

Review Article

Date of Receive- 07<sup>th</sup>-May-2024

Date of Acceptance- 18<sup>th</sup>- may-2024

Date of Publication- 04<sup>th</sup> -June-2024

## Smart Vehicle Security System Using Fingerprint Authentication with Alcohol Detection

*Thanuja M<sup>1\*</sup>, Bharath Kumar<sup>2</sup>, JSumanth Sagar<sup>3</sup>, R Bharath<sup>4</sup>*

*<sup>1,2,3,4</sup>Students, Department of Electronics and Telecommunication Engineering, Visvesvaraya Technological University Regional Centre, Bengaluru, Karnataka, India*

*Author for Correspondence Email- [tanum2192@gmail.com](mailto:tanum2192@gmail.com)*

### Abstract:

An electronic device is installed in a car or fleet of vehicles as part of a vehicle tracking system, which allows the owner or a third party to follow the whereabouts of the vehicle while also gathering data. The technology known as a modern vehicle tracking system (VTS) uses a variety of techniques, including GPS and GSM modules as well as other radio navigation systems that employ satellites and ground-based stations to pinpoint a vehicle's location. Effective, real-time mapping-based vehicle position tracking is provided by GSM and GPS-based systems. The Global Positioning Satellite System provides the system with time and geographic position data. The security system mechanism has two modes: first, the vehicle will be in OFF mode and an alert message will be issued to the registered user if someone tries to turn on the car while the system is functioning. A person with authorization will be verified and granted access in the second mode. The peripheral interface controller, or PIC for short, is the brains of this system. It is in charge of producing the inputs and outputs and overseeing everything. An LCD (Liquid Crystal Display) will show the system's output. Programming and LCD interface design are necessary to achieve a proper LCD display. The user will receive three trials in total, and access will be granted if the scan matches. If the burglar persists after three unsuccessful attempts, an alarm message will be dispatched to the owner's vehicle. When the owner sends an SMS, the system will be turned on. The second alert message may be sent to the local police station in the event of a network issue on the owner position. Programming and LCD interface design are necessary to achieve a proper LCD display. The user will receive

three trials in total, and access will be granted if the scan matches. If the burglar persists after three unsuccessful attempts, an alarm message will be dispatched to the owner's vehicle. The owner's SMS will trigger the system's activation. The second alert message may be sent to the local police station in the event of a network issue on the owner position. An RS232 cable is used to facilitate serial communication. The prototype model and the programs are interfaced with it. Serial communication protocol known as UART (Universal Asynchronous Receiver Transmitter) is used to interface microcontroller with GSM.

**Keywords:** Vehicle tracking system, GPS, ATMEGA, Microcontroller security system, LCD display, UART, alert message RS232.

### ❖ Background/Literature Survey:

- Although a number of car anti-theft technologies have recently been created, the outcome is still unsatisfactory. Three categories comprise domestic and international vehicle anti-theft products based on technology:
- Mechanical locking mechanisms, such as tire locks, hand locks, and wheel locks.
- Alarm system for bikes
- Vehicle monitoring and recovery systems: Pro Scout GPS Vehicle monitoring System, LoJack Tracking System

Vehicle tracking systems such as TravelEyes2 and tracking systems. Radio signals serve as the foundation for the majority of car tracking and recovery systems.

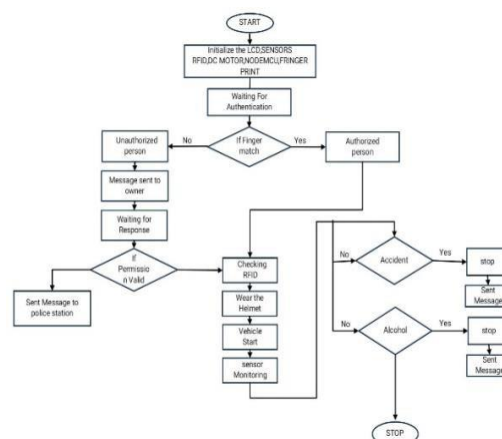
- These days, vehicle security is a major worry because bike thefts are on the rise. Keeping track of a bike's keys is another issue. Here, we propose a solution to this problem: a fingerprint-authenticated bike starting system. This ignition system was made using the Arduino UNO. The biometric technology provides a safe and convenient way to start the bike and ensures that only authorised users can do so. Users are required to upload their fingerprints in order to utilize the system. It makes it possible for several people to register as authorized workers. When in monitoring mode, the system searches for the user's biometrics, and the engine is started through authentication[1].
- When an accident or theft happens, the information related to those occurrences is not recorded, and if the bike is in a distant area, the user cannot access the emergency numbers. That key is the only other way to get into the bike. The creation of a motorcycle that can start itself with a fingerprint is the aim of this project. With this technology, the owner only needs to use his fingerprint to start his motorcycle. Here, the owner may always be aware of the location of the car and need not carry the key. An added caution is that in the event of an accident, the position of the bike will be included in an alarm message sent to five of the owner's acquaintances.

The bike will also sound a theft alert in the event that someone tries to take it. This study suggests an alternative kind of identification: an accident detection system with real-time GPS tracking and bike authentication based on fingerprints[2-4].

- The study recommends a four-module strategy that concentrates on the key risk factors that were previously discussed. The first is a Black Box module, which recognizes possible driving situations and stores the driving conditions at the moment of the accident on an SD card. The second use a smartphone app to provide emergency alerts to a predetermined emergency number and leverages data records to address vehicle health, driver and passenger safety. The automated toll payment system in module three and the tiredness detection system in module four are both based on image processing techniques[5-7].
- TO use biometrics to develop a suitable car security system. The anti-theft fingerprint security system is among the most advanced security systems available. The bike has a fingerprint security system installed, and the owner may track the bike's whereabouts in real time and communicate with it via GSM/GPS modules. The hardware modules are constructed using an Arduino microcontroller UNO, a fingerprint sensor, and a four-channel relay module.
- . This study proposes a revolutionary design to enhance the motorcycles' security system by utilizing fingerprint sensors. The GSM/GPS modem can be used to find the vehicle's current location, and the users' smartphone can control the ignition status of the vehicle[8].
- While they go over the papers, we may see the traffic cops commit a lot of crimes. The crime will be committed by both the people and the police. An extra portable fingerprint sensor module that is connected to the Internet of Things and stores the individual's license information is given to the traffic police in order to address that problem. If the user places their finger on the sensor, the device will display whether or not they have a license. This will be made possible by connecting the bike's data to the IOT[9].

## ❖ Biometric Recognition

The individual identification and biological characteristics of humans are referred to as biometric recognition. Humans are uniquely identified by their biological



## Figure 1. Working Block Diagram

characteristics, including their fingerprint, palm print, hand geometry, face, retina, iris, and voice. Working Block Diagram is shown in Figure 1.

### Fingerprint module:

A device called a fingerprint capture module is linked serially to a communication port. Via the MAX232 IC, any Arduino micro controller can be connected to the R305 biometric thumbprint sensor. This biometric thumbprint scanner is capable of storing and comparing fingerprints in order to get the appropriate result. There are numerous applications for this straightforward biometric thumb print sensor project that uses a microcontroller, including face identification, forensic analysis, criminal investigations, home security, and attendance tracking. The matching algorithm, which compares a person's fingerprint in real time with previously saved templates to determine the exact match between the individual and their identity, powers the entire system[10].

### Enrolling:

The process of authenticating a user's fingerprint is called data enrolling. Two primary functions of a fingerprint sensor are to register fingerprints and conduct searches.

prints left by fingerprints. Allocate IDs to every thumb print user by enrolling thumb prints. It's simple to 'use' the sensor to identify which ID is currently being photographed once you've enrolled each print.

### Verification:

The Fingerprint Sensor module uses the command verification to capture the fingerprint of the user and then uses that information to check if the current identification number is stored in the database [6]. Following the comparison and evaluation of the match occurrences, it generates a comparison value. The comparison value must be greater than the system-assigned threshold value if the bike needs to be ignited. If the comparison value is less than the threshold, the bike module shouldn't be able to ignite.

### Identification:

Identification is the process of determining the current fingerprint's value and allocating it an ID number. Checks our database to see if any matches exist based on that ID number. Should matches be discovered, they will be stored in the host; if not, the device will be returned and will not ignite.

### Working Principle:

The system is supplied with a 9V universal power source. With their unique setups, the LCD display, alcohol sensor, and fingerprint sensor module interfaced with the Arduino Uno board. Each sensor senses its surroundings, and depending on its type, it can provide data to the process. The program determines which value is designated as a threshold based on the data received from the sensor, and the Arduino output is then sent to the bike module. Once the identical fingerprint was placed on the

The bike's fingerprint sensor module will suddenly ignite. We talked about fingerprint-based smart key evaluation and included various case studies in the next sections.

#### Implementation and Results:

The fingerprint sensor must be integrated into the handlebars of the bike or another easily accessible location in order to use it as part of a biometric shield for bikes. Before granting access to specific functions or data, including starting the bike or accessing personalized settings and statistics, the fingerprint sensor would verify the rider's identification. After capturing the rider's fingerprint and comparing it to data that has been stored, the sensor would provide entry if the match is successful. This enhances the usefulness of the bike with an additional degree of security and customization. Robust hardware and software integration would be necessary for the implementation to guarantee precision, dependability, and a smooth user experience. In addition, to protect the user's biometric data, privacy issues need to be taken into consideration. Upper view of model is shown in Figure 2. LCD screen showing "show your card", invalid card" and "valid card" is shown in Figure 3(a), (b) and (c).

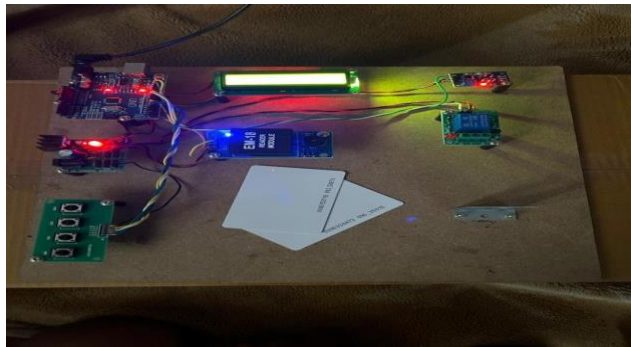


Figure 2. Upper view of model





**Figure 3 (a), (b), (c) : LCD screens**

## ❖ Conclusion:

This research project tracks the position of vehicles and uses fingerprint verification to prevent theft in a quasi-real-time manner at the lowest possible cost. In addition to being a less expensive security check method, fingerprint technology helps prevent car theft. In the future, it will be possible to create applications for smartphones (such as Android and Windows) and interface a specific smartphone that is installed in a car with a fingerprint sensor to obtain real-time vehicle tracking and interactive mapping.

Security is becoming a must for all applications. Enhancing security is the goal of this initiative. Given its ease of use and security features, the fingerprint is a biometric pattern that shows great promise for personal identification. This is an innovative approach to creating a small, affordable car theft deterrent device.

The work showcased here shows the first iteration of an embedded bike that will be available soon. Not only will driving a customized car be more engaging, but it will also be safer. The fingerprint biometric performance analysis was reported in this paper. It seems to have advantages over security based on tokens and passwords. The survey summarized the problems with unimodal biometric systems. Based on convenience, size, privacy, and operating temperature range, it can be determined that automatic fingerprint recognition is the biometric technology that can be utilized for security. By enabling the owner to identify the intruder and take control of the car, the suggested security system can help lower the rising rate of vehicle theft. It can be used with a car, truck, heavy industrial vehicle, yacht, boat, or Arduino vehicle. Other authorization applications requiring robots, border management, ATM banking security, etc. can also dependably use this technology.

## Future works:

1. Enhanced Biometric Sensors: Real-time tracking of many health variables with the integration of more precise and varied biometric sensors.
2. AI Integration: This method makes use of artificial intelligence to evaluate biometric data and offer the rider tailored insights and suggestions.
3. Connectivity: Easy data exchange, navigation, and emergency alarm integration with cellphones and other devices.
4. Safety Features: Including functions such as automated emergency reaction
  5. Energy Harvesting: This technique uses technology to capture movement energy from the rider to power additional bike accessories and the shield.
  6. Customization: Providing alternatives for the shield's appearance, user interface, and operation to accommodate different tastes and requirements.
  7. Healthcare Collaboration: Using biometric data to inform preventative healthcare and early health issue detection in conjunction with healthcare practitioners.
  8. Sustainability: Using eco-friendly materials in the shield's design and making sure it runs on less energy would reduce its negative effects on the environment.

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