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Real time vehicle theft prevention and safety control system

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ABSTRACT

Vehicle theft and road safety have become major concerns in modern transportation systems due to the rapid increase in the number of vehicles and the limitations of traditional security mechanisms such as mechanical locks and basic alarm systems. This project proposes a Real-Time Vehicle Theft Prevention and Safety Control System designed to provide intelligent monitoring, enhanced security, and immediate emergency response. The system integrates technologies such as GPS for continuous location tracking, GSM for instant communication, microcontrollers for control processing, and sensors for detecting unauthorized access, vibration, tilt, and collision events. The vehicle's location is continuously monitored and transmitted to the owner through SMS or a mobile application, enabling real-time tracking from anywhere. In case of theft or unauthorized ignition attempts, the system triggers alerts and allows remote engine disabling to prevent further movement of the vehicle. Additionally, safety features such as accident detection automatically send emergency notifications along with precise GPS coordinates to predefined contacts or authorities, ensuring quick assistance during critical situations. The inclusion of ignition control, door lock monitoring, and panic button functionality further strengthens both security and passenger safety. The system is designed to be cost-effective, compact, and easily adaptable to existing vehicles without major structural modifications. By combining theft prevention, real-time tracking, and emergency safety features

into a unified platform, this solution significantly improves vehicle security.

KEYWORDS: ***Vehicle Theft Prevention, Internet of Things (IoT), Raspberry Pi Zero W, GPS Tracking, Engine Safety Monitoring***

INTRODUCTION

Vehicle theft and unsafe driving conditions have become major challenges in modern transportation systems. Traditional security methods such as mechanical locks and alarm systems are no longer sufficient to provide effective vehicle protection. The proposed Real-Time Vehicle Theft Control System using Engine Safety Technique integrates IoT technology, sensors, and embedded systems to improve vehicle security and safety. The system utilizes IR sensors, flame sensors, MQ135 gas sensors, GPS modules, and Raspberry Pi Zero W to monitor vehicle conditions continuously. It detects unauthorized access, fire hazards, harmful gases, and abnormal situations, enabling automatic alerts, location tracking, and engine control for enhanced safety.

RELATED WORK

Several research studies have focused on improving vehicle security and safety through the integration of embedded systems and IoT technologies. Existing systems mainly utilize GPS tracking, GSM communication, and sensor-based monitoring to detect theft and provide real-time alerts. Some approaches use engine immobilizers and alarm systems to prevent unauthorized access, while others implement fire and gas detection mechanisms for vehicle safety. IoT-based solutions have further enabled remote monitoring and control through mobile applications. However, many existing systems focus on individual functions rather than providing an integrated platform combining theft prevention, engine safety monitoring, and real-time tracking capabilities.

LITERATURE REVIEW

The literature survey reviews existing technologies and research related to vehicle safety, security, and real-time monitoring systems. Traditional vehicle protection methods such as mechanical locks and alarm systems provided only basic security and lacked intelligent monitoring capabilities. With advancements in embedded systems, technologies such as GPS tracking, GSM communication, and sensor-based monitoring systems were introduced to improve vehicle protection.

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Researchers have integrated sensors like IR, flame, and gas sensors for hazard detection and theft prevention. IoT technology further enhanced these systems through real-time monitoring and remote access. However, existing systems still lack complete integration of safety, security, and tracking features.

EXISTING METHOD

Existing vehicle security systems mainly rely on traditional methods such as mechanical locks, key-based ignition systems, steering locks, and basic alarm systems for protection against theft. Some advanced systems use engine immobilizers and GSM-based communication to restrict unauthorized access and send alert messages to vehicle owners. GPS tracking systems are also used for monitoring vehicle location and theft recovery. However, these systems mainly focus on individual functionalities and lack integration with safety features such as fire detection, gas monitoring, and automatic engine control. As a result, they provide limited real-time monitoring and response capabilities during emergency situations.

PROPOSED METHOD

The proposed system introduces a Real-Time Vehicle Theft Control System using Engine Safety Technique by integrating IoT technology, Raspberry Pi, and multiple sensors for intelligent monitoring and control. The system uses IR sensors for authorized access detection, flame sensors for fire hazard monitoring, and MQ135 gas sensors to detect harmful gases and fuel leakage.

A GPS module enables real-time vehicle tracking during theft situations. The Raspberry Pi acts as the central processing unit, analyzing sensor data and controlling engine operation automatically. When unsafe conditions or unauthorized activities are detected, the system generates alerts and performs automatic engine shutdown for enhanced security and safety.

SYSTEM ARCHITECTURE

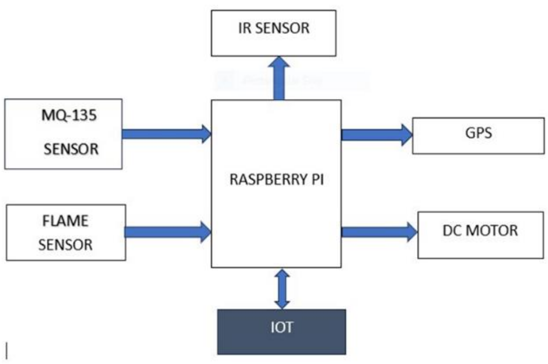

Fig 1: Block Diagram

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METHODOLOGY DESCRIPTION

IR Sensor Detection

The IR sensor is used to detect authorized access and monitor the presence of the rider before allowing vehicle operation. It continuously senses the required conditions and sends signals to the Raspberry Pi for further processing.

Flame Detection and Safety Control

The flame sensor is placed near the engine area to identify fire hazards or abnormal heat conditions. When fire is detected, the system immediately generates an alert and activates safety actions to prevent damage.

Gas Leakage Monitoring

The MQ135 sensor continuously monitors air quality and detects harmful gases such as smoke and fuel leakage. If gas levels exceed the predefined threshold, the sensor sends information to the Raspberry Pi for immediate response.

Vehicle Tracking and Communication

The GPS and IoT technologies are used for real-time vehicle location tracking and remote monitoring. The system sends vehicle status and location information to users, helping in theft detection and quick response.

Engine Control and Decision Processing

The Raspberry Pi acts as the central processing unit and receives data from all connected sensors. Based on the programmed logic and sensor conditions, it controls the DC motor operation and performs automatic engine control actions.

SOFTWARE AND HARDWARE REQUIREMENTS

Hardware Components

Raspberry Pi Zero W

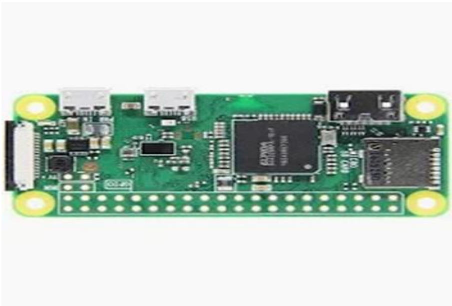

Fig 2: Raspberry Pi Zero W

The Raspberry Pi Zero W acts as the central processing unit of the system and controls all connected devices. It receives sensor data, processes information, and performs decision-making operations.

IR Sensor

Fig 3: IR Sensor

The IR sensor is used to detect authorized access or rider presence before allowing vehicle operation. It sends detection signals to the Raspberry Pi for verification and control.

MQ135 Gas Sensor

Fig 4: MQ135 Gas Sensor

The MQ135 sensor is used to detect harmful gases, smoke, and fuel leakage near the engine area. It continuously monitors air quality and sends readings to the controller.

Flame Sensor

Fig 5: Flame Sensor

The flame sensor detects fire or abnormal heat conditions near the engine section. It helps in providing early warning and preventing damage by triggering safety actions.

GPS Module

Fig 6: GPS Module

The GPS module provides real-time location information of the vehicle using satellite communication. It helps in vehicle tracking and theft detection applications.

DC Motor

Fig 7: DC Motor

The DC motor is used to represent the vehicle engine operation in the proposed system. It operates according to the control signals generated by the Raspberry Pi.

IoT Module

The IoT module enables remote communication and real-time monitoring of vehicle status. It allows users to receive alerts and track vehicle information through network connectivity.

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Software Requirements

The software section includes Raspberry Pi OS and Python programming language for system implementation and control. Python libraries are used for sensor interfacing, GPIO operations, serial communication, and IoT connectivity. The software continuously reads sensor data, processes conditions, and performs real-time monitoring and control operations for vehicle safety and theft prevention.

RESULTS AND DISCUSSION

The implemented system successfully demonstrates real-time monitoring and control of vehicle safety and security conditions. The IR sensor effectively detects authorized access, ensuring that the engine (DC motor) operates only when valid conditions are met. The flame sensor responds quickly to fire detection near the engine and immediately triggers a shutdown action to prevent damage or accidents. The MQ135 sensor accurately monitors harmful gases and activates safety responses when threshold levels are exceeded. The Raspberry Pi processes all sensor inputs in real time and controls the DC motor efficiently, showing proper ON/OFF operation based on safety conditions. The GPS module provides continuous location tracking, which is useful in case of theft or unauthorized movement. The IoT feature enables remote monitoring and alert generation, improving response time.

Overall, the system performs reliably by integrating multiple sensors for safety, security, and tracking. It reduces risks of theft, fire hazards, and unsafe operation, making it an effective prototype for smart vehicle safety applications.

The system was successfully tested under different operating conditions such as normal operation, unauthorized access, fire detection, and gas leakage scenarios. In normal conditions, the IR sensor verified valid access and the DC motor (engine) operated smoothly without interruption. When unsafe conditions were introduced, such as absence of authorization, flame detection, or high gas concentration from the MQ135 sensor, the system responded immediately by stopping the motor and activating safety control actions.

The flame sensor showed fast response in detecting fire near the engine area, ensuring instant shutdown to avoid damage. Similarly, the MQ135 sensor effectively detected harmful gas levels and triggered protective actions, demonstrating reliable environmental monitoring. The Raspberry Pi processed all inputs in real time with minimal delay, ensuring proper coordination between sensors and output devices. levels and triggered protective actions, demonstrating reliable environmental monitoring. The Raspberry Pi processed all inputs in real time with minimal delay, ensuring proper coordination between sensors and output devices

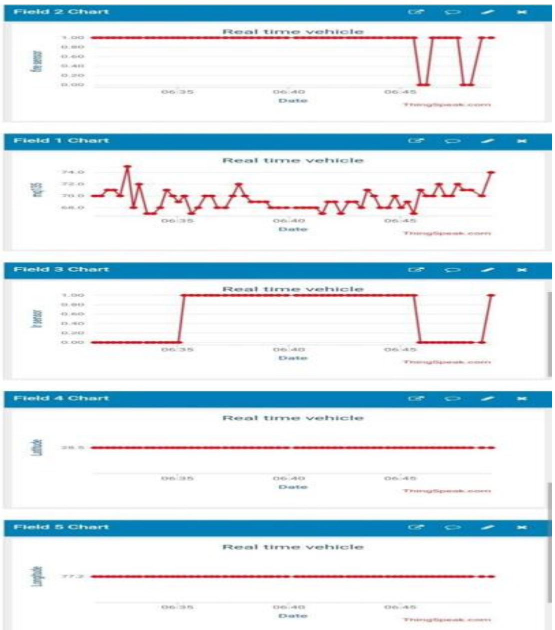

Fig 8: results

The GPS module continuously provided accurate location data, which is essential for tracking the vehicle during theft or unauthorized movement. The IoT integration successfully enabled remote monitoring and alert transmission, allowing the user to receive real-time updates.

Overall, the analysis shows that the system is efficient, reliable, and responsive in handling multiple safety conditions simultaneously. It improves vehicle security by integrating detection, control, and tracking into a single automated system.

CONCLUSION

The Real-Time Vehicle Theft Control System using Engine Safety Technique successfully improves vehicle security and safety through the integration of IR sensors, flame sensors, MQ135 gas sensors, GPS modules, and Raspberry Pi. The system provides real-time monitoring, theft detection, automatic engine control, and hazard identification to reduce accidents and unauthorized access. This intelligent approach enhances vehicle protection, minimizes human intervention, and offers a reliable solution for modern transportation systems.

FUTURE SCOPE

The system can be further enhanced by integrating biometric authentication methods such as fingerprint recognition for improved security and user verification.

Advanced IoT and cloud technologies can also be implemented for remote monitoring, real-time notifications, and mobile application support. Future developments may include AI-based analytics and smart vehicle automation features for improved performance and security.

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