture", Biosystems Engineering, vol. 172, pp. 57-66, 2018.



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