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Survey Rover

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Abstract*: This project develops an IoT-enabled survey rover using ESP8266 and Blynk IoT for remote control and monitoring. The rover collects environmental data using sensors and transmits it in real time to the Blynk Cloud. Users can control its movement and access sensor readings via a mobile app or web dashboard. The system is designed for applications like remote exploration and environmental monitoring.*

Keywords: IoT, ESP8266, Blynk Cloud, Remote Monitoring, Survey Rover, Environmental Data

I. INTRODUCTION

This project focuses on the development of an IoT-enabled survey rover using ESP8266, Blynk IoT, and multiple sensors for remote monitoring and control. The rover is equipped with 4 12V motors, 2 L298N motor drivers, a DHT11 sensor, and an MQ-2 sensor to gather environmental data while navigating various terrains. The Blynk platform facilitates seamless wireless communication, allowing users to control the rover and monitor real-time sensor data remotely. This implementation enhances automation, efficiency, and accessibility in environmental surveying and remote exploration applications.

In today's world, real-time environmental monitoring is essential for various applications, ranging from agriculture to climate studies and urban planning. With the advent of smart technologies, we can now collect data more efficiently and in real time, even from remote or difficult-to-access locations. To address the growing need for such solutions, this project presents the development of a Survey Rover designed to monitor temperature and humidity levels in its surroundings.

The rover is equipped with advanced sensors that measure atmospheric humidity and temperature and can transmit this data to a remote location via radio or other wireless connections. Operated from a distant command center, this rover allows users to observe environmental conditions without needing to be physically present, providing a versatile tool for monitoring dynamic environments.

This system utilizes a Node MCU microcontroller to manage sensor data collection and communication. Its capability to be operated remotely makes it ideal for deployment in a wide range of locations, from agricultural fields to industrial zones or hazardous environments where human presence may be limited or dangerous. By incorporating real-time monitoring and remote control, the rover provides an innovative solution to modern environmental challenges

II. LITERATURE SURVEY

The advancement of IoT-based robotic systems has significantly contributed to the automation of environmental monitoring, surveillance, and remote operations. Numerous studies have explored the integration of microcontrollers, wireless communication modules, and sensor networks to enhance the functionality of autonomous rovers.

Several research papers highlight the effectiveness of ESP8266 as a reliable WiFi-enabled microcontroller for IoT applications. Studies have demonstrated its capability to establish real-time communication with cloud platforms such as Blynk, facilitating seamless data transmission and remote control of robotic systems.

Additionally, research on DC motor-driven mobility platforms emphasizes the importance of efficient motor control using L298N motor drivers to ensure stability and adaptability across different terrains. The deployment of DHT11 and MQ-2 sensors for environmental monitoring has also been widely investigated, proving their accuracy and cost-effectiveness in detecting temperature, humidity, and hazardous gases.

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Existing IoT-enabled rover designs primarily focus on autonomous navigation, data logging, and sensor-based decision-making. However, limitations such as latency in data transmission, limited battery life, and inefficient user interfaces remain challenges in real-world deployments. To address these issues, the proposed system integrates Blynk IoT for real-time monitoring, a robust power management system, and an optimized control mechanism, enhancing efficiency, usability, and scalability for surveying and remote sensing applications.

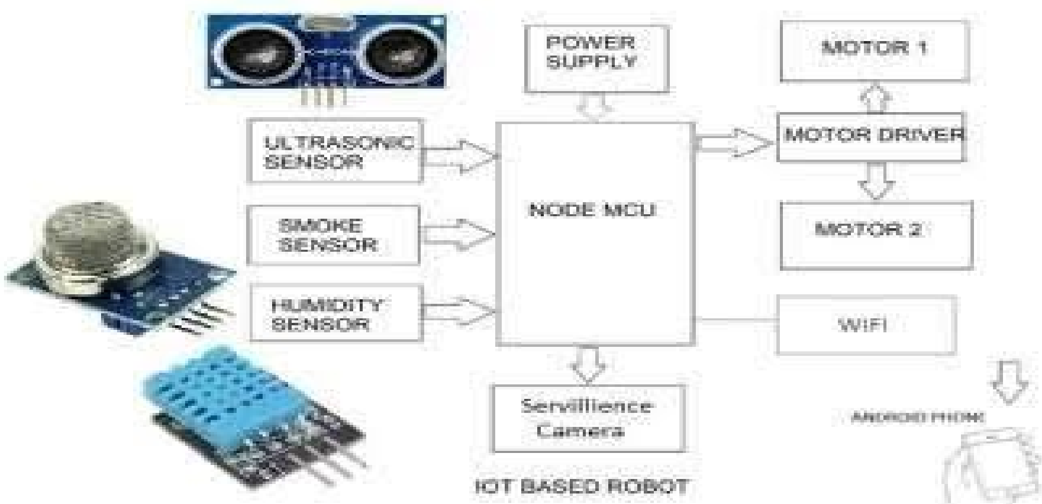
III. METHOD

In this project, we aim to build an Internet of Things (IoT) based system that will automatically monitor and notify users of environmental conditions, such as temperature, humidity, and smoke levels, to ensure proper safety and environmental management. In traditional methods, environmental monitoring is often done using fixed sensors or manual readings, which lack flexibility and require frequent human intervention to collect and analyze data. These systems also tend to be stationary, limiting their ability to cover wider areas or adapt to changing conditions in real-time.

To address these limitations, our system utilizes a rover equipped with temperature, humidity, and smoke sensors that can monitor conditions as it moves through different environments. The rover transmits real-time data to a remote server via the Internet, allowing users to monitor conditions from any location. When specific thresholds, such as high temperatures, excessive humidity, or smoke detection, are crossed, the system automatically sends notifications to alert users, ensuring timely action to prevent hazardous situations.

While traditional systems focus mainly on manual monitoring, our IoT-based rover provides a dynamic, real-time solution with minimal human intervention. It is designed to improve environmental management, safety, and response time by providing instant updates and the flexibility to monitor different areas as needed

Block diagram



Block diagram of Survey Rover

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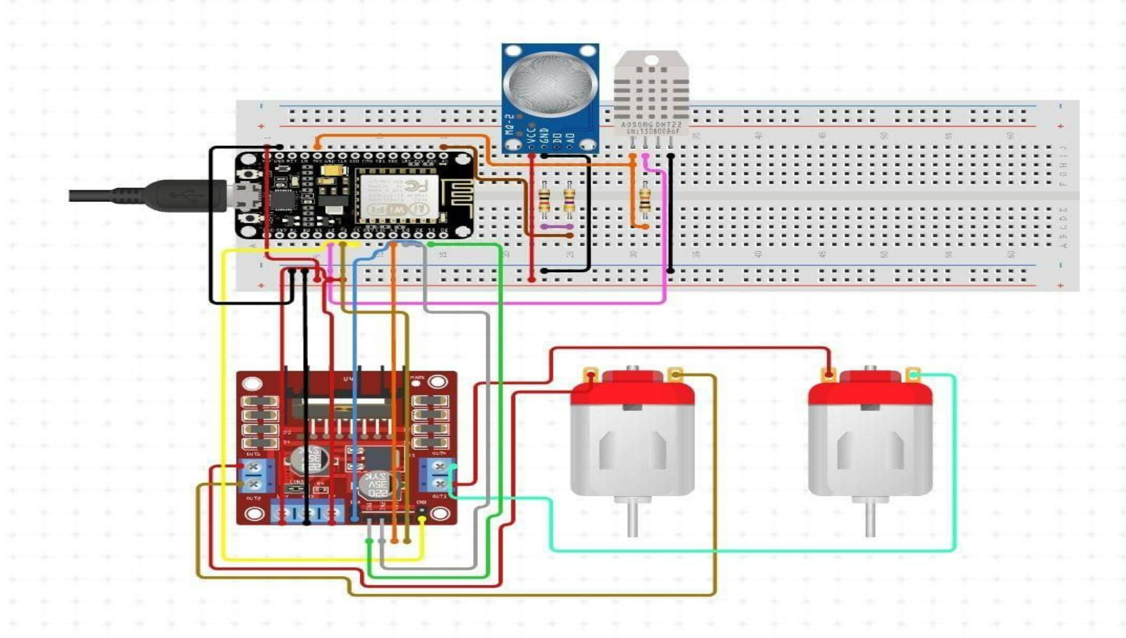
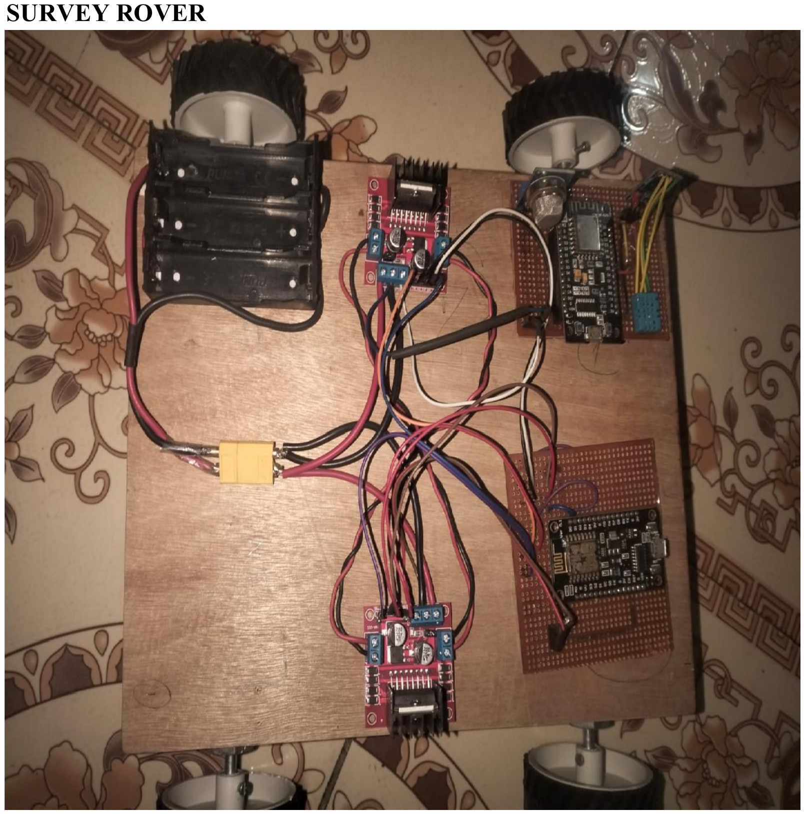
Schematic diagram



CONNECTIONS of Survey Rover

ACTUAL IMAGE SURVEY ROVER



ACTUAL IMAGE of SURVEY ROVER

IV. RESULTS

The IoT-based environmental monitoring rover project successfully delivers a reliable solution for real-time monitoring of temperature, humidity, and smoke levels. By integrating advanced sensors with the ESP32 microcontroller and IoT cloud technology, the rover enables continuous data collection and remote monitoring.

Users can access a user-friendly interface to view critical parameters, receive instant alerts for threshold breaches, and analyze historical data. Its mobility allows for comprehensive coverage of large areas, making it suitable for various applications, including industries, agriculture, and smart cities.

The project demonstrates the effectiveness of IoT in enhancing environmental management and safety, paving the way for future enhancements like additional sensors and autonomous navigation. Overall, it contributes to proactive environmental monitoring and awareness, supporting broader sustainability efforts.

V. CONCLUSION

The implementation of an IoT-enabled survey rover using the Blynk platform and ESP8266 provides an efficient and scalable solution for remote environmental monitoring and data collection. By integrating various sensors such as the DHT11 for temperature and humidity monitoring and the MQ-2 for gas detection, the system ensures real-time data acquisition for critical applications.

The wireless control capabilities offered by Blynk IoT enhance the rover's usability, allowing users to operate and monitor the system remotely with ease. The robust mobility enabled by four 12V motors and L298N motor drivers ensures adaptability across diverse terrains, making the rover suitable for applications in industrial safety, disaster response, and environmental research.

Furthermore, the proposed system is cost-effective, modular, and easily scalable, allowing for future enhancements such as GPS integration, AI-based data processing, and real-time video streaming. By leveraging IoT and cloud-based solutions, this project demonstrates the potential of smart automation in real-world applications, paving the way for advanced autonomous monitoring systems.

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