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Improving the Security System for the Vehicle by Using the Driving License and Fingerprint Automation

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Abstract - In contemporary times, the widespread use of vehicles necessitates robust protection against theft, which is achieved through the integration of RFID tags and fingerprint authentication. This paper introduces a vehicle ignition system that leverages RFID tags and fingerprint recognition to safeguard vehicles from unauthorized access. Authorized RFID tags initiate the authentication process, complemented by fingerprint verification for driver identification. Upon successful authentication, a relay is activated, enabling the ignition system, while a red LED displays the status. In the event of authentication failure, an alarm buzzer prevents unauthorized entry. This system significantly enhances vehicle security and ensures a smooth user experience, with potential for customization and scalability across various vehicle models. Key components include In contemporary times, the widespread use of vehicles necessitates robust protection against theft, which is achieved through the integration of RFID tags and fingerprint authentication. This paper introduces a vehicle ignition system that leverages RFID tags and fingerprint recognition to safeguard vehicles from unauthorized access. Authorized RFID tags initiate the authentication process, complemented by fingerprint verification for driver identification. Upon successful authentication, a relay is activated, enabling the ignition system, while a red LED displays the status. In the event of authentication failure, an alarm buzzer prevents unauthorized entry. This system significantly enhances vehicle security and ensures a smooth user experience, with potential for customization and scalability across various vehicle models. Key components include Arduino, Fingerprint Sensor, RFID Reader, RFID Tag, GSM module, Relay, Motor, LED, and LCD.

***Key Words*:** Arduino, Fingerprint Sensor, RFID Reader, RFID Tag, GSM module, Relay, Motor, LED, and LCD.

1.INTRODUCTION

The rising incidence of vehicle theft globally highlights the urgent requirement for advanced and effective security measures. Conventional security systems, while somewhat effective, often fall short in deterring determined thieves. Recognizing this challenge, our research aims to revolutionize vehicle security by integrating state-of-the-art biometric and identification technologies. Our proposed system combines the accuracy of fingerprint recognition with the flexibility of Radio-Frequency Identification (RFID) technology to create a robust defense mechanism against theft and unauthorized access. This integrated approach not only enhances vehicle security but also provides a seamless user experience. Central to our system is the use of fingerprint recognition, which offers unparalleled security by uniquely identifying authorized users based on their biometric characteristics. By integrating a fingerprint module into the vehicle's security system, we establish a secure authentication mechanism that effectively prevents unauthorized access. In addition, we incorporate RFID technology to further enhance security. RFID tags carried by authorized users communicate wirelessly with the vehicle's reader, granting or denying access based on predefined permissions. This dual-layered approach improves security while simplifying user authentication processes.

2. LITERATURE SURVEY

[1]. *"Design and Implementation of Vehicle Security System Using Fingerprint Recognition" by S. S. Jadhav et al.(2017) *

The paper introduces a vehicle security system that utilizes fingerprint recognition technology to grant access to authorized users based on their fingerprints, thereby enhancing security against unauthorized entry. It covers the hardware and software components of the system, as well as its implementation and performance evaluation.

[2]. *"Development of Vehicle Security System Using RFID Technology" by S. R. Khot et al. (2018)*This study focuses on the development of a vehicle security system based on RFID technology. The system enables automatic identification of authorized users through RFID tags, thereby enhancing security and preventing unauthorized access to the vehicle. The paper discusses the design methodology, hardware implementation and practical considerations of deploying the system in real-world scenarios.

[3]. *"Integration of Fingerprint and RFID Technology for Vehicle Security System" by S. A. Patil et al.(2019) *

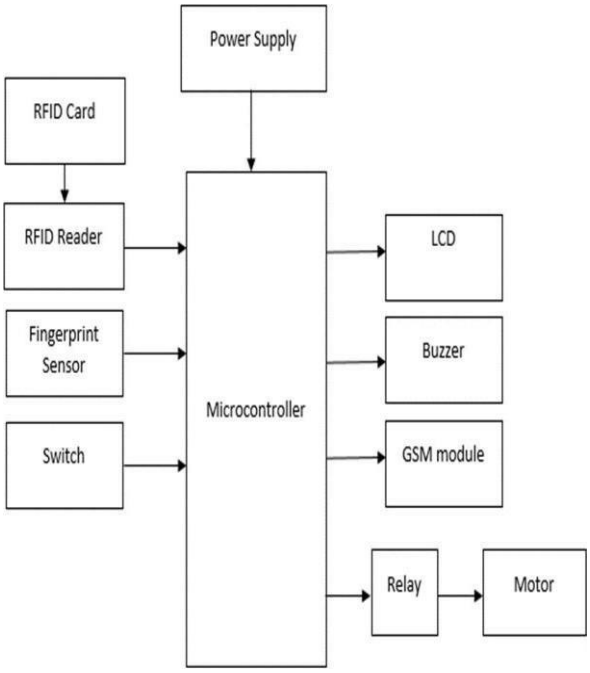
The paper introduces a novel approach to enhancing vehicle security by integrating fingerprint and RFID technologies. Through the combined use of fingerprint recognition and RFID tags, the system offers dual-layer security to authenticate users

and prevent unauthorized access. The study delves into the design principles, hardware architecture, and implementation challenges involved in seamlessly integrating these technologies into an effective security system.

3.PROPOSED METHOD

The proposed vehicle ignition system integrates RFID and fingerprint authentication technologies to establish a robust and secure method for vehicle access. Users must present an authorized RFID tag and provide their fingerprint for biometric verification upon approaching the vehicle. The RFID reader identifies the tag, while the fingerprint sensor captures and analyzes the user's fingerprint data, comparing it with pre-registered records. Successful verification activates a green LED, signaling readiness for ignition. A relay then powers the vehicle's ignition system, indicated by a red LED. Any authentication failure triggers an alarm and keeps the red LED off, thwarting unauthorized ignition attempts. Switches enable fingerprint enrollment, data deletion, and accessibility adjustments, while an LCD displays operational and stored data. This approach enhances security, deters theft, and streamlines user experience by eliminating traditional key mechanisms.

4.BLOCK DIAGRAM



I. Arduino Mega:

The vehicle security system employs the Arduino Mega 2560 as its central control unit, capitalizing on its extensive features such as numerous digital and analog pins, as well as UART capabilities. This microcontroller seamlessly interfaces with essential components including the RFID reader, fingerprint sensor, switches, LEDs, buzzer, relay, and LCD display. Responsible for managing the RFID and fingerprint authentication processes, the Arduino Mega ensures secure vehicle access. Upon successful verification, it initiates the ignition system, indicated by LEDs, while any authentication failure triggers an alarm. Designed for simplicity and user convenience, the system can be easily connected to a power source for effective operation, presenting an advanced and user-friendly approach to vehicle security.

II. Fingerprint Sensor:

The fingerprint sensor module, equipped with a TTL UART interface, facilitates secure biometric authentication within the vehicle security system by enabling users to store fingerprint data and customize matching modes. During enrollment, users record their fingerprint twice, creating a distinct template saved within the module. When verifying access, the live fingerprint is compared against stored templates for validation. Its compatibility with both 3.3V and 5V microcontrollers ensures smooth integration, thereby improving security by accurately identifying authorized users and deterring unauthorized access to the vehicle.

III. RFID:

RFID technology forms the backbone of the vehicle security system, comprising RFID tags and a reader. The RFID reader, equipped with a radio frequency module and antenna, generates an electromagnetic field to interact with passive RFID tags attached to authorized users or objects. These tags contain a microchip for storing information and an antenna for

communication. When a user approaches the vehicle, the reader activates the RFID tag, prompting it to transmit stored information back to the reader through a backscatter. The reader interprets this data and communicates it to the Arduino Mega, which then verifies the user's identity and grants access to the vehicle's ignition system if authorized. This seamless interaction between RFID components enhances security by reliably identifying authorized users without requiring direct line-of-sight, thereby providing a convenient and efficient access control solution.

IV. DC MOTOR:

In this project, the DC motor serves as a key component for demonstrating the functionality of the vehicle security system. Instead of directly controlling a vehicle's ignition the dc motor simulates the vehicle's ignition system. Upon successful authentication of the user through RFID and fingerprint sensors, the Arduino Mega triggers the DC motor, mimicking the activation of the vehicle's ignition. This simulated setup allows for testing and validation of the security system's authentication mechanisms and ensures that the system functions as intended in a controlled environment.

V. RELAY:

The relay in this project serves as a crucial switch that controls the power supply to the DC motor,simulating the ignition system of the vehicle. When the user's identity is successfully authenticated through the RFID and fingerprint sensors, the Arduino Mega activates the relay. This action allows the relay to close its contacts, enabling the flow of electrical current to the DC motor. As a result, the DC motor is powered, initiating the simulated ignition process. Conversely, if the authentication fails or if unauthorized access is detected, the relay remains in its default state, preventing power from reaching the DC motor and thereby securing the vehicle against unauthorized usage or theft.

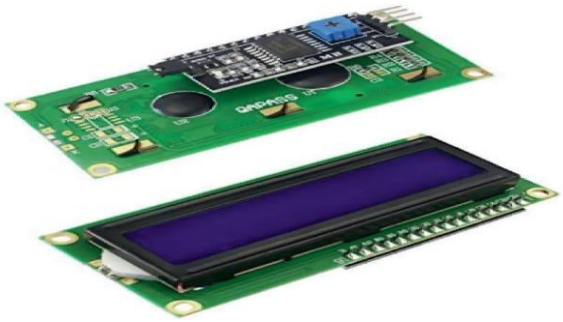
VI. BUZZER:

The buzzer used in this project serves as an audible indicator to alert users in case of authentication failures or unauthorized access attempts. When the RFID and fingerprint authentication processes detect an unauthorized user or a mismatch in the provided credentials, the Arduino Mega triggers the buzzer to sound an alarm.

VII. GSM MODULE:

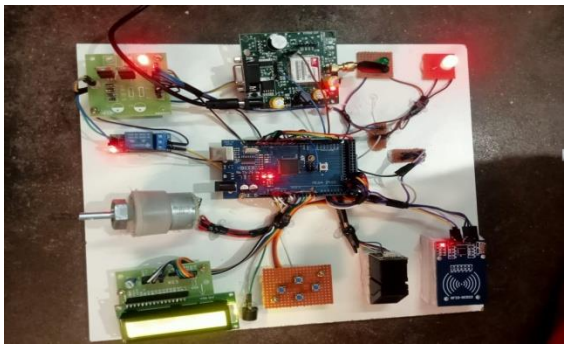
The GSM module serves the specific purpose of enabling remote communication and notifications between the vehicle security system and the owner or authorized users. Upon detecting unauthorized access or authentication failure via the RFID and fingerprint sensors, the Arduino Mega activates the GSM module. Subsequently, the GSM module sends a text message (SMS) alert to the owner's mobile phone, informing them of the security breach or unauthorized access attempt. This instant communication feature empowers the owner to promptly respond, such as by contacting authorities or activating additional security measures remotely. Thus, the GSM module enhances the efficiency of the vehicle security system by providing timely alerts, ensuring proactive action against security incidents.

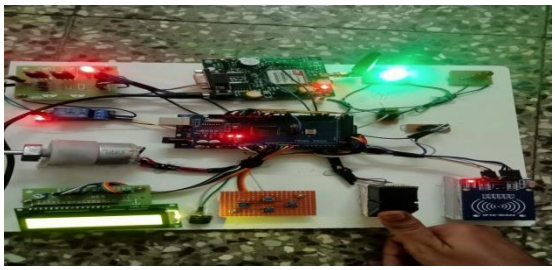
VIII. LCD:



The LCD (Liquid Crystal Display) in this project acts as a vital interface, providing real-time feedbackon the vehicle security system's operation. It displays authentication statuses such as "System Ready," "Access Granted," or "Access Denied," enabling users to monitor and interact with the system effectively. Additionally,the LCD offers valuable diagnostic information during setup and configuration, enhancing user understanding and usability.

5. RESULT





ALERT...!
Driving License not matched to Fingerprint :)

6. CONCLUSIONS

The integration of RFID, fingerprint authentication, GSM communication, a DC motor, relay, buzzer, and LCD displayin this vehicle security system project provides a comprehensive and robust solution for preventing unauthorized access and theft. By combining advanced technologies such as biometric authentication and remote communication, the system ensures heightened security while offering user- friendly features. The RFID and fingerprint sensors enable precise user identification, while the GSM module allows for immediate notification of security breaches to the owner's mobile device. The DC motor and relay simulate the ignition system, ensuring controlled access to the vehicle.The buzzer serves as an audible alert in case of authentication failures, while the LCD display provides real-time feedback on system status. Together, these components create a sophisticated and effective vehicle security system that prioritizes both security and user convenience.

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REFERENCES

[1]. Liu, Y., & Wu, M. (2019). Development of Vehicle Anti-theft System Based on RFID and GSM. 2019 International Conference on Green Energy and Environment Engineering (CGEEE 2019).

[2]. Lu, J., & Lin, Z. (2018). Design of Vehicle Anti-theft System Based on RFID and Fingerprint. 2018 IEEE International Conference on Advanced Manufacturing (ICAM).

[3]. Thakur, A., & Singh, A. (2016). Vehicle Security System Using GSM and RFID. International Journal of Engineering Research & Technology (IJERT).

[4]. Pham, H. T., & Vo, D. N. (2017). Development of a Vehicle Security System Based on RFID and GSM Technology. 2017 IEEE International Conference on Electrical Engineering and Mechatronics (ICEEM).

[5]. Chen, S., & Zhang, L. (2015). Design of Vehicle Security System Based on RFID and GSM. 2015 International Conference on Control, Automation and Information Sciences (ICCAIS).

[6]. Yang, J., & Chen, H. (2019). Design of Vehicle Anti-theft System Based on RFID and Fingerprint Recognition. 2019 IEEE International Conference on Power, Intelligent Computing and Systems (ICPICS).

[7]. Shukla, A., & Mishra, R. (2018). Design and Development of Vehicle Security System using RFID and GSM Technology. 2018 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS).

[8]. Patel, A., & Desai, P. (2017). Vehicle Security System Using RFID and GSM. 2017 International Conference on Computer Communication and Informatics (ICCCI).

[9]. Rathore, S., & Jain, A. (2016). Development of Vehicle Security System using RFID and GSM. 2016 IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT).

[10]. Zhang, Y., & Wang, Y. (2019). Research on Vehicle Security System Based on RFID and GSM Technology. 2019 IEEE International Conference on Mechatronics, Electronic, Industrial and Control Engineering (MEIC).