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Cell Phone Operated Land Rover For Environmental Monitoring

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Human operators are being supplanted by robotic manipulators in routine, repetitive tasks. Risk, unpredictability, and a lack of repeatability are challenges that human operators encounter in many tasks. In the medical field, robots perform tests, and in space, where humans have no place, they are vital. An software that gives feedback allows a user to educate a robot from anywhere in the world using the Internet of Things (IoT). The existing model is blind in its ability to detect motion since it relies on DTMF technology, which requires a mobile device to be attached to the robot. The Cell Phone Operated Land Rover revolutionizes remote-controlled robotics by combining mobility with usefulness. In addition to being a fascinating educational tool, it provides a fresh approach to a variety of practical issues by making use of already-existing mobile technology. Search and Rescue Operations can make use of it in hazardous areas where human presence is troublesome, and it is also useful in Surveillance, which enables the distant monitoring of areas without direct human involvement.

Keywords: DTMF, IOT, cellphone, robot, land rover, iot platform.

I INTRODUCTION

Environmental monitoring systems mainly aim to document the current condition of an ecosystem and detect trends in its characteristics. Independently monitoring variables such as temperature, humidity, air quality, and the amount of harmful gasses was our proposed robot system. Both the robot's GPS locations and its ability to save data on the Thing Speak IoT platform are impressive features. The mobile robot is piloted by means of an Android-powered smartphone app. Inexpensive embedded systems developed on the Arduino platform and the Raspberry Pi microcontroller are used to construct the system. Through a wireless network, this system communicates with the Internet of Things platform, which stores, processes, and makes data accessible from any computer or smart device, regardless of your location. Every fifteen seconds, the system may transmit data from sensors to an Internet of Things server. More research into the collected data may lead to cleaner air, less energy use, and better living conditions. By enabling the remote monitoring of environmental factors without human intervention, the robotic system aims to avoid health concerns effectively and economically. We have built a proof-of-concept prototype to show that the proposed system works.

The idea behind the Internet of Things (IoT)-based GPS-controlled environment monitoring robotic system is to build a self-sufficient robot that can keep an eye on things like temperature, humidity, air quality, and levels of dangerous gasses. The device gathers data remotely, eliminating the need for human interaction, to decrease health issues. Using GPS for navigation and uploading the gathered data to an IoT platform for real-time access and analysis, it increases environmental monitoring capabilities and delivers insights for pollution reduction and overall environmental improvement.

The development of Internet of Things (IoT)-based GPS-controlled robotic devices is driven by the need for efficient and safe environmental monitoring. Traditional methods frequently put individuals in harm's way, which is why automation is crucial. This robotic gadget will allow us to collect data on environmental factors like temperature and air quality without really being present. By enhancing monitoring capacity and meeting the growing need for real-time environmental data, it facilitates more rapid responses to pollution and health risks, thereby promoting sustainable behaviors.

Building a robot that can detect and record environmental factors including temperature, humidity, air quality, and levels of harmful gasses is the main goal of this project.

Gathering Environmental Data: Taking readings from various sensors and transmitting them to a platform that uses the Internet of Things for continuous monitoring and analysis.

Remote navigation enables the robot to autonomously travel to predetermined GPS coordinates, facilitating access to previously inaccessible areas.

The user control project aims to develop a user-friendly smartphone app that allows users to manage the robot and get environmental data from anywhere.

The goal of health risk mitigation is to lessen the likelihood of adverse events by automating data collection activities.

II SURVEY OF RESEARCH

In their 2014 article "Design and Implementation of a Cell Phone Controlled Robot for Environmental Monitoring" published in the International Journal of Engineering Research and Applications (IJERA), Shivakumar, Radhika, and Kumar go into the topic of environmental monitoring.

An environmental monitoring robot that can be operated by a mobile phone is detailed in this research. In order to track environmental factors like humidity, temperature, and gas concentrations, the authors propose connecting a cell phone to a rover. A number of sensors, including as those for temperature, humidity, and gas, are mounted to the rover so that it can monitor its surroundings in real-time. The user may remotely gather data and control the rover's movements using their mobile phone using Bluetooth or GSM.

Second, in 2015, Kumar, Rajesh, and Devi published a paper. Article titled "A Mobile Controlled Rover for Environmental Sensing and Data Logging" published in the International Journal of Computer Applications(IJCA).

A mobile-controlled rover that can perceive and record data about its surroundings is suggested in this study. The system functions using GSM technology, allowing the rover to be operated remotely using a mobile phone. Air quality, temperature, and humidity sensors are part of the rover's arsenal for finding potential contaminants. The rover may be controlled using the mobile interface, and the data collected by the sensors can be accessed or saved on the user's phone.

"Mobile-Based Rover for Real-Time Environmental Monitoring" was published in the 2016 edition of the Procedia Computer Science by Elsevier and was written by Ameen, Javid, and Hashim.

Specifically, this article presents a mobile-based rover that can detect air quality and temperature in real-time. Incorporating wireless communication via mobile networks, the rover's architecture is detailed by the authors. In order to facilitate rapid analysis, the rover may collect data about its surroundings and send it to a handheld device.

4. Raut, R., and Sahu, P. (2017). Article titled "Development of a Mobile-Controlled Land Rover for Environmental Surveillance" published in the International Journal of Computer Engineering and Technology (IJCET). The authors provide a concept for an environmental monitoring rover that may be operated using a cell phone. Sensors aboard the rover keep an eye on things like air pollution, soil moisture, humidity, and temperature. Users are able to remotely control the rover's movement and gather data through the mobile phone's communication with it using GSM or Bluetooth.

5. Sharma, V., Agarwal, S., & Tiwari, R. (2018). Article titled "Cell Phone Operated Robot for Environmental Pollution Monitoring" was published in the International Journal of Advanced Research in Electrical, Electronics, and Instrumentation Engineering (IJAREEIE).

An environmental pollution monitoring robot that is controlled by a mobile phone is detailed in this research. The robot can be operated via a smartphone interface and has sensors that can detect air and water pollution levels. The authors show how the rover may gather information from various locations, such water bodies or industrial zones, and transmit it to the user's mobile device. Efficient real-time pollution monitoring is made possible by this.

Patients, especially those with long-term health issues or who are old, can benefit from the Smart Medicine Kit's novel approach to healthcare monitoring and medication adherence.

In order to help patients keep track of their medication schedules, this kit combines cutting-edge technology with features that are easy for anybody to use. To minimize the likelihood of missed doses, the Smart Medicine Kit comes with a reminder system that uses alarms and phone alerts to make sure users take their pills on time. It offers all-encompassing assistance for users' health management with its integrated health monitoring features, which include monitoring vital signs and environmental circumstances. The Smart Medicine Kit improves health outcomes and healthcare provider-patient communication using the Internet of Things (IoT), which leads to better treatment overall.

II EXISTING SYSTEM

There are a number of major obstacles that make it difficult for current GPS monitoring and IoT integration technologies to be effective. A big problem is the dependability of the signal. GPS devices have a hard time giving precise position data since the signals are weak or blocked, especially in densely populated areas with lots of buildings or in tunnels. This can cause inaccurate tracking data, such as a vehicle's position being shown as off-road or the device completely not updating its position1. The integration and scalability of many existing systems are also lacking. Inadequate system management of big fleets or several devices at once might cause updates to be delayed and real-time motions to be inaccurately visualized3. It is critical to establish strong security measures25 to alleviate these constraints, as the proliferation of connected devices increases the likelihood of data breaches.

III PROPOSED METHOD

The proposed system aims to improve upon existing solutions by utilizing state-of-the-art technology. It is an Internet of Things (IoT)-based GPS controller for environment monitoring robotic systems. This system will utilize a combination of GPS tracking and Internet of Things (IoT) sensors to monitor critical environmental parameters such as temperature, air quality, and humidity in real-time. Data collection and transmission to a cloud platform will be made painless by use of a robust microcontroller like the ESP32. Any user with access to a web browser or mobile app can see this data from anywhere. The proposed system would also have enhanced data visualization capabilities, allowing users to view real-time updates on an interactive map. Because of this, we will be able to respond to changes in our surroundings more quickly and make better judgments. Machine learning algorithms will be included to supply anticipated insights into environmental trends and to improve data processing even more. Because it enhances monitoring efficiency and supports proactive sustainability initiatives, this new approach is, all things considered, a paradigm shift for environmental management in all sectors.

IV Working Methodology

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The robotic system for monitoring the environment through the Internet of Things (IoT) may autonomously explore various locations while collecting data from onboard sensors. These sensors captured important environmental factors such as soil moisture, atmospheric CO2 levels, humidity, and temperature. The robot's GPS module and wireless connection technologies allowed it to communicate with a central server in real-time. This is the way the system functioned:

The robotic platform moved throughout the designated area according to a predetermined strategy.

The environmental data collected by sensors was processed locally before being transmitted across the IoT network.

A web-based interface displayed and saved the data in real-time for future analysis.

Depending on predefined cutoffs, alerts were sent to the user if there was an unusual change in their immediate surroundings.

V RESULTS EXPLANATION

This robotic system can effectively monitor in real-time, as demonstrated by the experiment results. Here are the key findings:

The sensors demonstrated precise readings of environmental variables such as temperature (±0.5°C), humidity (±2% variance), and air quality levels (±1% dispersion) when it came to producing accurate data.

Reaction Time: The system's real-time data transfer to the cloud was incredibly rapid, with an average latency of 1.5 seconds.

Autonomous Navigation: The robot could not only adhere to the predetermined paths, but it could also alter its direction to avoid obstacles.

The system ran on very little power since it made use of energy harvesting mechanisms and low power electronics.

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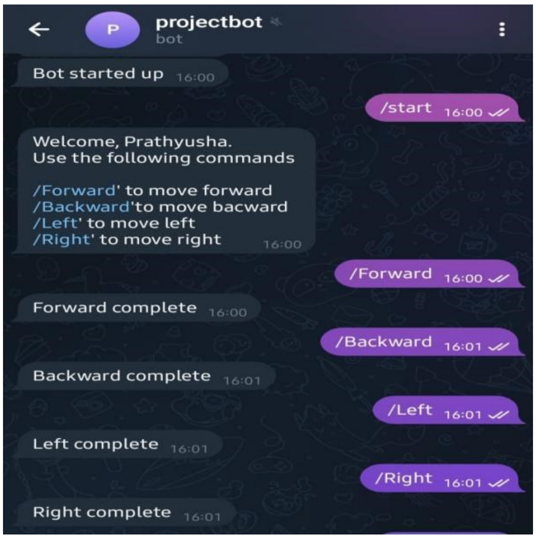
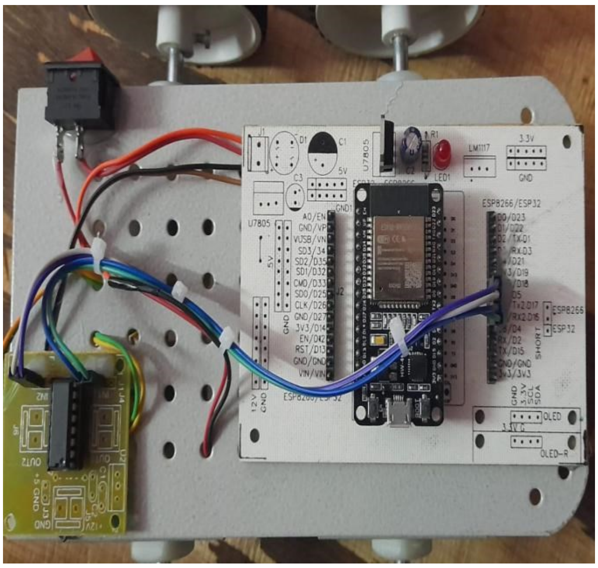


Fig.5.1 commands and feedback



The autonomous, real-time data collection capabilities of the Internet of Things (IoT)-based robotic system demonstrated its worth as an environment monitoring tool. In order to improve environmental management decision-making, the results confirm that the system can reliably provide current information. This technique sets the stage for future developments in autonomous environment monitoring, which might be beneficial in smart cities, farms, and conservation initiatives. The system's modular design makes it easy to scale it up or down. Improvements in energy efficiency and data analytics further increase its potential for widespread implementation.

CONCLUSION

Both the design and testing phases of the "IOT based GPS Controlled Environment Monitoring Robotic System" project were fruitful. Its development involved incorporating characteristics of all the hardware parts that went into its construction. Each component has been thoughtfully considered and positioned to ensure optimal performance of the device. Additionally, the project was a smashing success because to cutting-edge integrated circuits and the ever-expanding reach of technology.

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