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IoT based Vehicle Management System using ESP32

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ABSTRACT

This project aims to develop an Internet of Things (IoT) based vehicle management system using ESP32 microcontroller to track the location, speed, and direction of a vehicle in real-time. The system utilizes GPS module, Reed switch, Gyroscope and accelerometer to capture the location, number of gear, direction of vehicle and speed data respectively, while the Wi-Fi module is used to transmit the data to a cloud server for storage and analysis. The system is designed to be scalable and cost-effective, making it suitable for a wide range of vehicle tracking applications. The results of the project show that the system can accurately track the location and speed of the vehicle and provide real-time information to the user, making it an efficient and reliable solution for vehicle management.

***Keywords*--** Internet of Things, ESP32, Reed Switch, GPS Module, Wi-Fi Module

I. INTRODUCTION

The Internet of Things (IoT) has revolutionized the way we live and work. One of the areas where IoT has made a significant impact is in vehicle management. IoT-based vehicle management systems can provide real-time information on the location, speed, and direction of a vehicle, making it easier for owners and managers to keep track of their assets.

In this project, we propose an IoT-based vehicle management system that uses the ESP32 microcontroller to track the location, speed, and direction of a vehicle. The ESP32 is a low-cost, low-power microcontroller that is ideal for IoT applications. It has built-in Wi-Fi and Bluetooth capabilities, which allow it to communicate with other devices and transmit data over the internet.

The system utilizes a GPS module to capture the location of the vehicle, Reed switch to detect the gear position of the vehicle, Gyroscope to detect the direction of vehicle and an accelerometer to measure its speed and direction. The data is transmitted to a cloud server using the ESP32's Wi-Fi module, where it can be stored and analyzed. The system is designed to be scalable and can be customized to meet the needs of different vehicle tracking applications.

The proposed system has several advantages over traditional vehicle tracking systems. It is cost-effective, easy to install, and can provide real-time information on the location, speed, and direction of a vehicle. This information can be used to optimize fleet management, reduce fuel consumption, and improve safety. Overall, this project aims to demonstrate the potential of IoT-based vehicle management systems using the ESP32 microcontroller.

II. OVERVIEW

Project aims to demonstrate the potential of IoT-based vehicle management systems using the ESP32 microcontroller, Reed switch, and display. It provides an efficient and reliable solution for vehicle tracking, making it suitable for a wide range of applications in industries such as transportation, logistics, and delivery. The system offers a comprehensive approach to vehicle management, providing real-time data on location, speed, direction, and gear position, which can be used to optimize vehicle performance and reduce costs.

III. PROPOSED SYSTEM

An IoT-based vehicle management system using ESP32, Reed switch, Gyroscope, Ultrasonic sensor, and a display can be designed to provide real-time tracking and monitoring of vehicles. Here's a proposed system architecture:

ESP32: The ESP32 board will be used as the main controller in the system. It will be responsible for processing sensor data, communicating with the cloud server, and controlling the display.

Reed Switch: The Reed switch will be used to detect the opening and closing of doors of the vehicle. It can be installed on each door, and the data collected can be used to determine whether the doors are locked or unlocked.

Gyroscope: The Gyroscope will be used to measure the orientation of the vehicle. By tracking the orientation of the vehicle, the system can determine the direction of travel.

Ultrasonic Sensor: The Ultrasonic sensor can be installed at the front and back of the vehicle to detect obstacles. The sensor can send data to the ESP32, which

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can then alert the driver of any obstacles in the way.

Display: The display can be used to show real-time data such as the number of gears, speed, and location of the vehicle. It can also display alerts when obstacles are detected.

Cloud Server: The cloud server can be used to store data collected from the sensors, which can be used to generate reports and analyze vehicle performance.

The system can work as follows:

The sensors will collect data on the vehicle's location, orientation, and speed.

The ESP32 will process the sensor data and send it to the cloud server.

The cloud server will store the data and generate reports based on the data collected.

The display can be used to show real-time data such as the number of gears, speed, and location of the vehicle. It can also display alerts when obstacles are detected.

If an obstacle is detected, the ESP32 can send an alert to the driver, warning them of the obstacle and how to avoid it.

Overall, the proposed system can help in tracking and monitoring vehicles, prevent accidents due to obstacles, and improve vehicle performance by providing real-time data on its operation.

IV. CONCLUSION

In conclusion, the IoT-based vehicle management system using ESP32, Reed switch, gyroscope, ultrasonic sensor, and display offers a comprehensive solution for tracking vehicles, determining the number of gears, direction of the vehicle, and preventing obstacles.

The system's primary advantage is that it provides real-time data on the vehicle's status, including location, speed, and distance traveled, which can help fleet managers optimize routes, monitor fuel consumption, and ensure timely maintenance.

Furthermore, the system's ability to detect obstacles and alert the driver is critical for ensuring the safety of the vehicle and its occupants. The gyroscope and ultrasonic sensors are particularly useful for this purpose, providing accurate and reliable data on the vehicle's orientation and proximity to obstacles.

Overall, the IoT-based vehicle management system is a valuable tool for fleet managers and vehicle owners, providing real-time data on the status of their vehicles and helping them make informed decisions to improve efficiency, safety, and overall performance

FUTURE SCOPE

The IoT-based vehicle management system using ESP32, Reed switch, gyroscope, ultrasonic sensor, and display has a lot of potential for future development and improvement. The IoT-based vehicle management system has a lot of potential for future development and improvement, and there are several areas where it can be enhanced using advanced technologies such as machine learning, cloud-based data storage, mobile applications, and block chain.

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Here are some references that can be helpful for designing an IoT-based vehicle management system using ESP32, Reed switch, Gyroscope, Ultrasonic sensor, and a display:

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