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# VEHICLE ANTI-THEFT SECURITY SYSTEM WITH IGNITION LOCKING USING EMBEDDED SYSTEM

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# 1. ABSTRACT

The Vehicle Anti-Theft Security System is an advanced embedded solution designed to prevent unauthorized access and safeguard vehicles. This system integrates multiple technologies, including GSM communication, fingerprint authentication, and a password keypad, to provide a robust, multi-layered security framework. At its core, the system is powered by an Arduino microcontroller, which interfaces with various components: a fingerprint sensor for biometric verification, a password keypad for additional security, an LCD display for user interaction and status updates, and a GSM module for real-time notifications. A DC motor simulates the vehicle's ignition system, locking or unlocking based on successful authentication. To access the vehicle, users authenticate their must identity via fingerprint scanning or password entry. In the event of unauthorized attempts, the system triggers an alarm and sends an SMS alert to the owner, ensuring prompt action. The LCD provides clear feedback during the authentication process, enhancing the experience. Additionally, user the GSMmodule enables remote monitoring and control, allowing the owner to lock or unlock the ignition via SMS in

emergencies. This solution is costeffective, scalable, and highly versatile, making it suitable for both individual vehicle owners and commercial applications.

# 2. INTRODUCTION

In a world where vehicle theft is a growing global concern, securing vehicles has shifted from being a convenience to an absolute necessity. Traditional security measures often lack the sophistication needed to provide comprehensive protection, driving the demand for advanced solutions. The Vehicle Anti-Theft Security System with Ignition Locking addresses this challenge by integrating modern technologies with embedded system design, delivering a multi-layered defense mechanism that emphasizes safety, reliability, and ease of use. This state-of-the-art system combines cutting-edge technologies such as GSM communication, fingerprint authentication, password keypads, and an LCD interface, along with a DC motor mechanism for ignition control. Together, these components create a robust, cost-effective, and scalable solution to deter unauthorized access and prevent vehicle theft. The system ensures that only authorized users



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can operate the vehicle by utilizing biometric fingerprint scanning or password-based authentication. Once the user's identity is verified, the ignition system is activated. However, if an unauthorized attempt is detected, the system immediately disables the ignition, triggers an alarm, and sends real-time SMS alerts to the vehicle owner's mobile device via the GSM module. This comprehensive approach not only enhances vehicle security but also provides peace of mind, making it an ideal solution for both personal and commercial applications.

## 3. LITERATURE SURVEY

Sarfraz Fayaz Khan and Mohammad "IoT-Based Khan's Ahmar paper, Framework Vehicle **Over-Speed** for Detection," was presented at the 1st International Conference on Computer Applications & Information Security (ICCAIS) in 2018. This paper proposes a real-time vehicle overspeeding detection system based on the Internet of Things. The primary goal of the system is to automate road safety by efficiently monitoring and controlling vehicle speeds utilizing modern IoT technology. Second International Conference Smart on Systems and Inventive Technology (ICSSIT), 2019; "GPS and GSM Enabled Tracking, Monitoring, and Control System for Multiple Applications," Sohail Sheikh, Neema A. Ukani, and Saurabh S. Chakole. In 2019, 978-1-7281-2118-5 The ISBN is IEEE. This paper presents a GPS and GSM-based for system tracking. control various monitoring, and in applications. The system offers a costeffective and adaptable solution that may be applied to a number of industries, such as transportation, healthcare, and asset management.

By Eden Yasin Ibraim and Lorant Andras Szolga. "Vehicle Monitoring System Using SIM7600CE-T Controlled over Arduino Platform," 2023 IEEE Long Island Systems, Applications and Technology Conference, USA, pp. 1-4, 2023. The vehicle monitoring system outlined in this paper is controlled by the Arduino platform and is powered by the SIM7600CE-T module. The system prioritizes secure connectivity, data monitoring, and real-time tracking to enhance vehicle management and safety.

Ganiyu Azeez Abdulah, "Development of a Vehicle Tracker Using SMS Alerts System with Google Map Links," Advancement of Computer Technology and Its Applications, vol. 6, no. 3, pp. 34-41, 2023. This research outlines the creation of a vehicle tracking system that integrates SMS alerts with Google Maps links for real-time location sharing. The system focuses on affordability, reliability, and user convenience to provide effective vehicle tracking solutions.

## 4. EXISTING SYSTEM

The growing demand for safety and security in a variety of industries has spurred the need for innovative solutions. According to this study, a low-cost, portable system for tracking, monitoring, and online and offline accident alerts can be built using NodeMCU. The technology incorporates a slide wake-up mechanism and a complex algorithm that is tailored for low power use to further minimize energy consumption. The design makes advantage of IoT technologies to store and



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retrieve data through the cloud. Together, MEMS accelerometers and ultrasonic sensors enable accurate detection and response in accident alerts. In the event of theft attempts or unauthorized access, the system notifies the owner by SMS, acting as an anti-theft solution.

Experimental results demonstrate the system's capability to provide real-time speed monitoring and location tracking, validating its effectiveness in enhancing vehicle safety and security.

# DISADVANTAGES

- ✓ Limited Range: The system's functionality depends on network coverage, which can be unreliable or unavailable in certain areas.
- Security Risks: Cloud-based data storage introduces potential vulnerabilities, including hacking risks and privacy concerns.
- ✓ Hardware Limitations: The microcontroller and sensors may face constraints in processing power and storage capacity, potentially impacting performance.

# 5. PROPOSED SYSTEM

The proposed Vehicle Anti-Theft Security System is a sophisticated and reliable solution aimed at enhancing vehicle preventing unauthorized security by access. The system is powered by an Arduino microcontroller and integrates a fingerprint sensor, password keypad, GSM module, DC motor, and LCD display to deliver a comprehensive, multi-layered security mechanism. Fingerprint authentication serves as the primary access control. ensuring only authorized individuals can operate the vehicle. A password keypad provides an additional

layer of security, requiring a valid code to unlock the system. The GSM module enables real-time communication, sending SMS alerts to the vehicle owner in cases of unauthorized access attempts or emergencies. The DC motor, simulating the ignition system, remains locked until successful authentication is completed. The LCD display enhances user interaction by providing clear guidance during the authentication process and displaying system status updates. In the event of repeated invalid attempts, the system activates an audible alarm to deter intruders and alert nearby individuals. This cost-effective and scalable solution combines physical security with remote monitoring and control, offering vehicle owners greater peace of mind and a userfriendly experience.

# ADVANTAGES

- ✓ Enhanced Security: Integrates fingerprint authentication, password protection, and GSM alerts for a robust, multi-layered defense.
- ✓ Real-Time Alerts: Sends SMS notifications via the GSM module to alert the owner of tampering or unauthorized access attempts.
- Remote Control: Enables the owner to lock or unlock the vehicle remotely through SMS, offering convenience and flexibility.
- Cost-Effective Design: Built using Arduino and readily available components, providing an affordable yet reliable solution.

6. BLOCK DIAGRAM



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# 7. HARDWARECOMPONENTRE QUIRED

# **ARDUINO:**



The The open-source Arduino Uno microcontroller board, developed by Arduino.cc, features the Microchip ATmega328P CPU. It is easy to link with expansion boards (shields) and other circuits thanks to its many digital and analog input/output (I/O) pins. The board includes 14 digital and 6 analog pins and can be programmed using the Arduino Integrated Development Environment (IDE) via a type-B USB port. An external power source, such as a 9-volt battery, or a USB connection can power the Arduino Uno. It is capable of handling input voltages between 7 and 20 volts. The Uno, like the Arduino Nano and Leonardo, is versatile enough for a variety of applications. The board is programmed using the Arduino programming language, which is derived from Wiring, and the Arduino software (IDE), which is based on

Processing. Users may control the microcontroller in this setup, enabling the board to perform a number of tasks.

## **DC MOTOR:**

An apparatus that transforms DC electrical power into mechanical power is called a direct current (DC) motor. It operates on the principle that a conductor carrying current in a magnetic field experiences a mechanical force.

## LCD:



The I2C 1602 LCD module is a 16character, 2-line display connected via an I2C daughter board. The I2C interface simplifies connections, requiring only two data lines, along with +5 VDC and GND, for operation.

### **FINGERPRINT SENSOR:**



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The fingerprint sensor is a device used for fingerprint detection, commonly fingerprint integrated into detection modules for computer security. It offers key features such as high accuracy, enhanced performance, and reliability, leveraging exclusive fingerprint biometric technology. Fingerprint scanners or readers provide a highly secure and practical alternative to passwords, as they are more difficult to forge and offer greater convenience compared to remembering complex passwords.

### GSM:



The GSM (Global System for Mobile Communication) mobile communication modem was developed by Bell Laboratories in the 1970s. It is one of the world's most widely used mobile communication systems. GSM is an open cellular digital technology that is used to provide voice and data services. It uses a wide range of frequency bands, including 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz.

### **PASSWORD KEY PAD:**



This 16-button keypad serves as an essential human interface component for microcontroller projects. Its adhesive backing allows for easy mounting, making it suitable for a wide range of applications.

## APPLICATION

Automated Security for Remote Locations: The system can be used for vehicles in remote or high-risk locations where traditional security measures may not be sufficient, providing remote monitoring and control.

Integrated Anti-Theft System for Smart Cities: In smart city initiatives, this system could be integrated with IoT platforms, providing real-time alerts, remote locking, and monitoring, improving urban mobility security.

Emergency Response Vehicles: Emergency vehicles (ambulances, fire trucks) can incorporate the system to ensure that only authorized personnel can access and operate them, preventing misuse or theft.

Vehicle Recovery Systems: In case of a theft, the system's ability to send alerts and enable remote locking could assist law enforcement in recovering stolen vehicles quickly.

## CONCLUSION



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The Vehicle Anti-Theft Security System provides a dependable and cost-effective solution to safeguard vehicles from theft. By integrating technologies such as GSM communication, fingerprint authentication, password keypads, and an LCD interface, the system offers multi-layered protection against unauthorized access. In the event suspicious activity, of the system automatically locks the ignition and sends immediate SMS alerts to the vehicle owner, ensuring prompt communication and a swift response. The system's flexibility allows for easy integration of additional security features and customization based on user preferences. its combination of biometric With authentication, password security, and real-time communication, this system delivers a robust, user-friendly solution that enhances vehicle safety while maintaining affordability and scalability. It gives vehicle owners peace of mind, knowing their vehicle is protected by an advanced and reliable security system.

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