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GPS Tracking and GSM Based Vehicle Theft Alert and Engine Locking System

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Abstract: *Vehicle theft is a major concern worldwide, leading to significant financial losses and safety issues. Traditional vehicle security systems such as alarms are often insufficient because they only provide local alerts. This paper presents a GPS and GSM-based vehicle theft detection and engine locking system designed to enhance vehicle security and recovery. The system integrates a GPS module for real-time vehicle location tracking and a GSM module for communication with the owner via SMS alerts. When unauthorized access or theft is detected, the system sends an alert message containing the vehicle's location coordinates. Additionally, the engine can be remotely disabled using a GSM command, preventing further movement of the stolen vehicle. The proposed system is cost-effective, reliable, and suitable for real-time vehicle monitoring applications.*

Keywords: GPS, GSM, Vehicle Theft Detection, Engine Locking System, Arduino Microcontroller

I. INTRODUCTION

Vehicle theft has become one of the most common crimes in urban and rural areas. Conventional vehicle security systems rely mainly on audible alarms, which can be easily ignored or disabled by thieves. Therefore, modern vehicle security requires intelligent systems capable of detecting unauthorized access, informing the vehicle owner, and allowing remote control of the vehicle.Global Positioning System (GPS) and Global System for Mobile Communication (GSM) technologies provide efficient solutions for vehicle tracking and monitoring. GPS enables accurate positioning and navigation, while GSM allows communication between the vehicle system and the owner via SMS or calls.This paper proposes a GPS and GSM-based vehicle theft alert and engine locking system that can notify the owner when unauthorized activity occurs and provide the vehicle's real-time location. The system also includes a remote engine locking feature that disables the vehicle engine through a relay mechanism.

II. LITERATURE REVIEW

Several vehicle tracking and anti-theft systems have been proposed in recent years.Researchers have developed GPS-based vehicle tracking systems that provide real-time location monitoring using satellite signals. However, these systems often lack engine immobilization capabilities.

GSM-based alert systems are also widely used for vehicle monitoring, allowing communication through SMS messages. Some modern systems integrate both GPS and GSM technologies for better performance.

However, many existing solutions are expensive and require complex infrastructure. The proposed system aims to develop a low-cost, efficient, and easy-to-install vehicle theft protection system using widely available components such as Arduino microcontrollers, GPS modules, and GSM modules.

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III. SYSTEM ARCHITECTURE

Block Diagram of Proposed System

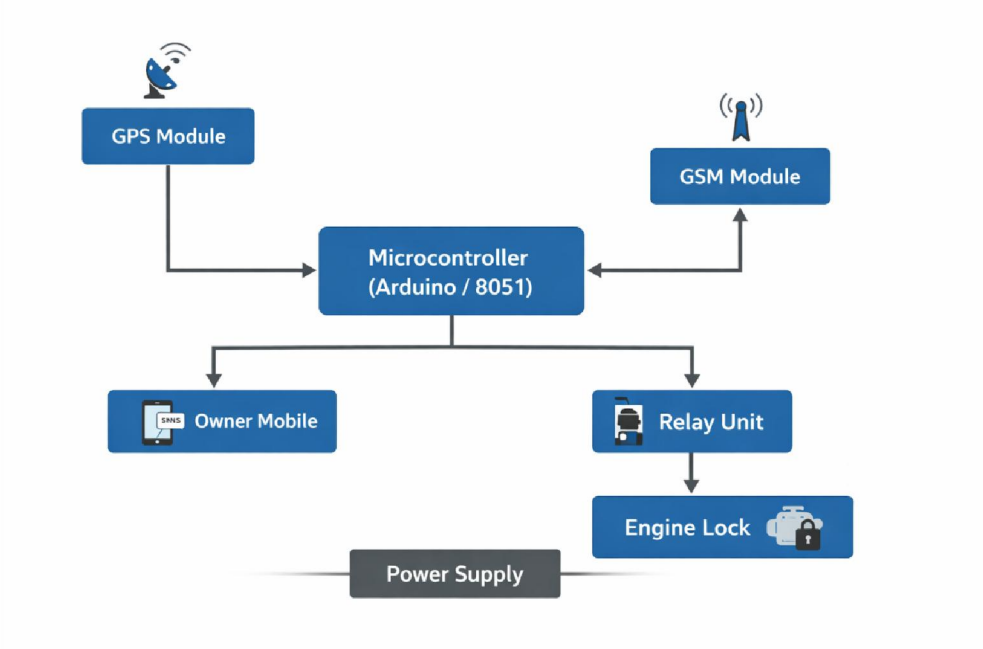

Fig. 1 Block Diagram of System

The system consists of the following main components:

- GPS module
- GSM module
- Microcontroller
- Relay-based engine locking circuit
- Power supply

Hardware Components

A. GPS Module

The GPS module is responsible for obtaining the geographic location of the vehicle. It communicates with satellites and provides information such as latitude, longitude, speed, and time. The location data is transmitted to the microcontroller via serial communication.

B. GSM Module

The GSM module is used for communication between the vehicle system and the owner. It sends SMS alerts when unauthorized access is detected. The owner can also send commands to control the vehicle engine.

C. Microcontroller

The microcontroller acts as the central control unit of the system. It processes data received from the GPS module and controls the GSM module and relay circuit. Arduino is commonly used due to its simplicity and ease of programming.

D. Engine Locking Mechanism

A relay circuit is used to control the ignition system of the vehicle. When the owner sends a specific command through SMS, the microcontroller activates the relay to disable the engine, preventing further movement of the vehicle.

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E. Power Supply

The system is powered using the vehicle battery, typically providing 12V DC. Voltage regulators are used to provide appropriate voltage levels to different components.

V. SOFTWARE DESIGN

The system software is implemented using embedded programming in Arduino IDE.

Algorithm

Start the system.
Initialize GPS and GSM modules.
Continuously monitor vehicle status.
If theft or unauthorized access is detected:
Obtain location from GPS.
Send SMS alert to the owner via GSM.
Wait for owner command.
If owner sends **ENGINE OFF command**:
Activate relay.
Disable vehicle engine.
Continue monitoring.

VI. WORKING PRINCIPLE

The GPS module continuously tracks the vehicle location.
The microcontroller reads GPS coordinates and stores them.
When theft is detected, the GSM module sends an SMS containing the vehicle location to the owner's phone.
The owner can send an SMS command to the system to lock the engine.
Upon receiving the command, the microcontroller activates the relay to disable the ignition system.

Example SMS alert:

ALERT! Vehicle Theft Detected
Location:
Latitude: 18.5204
Longitude: 73.8567

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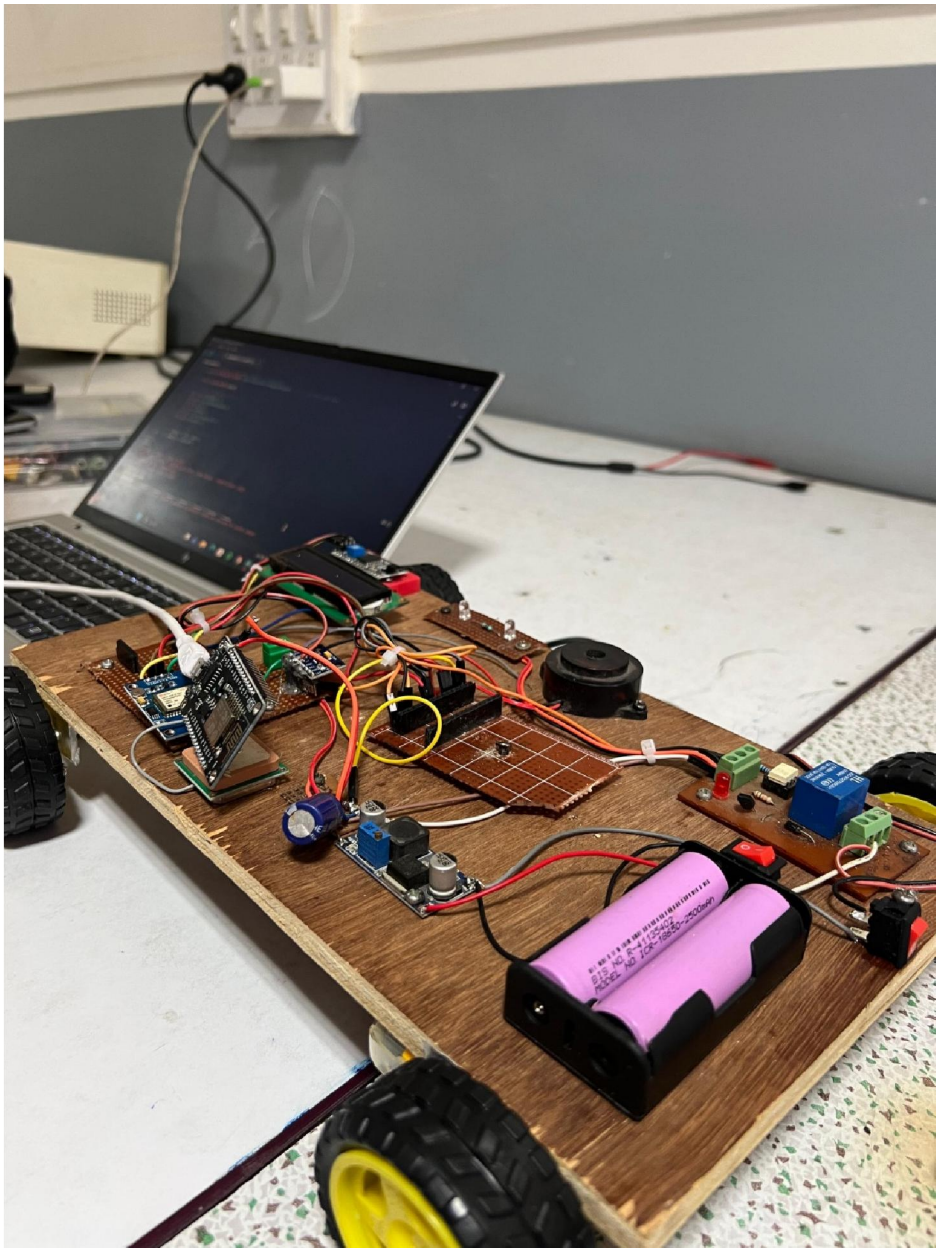

Fig. 2 System Output Model

VII. ADVANTAGES

Real-time vehicle tracking
Remote engine locking
Low cost implementation
Easy installation
Reliable communication via GSM

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VIII. APPLICATIONS

Private vehicle security
Fleet management
Car rental services
Logistics and transportation monitoring
Military vehicle tracking

IX. FUTURE SCOPE

The system can be enhanced with advanced features such as:

- Mobile application integration
- Internet of Things (IoT) connectivity
- Geofencing alerts
- Cloud-based vehicle monitoring
- Camera-based surveillance

X. CONCLUSION

This paper presented a GPS and GSM-based vehicle theft alert and engine locking system designed to improve vehicle security. The system provides real-time location tracking and remote engine immobilization using GSM communication. The proposed design is cost-effective, reliable, and easy to implement. It offers an efficient solution for preventing vehicle theft and improving recovery chances.

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