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VEHICLE THEFT DETECTION /NOTIFICATION WITH REMOTE ENGINE LOCKING

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ABSTRACT

Vehicle security is a growing concern due to increasing theft incidents. This project presents a Vehicle Theft Detection and Prevention System using RFID (Radio Frequency Identification), GSM (Global System for Mobile Communication), and a Relay Module for enhanced security.

The system consists of an RFID reader that scans authorized RFID tags. If an authorized tag is detected, the vehicle ignition system is activated using a relay module. If an unauthorized tag is scanned, an alert is sent to the vehicle owner via SMS using a GSM module, and an alarm (buzzer) is triggered. Additionally, an automatic call is placed to the owner for real-time verification.

The system is implemented using Arduino Uno (ATmega328P) as the microcontroller, which integrates RFID, GSM, LCD display, relay module, and a buzzer for theft detection and prevention. The use of a relay ensures direct control over the vehicle's ignition system. This project provides an efficient, cost-effective, and real-time solution to enhance vehicle security.

Vehicle theft is a significant concern in today's world, leading to financial losses and security threats. Traditional vehicle security mechanisms, such as mechanical locks and alarm systems, are often insufficient to prevent authorized users can start the vehicle while alerting the owner in case of unauthorized access attempts.

INTRODUCTION

This project introduces a Vehicle Theft Detection and Prevention System that integrates RFID (Radio Frequency Identification), GSM (Global System for Mobile Communication), and a relay module to prevent unauthorized vehicle access. The system is designed to ensure that only an authorized RFID tag can start the vehicle. If an unauthorized attempt is made, the system triggers an alert via SMS and calls the owner, providing real-time security measures.

The Arduino Uno (ATmega328P) microcontroller acts as the central processing unit, controlling the RFID, GSM, relay, buzzer, and LCD display for real-time status updates,the relay module is utilized to directly switch the vehicle ignition on or off.

This Vehicle Theft Detection and Prevention System provides a cost-effective, real-time security solution that proactively prevents unauthorized access and immediately notifies the owner of security threats. The integration of RFID authentication, GSM alerts, and relay-based ignition control ensures that only authorized users can start the vehicle while keeping the owner informed in case of potential theft.

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This project demonstrates how embedded systems can be used to enhance vehicle security and prevent theft effectively.

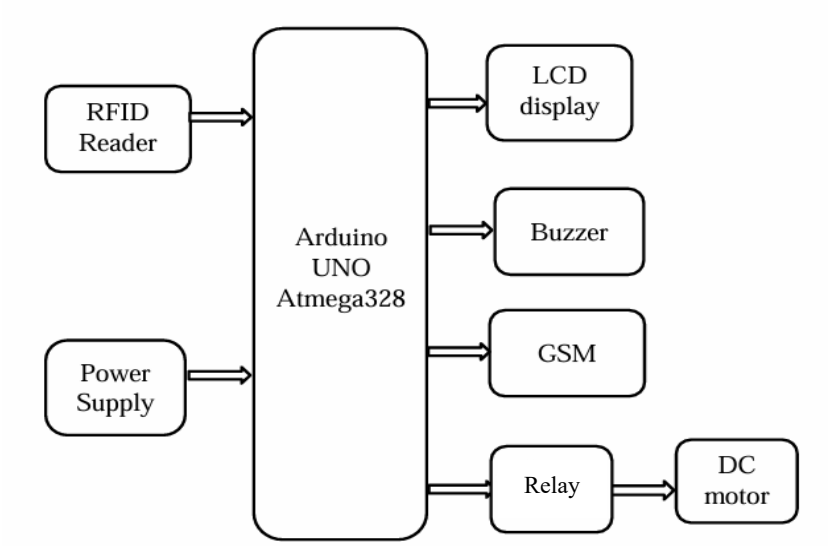

Figure.1 Block Diagram

LITERATURE SURVEY

Vehicle security has become a major concern due to the increasing cases of theft. Traditional security measures, such as manual locks and alarm systems, often fail to provide adequate protection. Several studies have explored advanced technologies like RFID, GSM, and microcontrollers to enhance vehicle security. RFID-based security systems use unique RFID tags assigned to authorized users to control vehicle access. Research by Jadhav et al. (2017) demonstrated that an RFID reader can detect unauthorized attempts to access a vehicle, triggering an alarm and sending alerts via GSM. Similarly, Patil et al. (2018) introduced an RFID-based engine immobilization system, where only an authorized RFID tag could start the vehicle, preventing theft.

Apart from RFID, GSM technology has been widely used for real-time theft notifications and remote vehicle control. In Kumar et al. (2019), a GSM-based alert system was implemented to notify the owner via SMS when unauthorized access was detected. Additionally, the owner could send an SMS command to remotely disable the vehicle's engine using a relay circuit controlled by a microcontroller. This approach ensures that even if a thief manages to bypass manual security measures, the owner can still prevent the vehicle from being stolen.

PROPOSED SYSTEM

The system comprises an RFID-based access control mechanism and a GSM-based notification system to enhance vehicle security. When an unauthorized access attempt is detected, an alert message is sent to the owner via SMS, and the engine is remotely disabled. The RFID Reader (EM-18) scans RFID tags and transmits their unique ID to the Arduino for authentication via serial communication. If the scanned tag matches a predefined authorized ID, access is granted; otherwise, it is denied. The GSM Module (SIM800L) sends SMS alerts and makes calls for remote authentication, ensuring the owner has control over vehicle access. The 16x2 LCD Display provides real-time feedback by displaying messages like "**Scan RFID**," "**Access Denied**," and "**Vehicle ON**."

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A relay module controls the vehicle ignition system, represented by a DC motor, and only activates when an authorized tag is detected and the owner answers the verification call. Additionally, a buzzer alerts the user in case of unauthorized access attempts, producing a beep when an unknown RFID tag is scanned while also triggering an SMS alert to the owner. This proactive approach significantly reduces the risk of vehicle theft.

The system comprises an RFID-based access control mechanism and GSM-based notification system. When an unauthorized attempt to access the vehicle is detected, an alert message is sent to the owner via SMS, and the engine is remotely disabled. This proactive approach significantly reduces the risk of vehicle theft.

The system requires multiple voltage levels: 5V for Arduino, RFID, LCD, and Buzzer, while 12V is needed for the GSM module and relay. A 12V DC power supply is connected to the GSM module and relay, while the Arduino is powered through its USB or a 5V regulator. The common ground (GND) is shared among all components to ensure stable operation. A step-down voltage regulator is used to provide the correct voltage levels for different components.

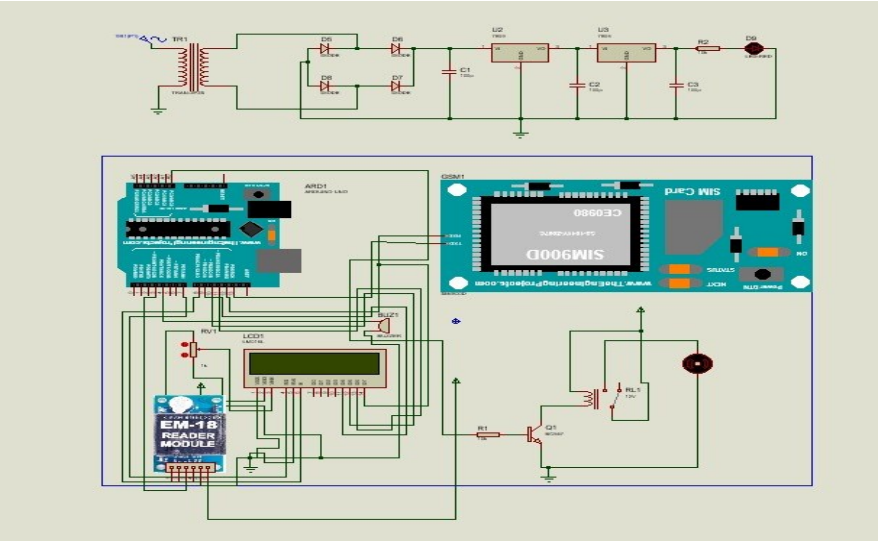

Figure.2 Schematic Diagram

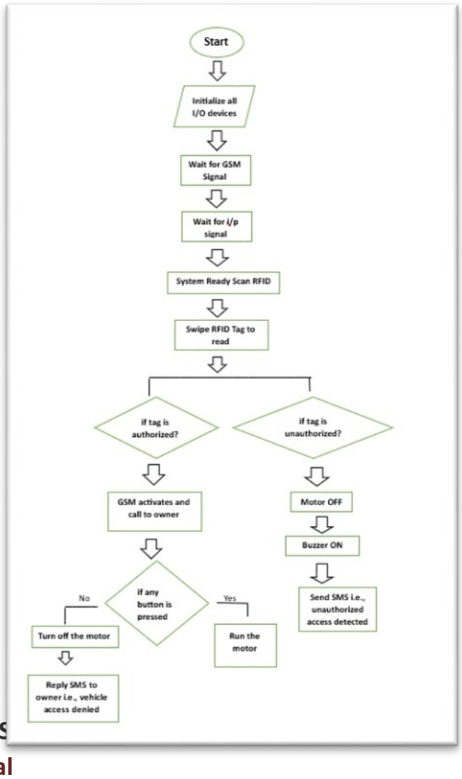

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Figure.3 Flow Chart

RESULTS

The RFID and GSM-based vehicle security system was successfully simulated in Proteus, demonstrating effective authentication, vehicle ignition control, and theft prevention features. The implementation followed a structured approach, including circuit design, code integration, and system testing. Below is a step-by-step discussion of the results obtained during simulation and their implications for real-world applications.

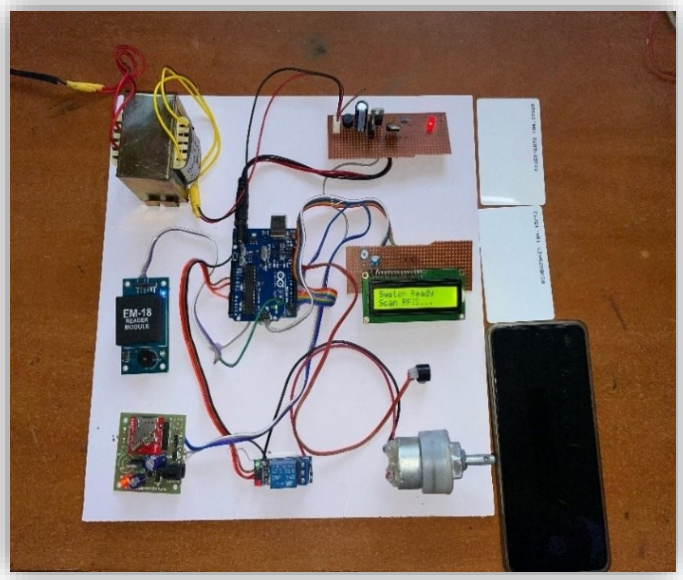

Figure. 4 Hardware Connection

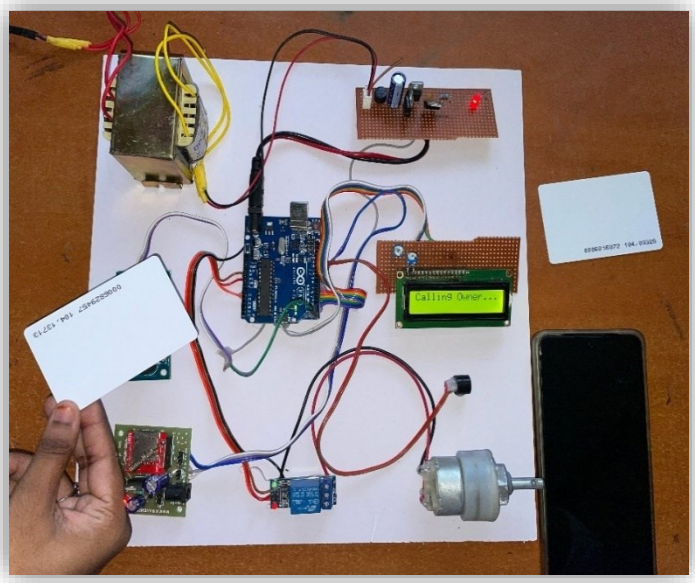

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Figure.5 (RFID Authentication)

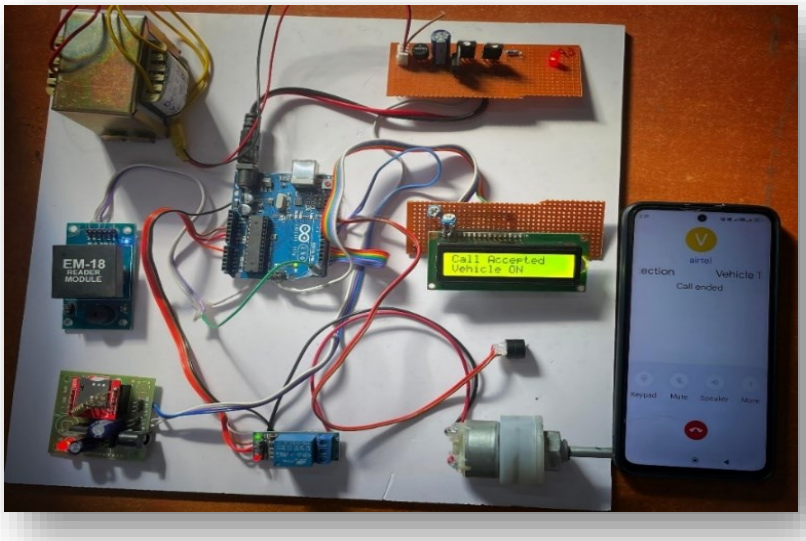

Figure.6 (GSM Module Communication)

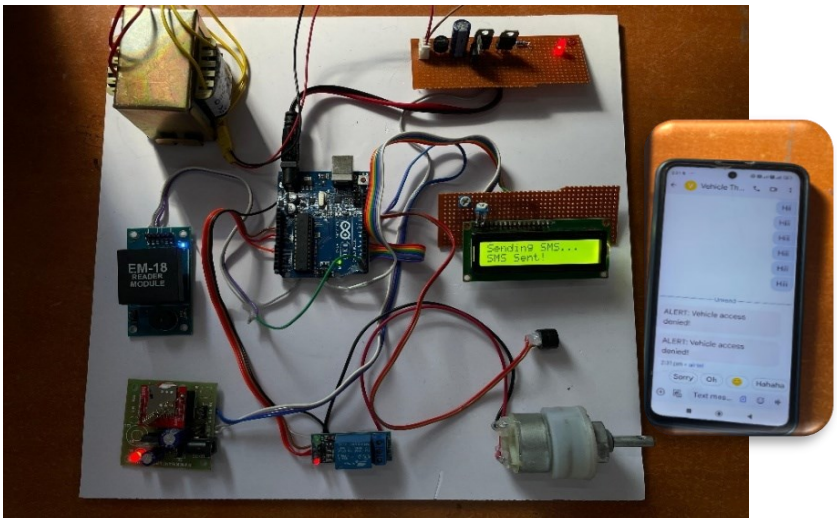

Figure.7 Unauthorized

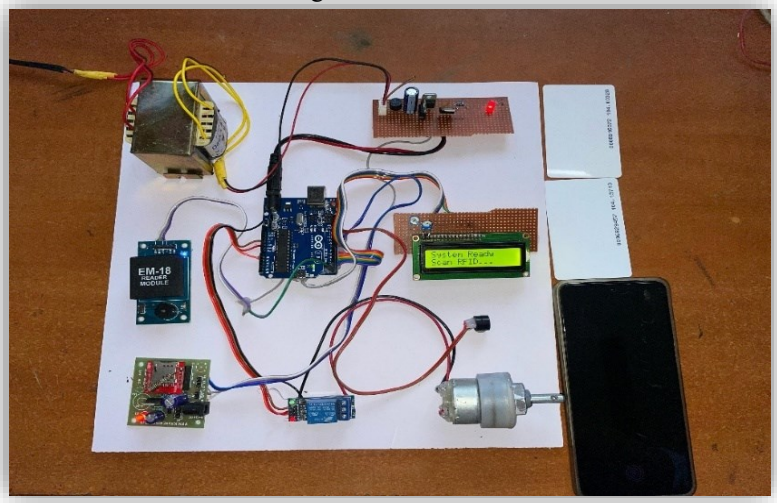

Figure.8 (System Reset)

ADVANTAGES

- **Enhanced Security –** Prevents unauthorized vehicle access and theft by using RFID authentication and remote verification.
- **Remote Monitoring –** The owner receives SMS alerts and calls, allowing real-time monitoring of **vehicle access. User-Friendly Interface –** The LCD display provides clear instructions and system status updates.
- **Automated Control –** The system automates vehicle ignition control, reducing manual intervention.
- **Quick Response to Threats –** Immediate alerts and remote engine disablement enhance security.
- **Low Power Consumption –** Operates efficiently with minimal power requirements.
- **Cost-Effective –** Uses readily available and affordable components.

APPLICATIONS

- **Vehicle Anti-Theft System –** Prevents unauthorized vehicle access and theft through RFID authentication and GSM alerts.
- **Fleet Management –** Helps companies monitor vehicle access and prevent misuse.
- **Restricted Area Access Control –** Can be used in parking lots and secure areas to ensure only authorized vehicles enter.
- **Public Transport Security –** Enhances security in buses and taxis by allowing only registered drivers to start the vehicle.
- **Personal Vehicle Security –** Ideal for individual car owners looking to add an extra layer of security.
- **Corporate & Government Vehicles** – Ensures only authorized personnel can access official vehicles.

CONCLUSION

This project successfully enhances vehicle security by integrating RFID for access control and GSM for real-time notifications. The implementation of remote engine locking provides an effective deterrent against theft, ensuring better protection for vehicle owners. By combining these technologies, the system offers a reliable, cost-effective, and user-friendly solution for securing vehicles against unauthorized access.

The Vehicle Theft Detection & Notification System with Remote Engine Locking is an effective security measure that enhances vehicle safety without relying on GPS tracking. This system utilizes sensors, GSM communication, and a remote-controlled engine locking mechanism to detect unauthorized access and prevent theft.

One of the most critical features is remote engine locking, which allows the owner to disable the vehicle's engine remotely through a mobile phone command.

This feature prevents the thief from starting or continuing to drive the vehicle, making recovery easier. Additionally, tamper detection mechanisms ensure that any attempt to disable the system is also reported to the owner.

FUTURE SCOPE

1. **Enhancing Timer Efficiency Using Raspberry Pi and Python:**

   Using Raspberry Pi instead of Arduino can significantly enhance timer efficiency because Raspberry Pi supports multithreading, real-time scheduling, and advanced power management.

   With Python, we can optimize the system using precise timers, event-driven programming, and non-blocking execution, making the RFID and GSM-based vehicle security system more efficient.

2. **GPS Integration for Real-Time Tracking:**

- Adding a GPS module can enable real-time location tracking of the vehicle.
- If unauthorized access is detected, the vehicle's location can be sent via SMS to the owner.
- This feature would be highly beneficial for theft recovery and vehicle monitoring.

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