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SECURING YOUR RIDE: A SMART ANTI-THEFT VEHICLE SYSTEM USING GSM

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Abstract: The escalating cases of vehicle theft pose a significant challenge in today's society, with existing commercially available anti-theft devices often being prohibitively expensive. The increasing prevalence of car theft incidents highlights the need for a more accessible and technologically advanced solution that can address the security concerns of a broader population. Current central locking security systems fall short in providing comprehensive protection against vehicle theft, necessitating the development of a more sophisticated anti-theft system. This paper aims to bridge the gap by proposing an affordable solution that leverages embedded systems based on GSM, GPS and Biometric–Finger print technology. This is an initiative to design and construct a smart anti-theft system that makes use of GPS, GSM a relay switch and a microcontroller system to prevent theft and determine the exact location of the vehicle. A distinctive feature of the system is the implementation of a finger print and password-protected control mechanism.

Kew Words: Vehicle theft, GPS, GSM, Finger print, Embedded Systems.

Introduction: Vehicle theft in public spaces is an escalating challenge. Car theft cases have been on the rise, necessitating a more affordable and effective solution to protect vehicles. The central locking security system for cars, while commonly used, does not provide comprehensive security in the event of theft. A more sophisticated system that leverages an embedded system based on GSM, GPS, and RFID technology provides a solution to vehicle security. The proposed anti-theft system is designed for easy installation in vehicles. By utilizing widely available and affordable technologies like GPS, GSM and Arduino boards, it ensures a cost-effective solution that can be implemented on a broad scale.
GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. The GSM network is divided into three major systems: the switching system (SS), the base station system (BSS), and the operation and support system (OSS).

Literature Review: Wu Aiping, 2007, puts forward an idea of using microcontroller as the core and GPS and GSM interfaced through the serial port in the micro controller. However, the system is loud sound and light which brings the notice of the owner and also shares the location of the car if it has moved. The aim is to find the vehicle where it is and also you can stop that a particular vehicle by sending a message. A key pad and a display is provided inside the vehicle. Using that we can switch on and switch off the vehicle. And also we can track the vehicle using this GSM modem. If the wrong password is entered, then the location of the vehicle is tracked by the GPS module and the message will be send to the owner of the vehicle.

Ms. Padmaja Adgulwar, Prof. Nilesh Chaubey and Prof.Shyam P Dubey, 2007 proposed in their paper that in

current years, automobile theft is growing at a disturbing rate throughout the world. Commercially present anti-theft vehicular systems are too costly.

Wan Lili and Chen Tiejun, 2009 proposed an automotive remote alarm system. GSM module is combined with microcontroller; vibration sensor and speed sensor are used to achieve Short Message Service (SMS) alarm and dual theft-proof of automobile. The short coming of traditional systems including low security and small alarming range can be overcome, thereby reducing the cost of this system. The message is also sent to the owner about the unauthorized usage. Further the fuel injector of the car is deactivated so that the user cannot start the car by any means.

M. A. A. Khedher, 2011, used robust design of secret lock system; a technique used to trap unauthorized user inside the car and only the owner who is equipped with the key to the secret lock system can deactivate the mechanism.

Kompalli Supriya and M.Venkateshwarlu, July 2015, have mentioned that in recent years, vehicle thefts are increasing at an alarming rate around the world. People have started to use the theft control systems installed in their vehicles. The commercially available anti- theft vehicular systems are very expensive. Here, we make a modest attempt to design & develop a simple, low-cost vehicle theft control scheme using an inbuilt microcontroller. This scheme involves a microcontroller & a mobile for the communication purposes.

Methodology: By integrating GPS for real-time location tracking and GSM for seamless communication, the system not only monitors a vehicle's movements but also employs intelligent algorithms to detect potential theft.

Block Diagram:

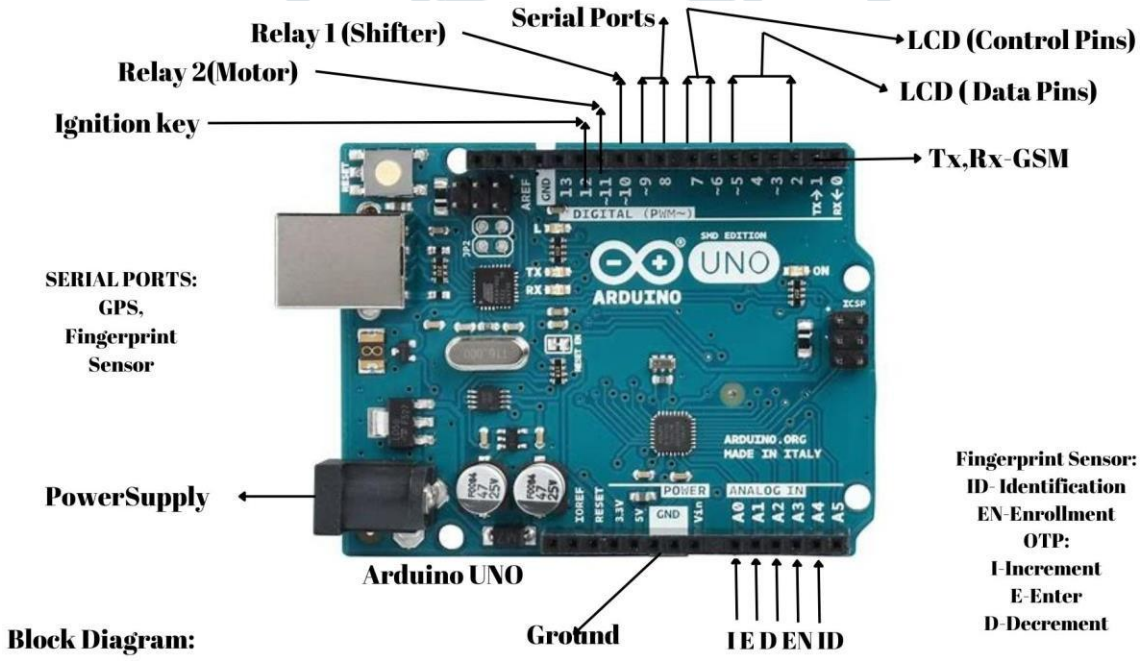


FIG.1

FIG.1 depicts the circuit diagram for the anti-theft vehicle system. At its core is the Arduino UNO, connected to key modules: a fingerprint sensor for authentication, a GPS module for tracking, and a GSM module for communication. A power supply unit provides the necessary voltage, while peripheral elements support proper functioning. Arrows indicate data flow between components, visualizing their interaction within the system.

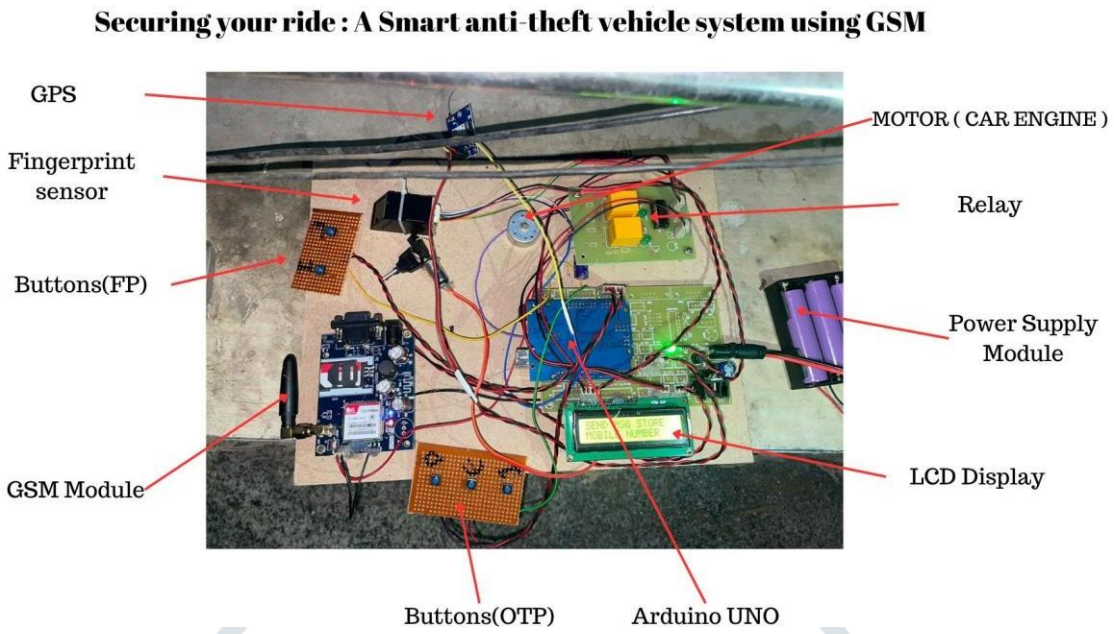


FIG.2

FIG.2 depicts a setup for an anti-theft vehicle system. It includes components such as a GSM module, GPS module, Arduino UNO microcontroller, and a fingerprint sensor. These components likely work together to provide security features such as remote tracking via GPS, GSM-based alerts, and fingerprint authentication for vehicle access.

Hardware components used include Arduino UNO, GPS, GSM, Biometric Fingerprint Scanner – R307P Model, LCD, Motor Driver, Relay, and Power Supply Unit.
Arduino IDE (Software) is used.

Arduino UNO serves as the central processing unit in the proposed anti - theft system, providing the intelligence and control necessary for seamless integration of various security features. This micro controller, based on the UNO Arduino architecture, boasts a powerful 32- bit RISC processor, making it well-suited for real time applications.

The Global Positioning System (GPS) is a fundamental component integrated into the proposed anti-theft system, playing a pivotal role in real-time location tracking. The utilization of GPS technology enhances the system's capabilities, contributing to a comprehensive approach to vehicle security.

The Global System for Mobile Communications (GSM) plays a vital role in the proposed anti- theft system, serving as a communication module that enables seamless interaction between the vehicle security system and the user.

The Liquid Crystal Display (LCD) serves as a crucial user-friendly interface for real-time information display and system interaction.

The Motor Driver is responsible for controlling and securing the physical aspects of the vehicle, such as central locking mechanisms or other security features.

The Power Supply Unit (PSU) provides the necessary electrical power to ensure continuous and reliable operation of the various electronic components.

UNO Arduino, which is seamlessly interfaced with other peripheral devices such as GSM, GPS, and more. This integration ensures a robust and multifaceted approach to safeguarding vehicles against theft. The

system's real-time GPS functionality allows for continuous monitoring of a vehicle's location, enabling swift response in the event of unauthorized movements. The GSM technology ensures seamless communication, providing the owner with instant alerts and facilitating prompt action to prevent theft.

Intelligent algorithms further enhance the system's capabilities, allowing it to detect suspicious activities and potential theft scenarios. By incorporating Fingerprint Sensor, the system can authenticate the vehicle owner's identity, adding an extra layer of security and Password protected OTP System, preventing unauthorized access.

Flowchart:

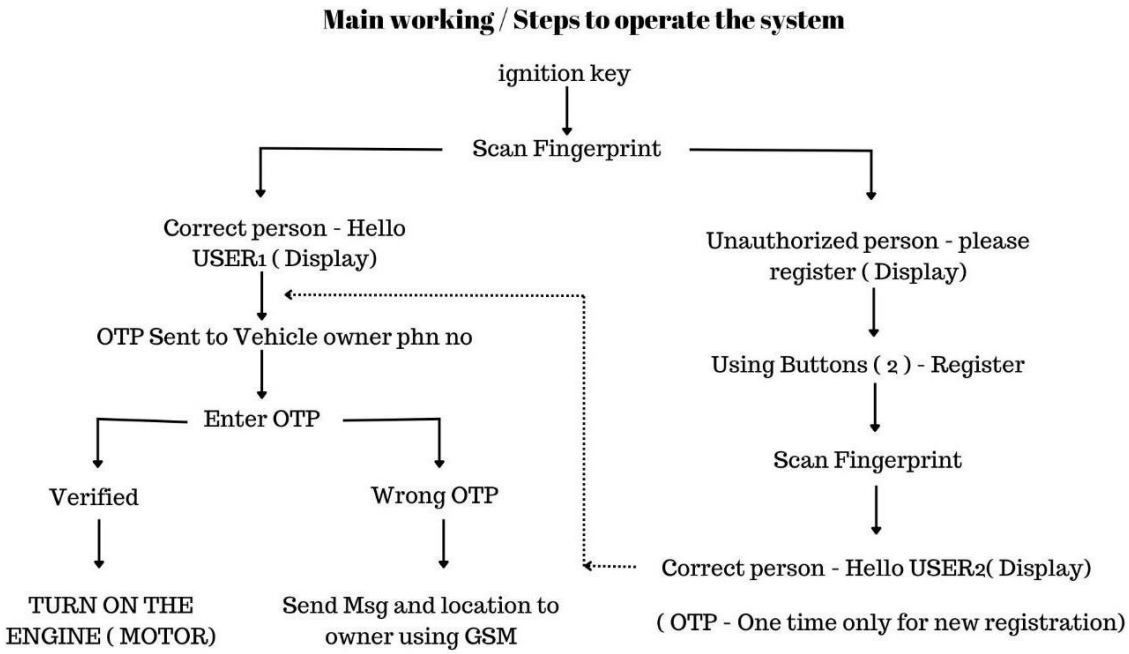


FIG.3

FIG.3 is flowchart which outlines the project's logical sequence concisely. Beginning with system initialization, it proceeds to fingerprint authentication, GPS location acquisition, and GSM communication. It then enters an idle state until a theft event triggers an alert, prompting user interaction. Finally, it concludes. This visual representation guides the project's execution, ensuring a systematic approach from start to finish.

Steps:

- This system architecture uses Arduino UNO at its core which interfaces to other peripheral devices like GSM, GPS, Fingerprint Scanner, and other components.
  The system uses a two-step verification process.

- In the first step, the system will ask to Turn ON the Ignition key. Then it will ask to Store Mobile Number in the System by sending a SMS to the Sim Card on the System, Once the Mobile Number is stored it is displayed on the LCD.

- In the next step, LCD displays and asks to Place Finger and which is interlinked with a microcontroller and GSM modem. When the USER scans the Fingerprint, if it is identified then Correct Match is displayed, if it fails to authenticate the user, it will send a warning message to the user's mobile phone and location is also shared.

- In the next step, to unlock the Engine, the one-time password (OTP) is to be entered using the Buttons, which is sent to the user's registered mobile phone by the system immediately after successful authentication of Fingerprint. As soon as the password is entered the system compares the sent password with the entered password, if the entered password is found to be authentic the system allows for the door to be unlocked.

- If the authentication fails, the location of the vehicle is sent to the registered mobile number. The GSM modem obtains the location of the vehicle through the GPS unit and sends it to the user of the car in case of theft.

Comparison:

Previously Available System: The described vehicle anti-theft system in corporate several key features to enhance security. As the system remains in an active mode through a dedicated switch while the vehicle is parked, unauthorized attempts to start the vehicle trigger a series of actions for theft prevention.

Present Proposed System: The Proposed system builds upon the existing anti- theft features by incorporating additional hardware components and an enhanceduserauthenticationprocess.Thisextendedsystemnotonlyenhances the security of the vehicle through Fingerprint authentication and OTP validation but also provides an additional layer of protection by utilizing the GPS module for location tracking in case of unauthorized access or potential theft. Fingerprint facility enhances authentication and serves as password protection. The reset button offers a user-friendly option to manage the system's state.

Results and Discussion: A distinctive feature of the system is the implementation of a password-protected control mechanism. To restart the vehicle Engine, a respected person must provide authentication through a password. This additional layer of security enhances the overall robustness of the system, making it more resistant to unauthorized manipulation.

FIG.4: Theft Detected-Finger Print Not found

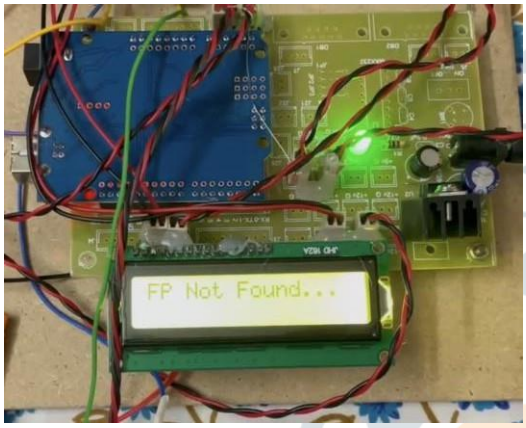
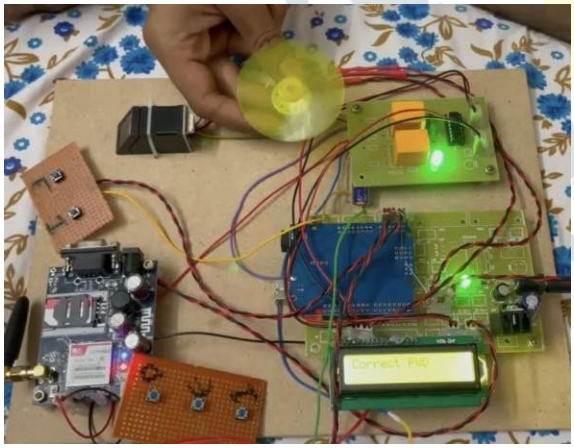


FIG.5: Correct PWD: Motor/Engine turns ON



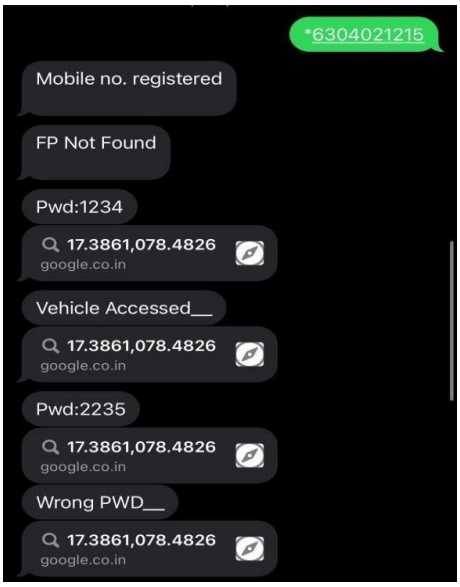


FIG.6

Inputs to the System and location acquired if wrong pwd or wrong Finger placed

In terms of practicality, the system prioritizes security, reliability, and cost efficiency. By utilizing widely available and affordable technologies like GPS, GSM, and Arduino boards, it ensures a cost-effective solution that can be implemented on a broad scale. This Vehicle Tracking and Locking System represent a comprehensive approach to enhancing the security of public vehicles, offering a reliable and economical solution to mitigate the risks of theft.

Conclusion: "Securing Your Ride" offers an affordable, comprehensive, and technologically advanced solution to the growing challenge of vehicle theft. With its integration of GPS, GSM, and Biometric finger print technologies, along with intelligent algorithms, this anti-theft system stands out as an effective and user-friendly option for safeguarding vehicles in today's increasingly security-conscious world.

Future Scope: The integration of face recognition and higher-level biometric authentication into the vehicle security system represents a robust foundation for future advancements in theft prevention. The proposed system can evolve and expand its capabilities to address emerging challenges and incorporate cutting- edge technologies. By considering these future advancements, the proposed vehicle security system can evolve into a comprehensive and adaptive solution, staying ahead of evolving security threats and meeting the increasing demands of vehicle owners for advanced theft prevention measures.

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