



## Electrical and Automation Engineering

Vol: 2(1), 2023

REST Publisher; ISBN: 978-81-956353-5-1

Website: <http://restpublisher.com/book-series/eae/>

DOI: <https://doi.org/10.46632/eae/2/1/16>



## Finger Print Sensing Vehicle Starter

\* S. Jalaja, Aravinth. R, S. Hariharan, E.A. Herrick Linor,

Vel Tech High Tech Dr. Rangarajan Dr. Sakunthala Engineering College, Chennai, Tamil Nadu, India.

\*Corresponding author Email: [jalaja@velhightech.com](mailto:jalaja@velhightech.com)

**Abstract:** *The fingerprint vehicle starter project aims to increase the security of vehicles by using biometric authentication technology. Biometrics system can be used as a good and effective security option. An important and very reliable human identification method is fingerprint identification. Vehicle safety has become a serious problem as the frequency of crime has increased. Vehicle keys are a big concern these days since they are easily forgotten or lost when carried. At start, this technology lets the customer to authenticate by scanning their unique fingerprint. The system uses a fingerprint scanner to identify the authorized user of the vehicle, allowing them to start the engine. This project is designed to prevent car theft and improve user convenience, as drivers will not need to carry keys with them. The system allows multiple users to register as authorized users. When into monitoring mode, the system checks for users to scan. On scanning, the system checks if user is authorized user. The system is implemented using an Arduino microcontroller and a fingerprint sensor module, which communicate with the vehicle's ignition system. The project's success is evaluated based on its accuracy in identifying the authorized user and its reliability in preventing unauthorized access to the vehicle. This project has the potential to significantly improve vehicle security and enhance user experience. This provides safe and worry-free way to begin the engine or automobile. The fingerprint vehicle starter project aims to increase the security of vehicles by using biometric authentication technology. Biometrics system can be used as a good and effective security option. An important and very reliable human identification method is fingerprint Identification.*

### 1. INTRODUCTION

Vehicles have been used in one form or other since the invention of wheel. With the invention of wheel, came in the 2nd most advanced technology, The Steam Engine. With the development of steam engine vehicle took the form of what we see today. In earlier times crank shaft mechanism were used to ignite the vehicle. Leaving that conventional method behind came in the concept of igniting the vehicles using key. And now, Keys are being replaced by Push start buttons. This project was started with the sole purpose of eliminating keys as conventional method of starting the vehicle. With the introduction of Biometrics in the 18th century, security advancement in technology has gone up to various levels. In the 18th century it was used to verify the employees working for the British Empire. Since then Biometrics has taken its toll. Biometrics is formed from the Greek words 'Bio' and 'Metrics' where 'Bio' means 'life' and 'Metrics' means 'to measure'. The four major methods used in Biometrics are: Palm, Fingerprint, Iris, Voice, Face etc. There are many more methods, but these four are the most important. Biometrics is used in Schools, Banks, Colleges, and Universities etc. One of the growing industries is the automotive industry. One of the first companies to introduce finger print recognition in cars was Mercedes, which was then followed by Volkswagen. But now a day's almost all the car makers are implementing Biometric based Security. Fingerprint sensors are quite cheap in comparison to other Biometric sensors. And they are relatively easier to maintain also. The reason for going into biometrics is that its chances of being duplicated are very less. There two Main purpose for this project. First being the eliminating the use of key completely for igniting the vehicle.

Fingerprint recognition technology allows access to only those whose fingerprints that are stored in the memory. Stored fingerprints are retained even in the event of complete power failure or battery drain. This eliminates the need for keeping track of keys or remembering a combination password, or PIN. It can only be opened when an authorized user is present, since there are no keys or combinations to be copied or stolen, or locks that can be picked. The fingerprint based lock therefore provides a wonderful solution to conventionally encountered inconveniences. This report focuses on the use of fingerprints to unlock locks, as opposed to the established method of using keys.

The proposed reliable and robust design of Two Wheeler Vehicle Security System (TWVSS) with features enhancing the security of the vehicle and ensuring the safety of the rider. Fingerprint matching techniques are of two types: graph based and minutiae based. The template size of the biometric information based on minutiae is much smaller and the processing speed is higher than that of graph-based fingerprint matching. In recent years, the automotive industry has witnessed significant advancements in vehicle security systems, aiming to combat the rising concerns of theft and unauthorized access. One emerging technology that has garnered attention is the Fingerprint Vehicle Starter. This innovative system replaces traditional keys or keyless entry systems with fingerprint recognition, offering a secure and personalized approach to vehicle access.

## 2. LITERATURE REVIEW

- **“Fingerprint based lock system**

**Authors name:** Omidiora E. O. et al

**Methodology:** In his paper basically focuses on the replacement of keys with the biometric specially fingerprint based lock systems in the vehicles because fingerprints are the oldest and most widely used form of biometric identification and also provide a robust security mechanism for various security domains. Their prototype consists of fingerprint software module used to store the database of the valid users, a hardware unit for interfacing and the ignition system module to ignite the vehicle. Database of the valid users is stored in the module. Now when a person tries to operate the vehicle then the CPU matches the fingerprint of the person with the stored database if the match result is successful then the vehicle is ignited and otherwise not. External devices (hardware) can be controlled through the PC parallel port. The parallel port is a simple and inexpensive tool for building computer controlled devices and projects. It is often used in computer controlled robots, Atmel/PIC programmers.

- **Fingerprint Security System**

**Authors name:** Karthikeyan.A.

**Methodology:** In his paper focuses on the fingerprint security as every person has unique fingerprint. A keypad is also used to add or delete the valid user in the module. FIM3030 fingerprint module by NITGEN is used in this purpose. Microcontroller AT89C52 is used for controlling the whole driving unit. LCD is used as a displaying unit for showing the information about the authorized and unauthorized user. Decoder DM742S138 is used for data routing and for interfacing with fast memory units as the decoder have short propagation delay. Latch 74HC373 is used which are high-speed Si-gate CMOS devices. A relay is used as a interfacing circuitry between the microcontroller output and the ignition system of the car. The amount of current required to drive the relay is amplified with the help of the transistor. Because of the limitation in the initiation of the spark plug and safety reasons only a prototype is developed whose success only depends on the ignition of the car battery.

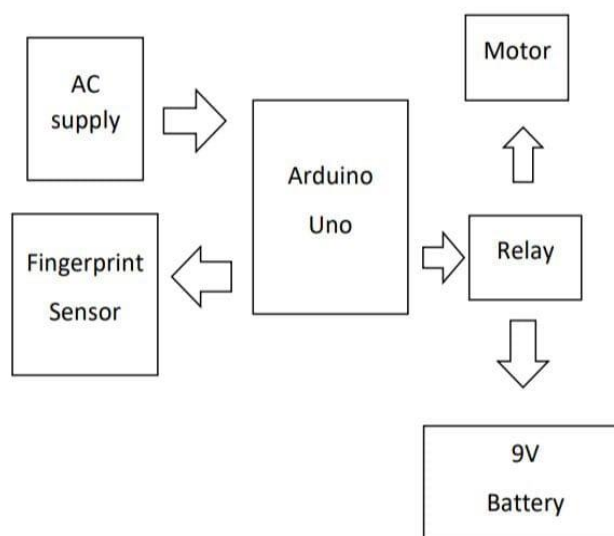
- **Two wheeler vehicle locking system**

**Authors name :** Prashantkumar R

**Methodology:** In his paper provides good and effective ways of securing the two wheeler vehicle with a combination of different types of locking options provided in the vehicle. This project does not use the concept of biometric identification but provide other security options that can be used in tracing out the vehicle if theft happens and also provide the owner of the bike the real time status of the vehicle. An engine immobilizer and alarm unit is used for isolating the fuel from the ignition system. SMS service for controlling and as a alarming device, With the help of the SMS the alert message can be received by the owner about the ignition of the bike and also with the help of SMS service the owner can lock the vehicle completely. RKS (Remote Keyless 13 System) is also used for locking the vehicle from a distance the RKS system in this project uses the SIM number as the master key of the vehicle. Side stand alert is also used in the project

## 3. METHODOLOGY

We realizing a project physically have lots to do with research, choice of component and testing of the components. The project was implemented and tested to ensure proper operation under stated instruction.



**FIGURE 1.** Block Diagram for Vehicle automation

The project was implemented and tested to ensure proper operation under stated instruction. The various modules were tested and satisfactory results were obtained. As the components used fall within the tolerance value of the components, hence an assurance of the proper functioning of the system. It shows that the designed system performs the measured values. The block diagram illustrates the flow of information and control within the Fingerprint Vehicle Starter project. The driver places their finger on the Fingerprint Sensor, which captures their fingerprint data. This data is then transmitted to the Control Unit for processing. The Control Unit compares the captured fingerprint against stored templates to authenticate the driver's identity. If the fingerprint matches an authorized user, the Control Unit sends a signal to the Vehicle Ignition System, enabling the engine to start. 9V Battery Arduino Uno Relay Motor AC supply Fingerprint Sensor 21 It's important to note that the block diagram provides a high-level overview and may not capture all the intricacies and subsystems involved in a real-world implementation of a Fingerprint Vehicle Starter project. However, it outlines the key components and their interactions to give a general understanding of the system's architecture. When enrolling, user needs to enter the finger two times. The system will process the two-time finger images, generate a template of the finger based on processing results and store the template. When matching, user enters the finger through optical sensor and system will generate a template of the finger and compare it with templates of the finger library. For 1:1 matching, system will compare the live finger with specific template designated in the Module; for 1: N matching, or searching, system will search the whole finger library for the matching finger. In both circumstances, system will return the matching result, success or failure. Fingerprint Sensor: The Fingerprint Sensor is the primary input component of the system. It captures the driver's fingerprint data when they place their finger on it. This sensor is strategically positioned within the vehicle, typically near the steering wheel or door handle, for easy access. Control Unit: The Control Unit is responsible for processing and verifying the fingerprint data captured by the sensor. It compares the captured fingerprint against pre-stored fingerprint templates to authenticate the user's identity. The Control Unit may also include additional functionalities, such as data storage and signal processing algorithms. 22 Vehicle Ignition System: The Vehicle Ignition System is the output component of the system, responsible for starting the vehicle's engine. Upon successful fingerprint authentication by the Control Unit, a signal is sent to the Vehicle Ignition System, allowing it to initiate the engine start-up process. This system interfaces with the vehicle's existing ignition system to control the engine's operation. Fig No. 1.2 Circuit connection of fingerprint sensor and Arduino It's important to note that the working mechanism described above is a generalized overview of how a Fingerprint Vehicle Starter typically operates. Actual implementations may vary in terms of the specific Sensors for fingerprint vehicle starter: Here in order to validate the authenticate user we have used the Fingerprint sensor R306 module. It consists of an optical fingerprint sensor and high-speed DSP processor. Also this module consists of the high performance fingerprint alignment algorithm this algorithm helps the module for the simple entry of the fingerprint and its matching. This hardware consists of the high capacity FLASH chips, hardware and software composition, stable performance, image processing and many other functions. Fingerprint scanners are security systems of biometrics. They are used in police stations, security industries, smartphones, and other mobile devices. Fingerprints People have patterns of friction ridges on their fingers; these patterns are called the fingerprints. Fingerprints are uniquely detailed, durable over an individual's lifetime, and difficult to alter. Due to the unique combinations, fingerprints have become an ideal means of identification.



**FIGURE 2.** Working of finger print sensor

#### 4. HARDWARE DESCRIPTION

**ARDUINO UNO:** Arduino Uno is a circuit board which has Arduino Ide. These two together gives the user to embed various codes for achieving their goal. This Arduino Ide uses the embedded C language. Together they are capable of reading analog or 27 digital input signals from different sensors, activating the motor, turning LED on/off and do many other such activities. All these functionalities are performed by sending a set of instructions to the ATmega328 main microcontroller, on the board via Arduino ID.

**RELAY:** Relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof relays are used where it is necessary to control a circuit by an independent low-power signal, or where 33 several circuits must be controlled by one signal. Relays were first used in long distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations. The traditional form of a relay uses an electromagnet to close or open the contacts, but relays using other operating principles have also been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays.



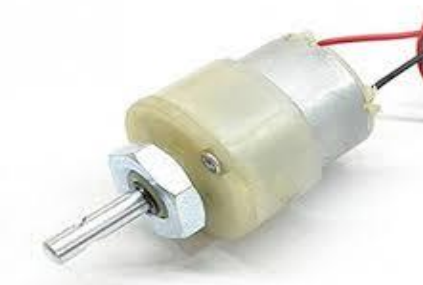
**FIGURE 3.** RELAY

#### Applications:

1. Increased Security: Fingerprint recognition is a highly secure method of authentication. It is nearly impossible to forge or duplicate a fingerprint, which makes it difficult for unauthorized users to gain access to the vehicle.

2. Convenience: With a fingerprint vehicle starter system, drivers no longer need to carry a key with them. They can simply use their fingerprint to start the vehicle, which can save time and eliminate the risk of losing or misplacing a key.

**DC MOTOR:** Resistor DC motors, as the name implies, operate with terminal voltage and current that is “direct”, or substantially constant. While it is possible to produce a “true DC” machine in a form usually called “acyclic”, with geometry, such machines have very low terminal voltage and consequently high terminal current relative to their power rating. Thus all application of DC motors have employed a mechanical switch or commutator to turn the terminal current, which is constant or DC, into alternating current in the armature of the machine. A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current in part of the motor.



**FIGURE 4. DC MOTOR**

## **5. SOFTWARE DESCRIPTION**

- The software used for the project is Arduino IDE
- It can also be used as a text editor with lot of new features
- For writing code and for the compilation for errors, and also for uploading it in the arduino software.
- It is platform software that runs on Windows, Linux, and Mac OS.
- C/C++ programming is supported.
- The software is open-source, allowing users to use it as they wish. They create their own plans and functions
- The Hex record is shipped off the board utilizing a USB link. A microcontroller is incorporated into each Arduino board. The microcontroller gets the hex record and executes the code.

### **Elements of Arduino IDE:**

Arduino IDE comprises of various areas

- Window Bar
- Menu Bar
- Alternate route Buttons
- Word processor
- Yield board

### **Applications:**

- Utilized in versatile route frameworks
- Utilized for family tasks, for example, programmed vacuum-cleaning
- Utilized in risky conditions where a human assault would be destructive.
- Programmed changeovers of road signals.
- Gatecrasher cautions

## 6. RESULT

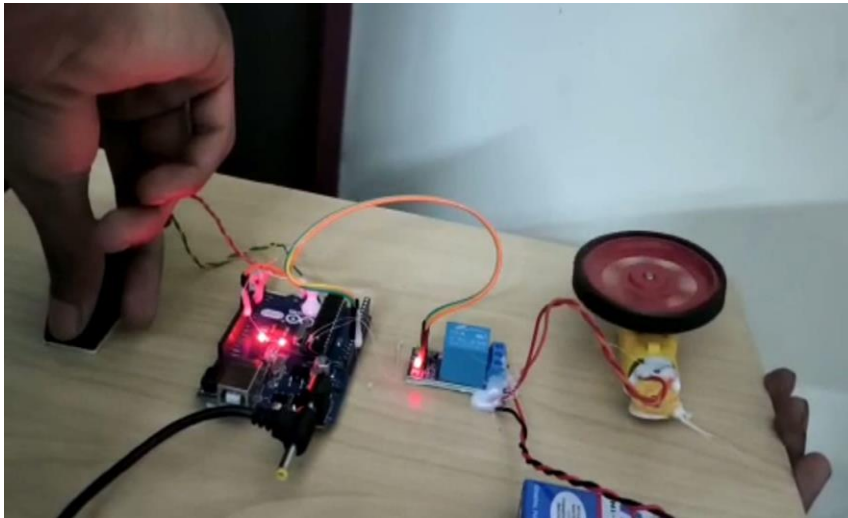


FIGURE 5. Finger Print Vehicle Starter

## 7. CONCLUSION

This vehicle ignition is highly affected in case the registered user finger is defaced or defected or colored, the system won't allow the user to ignite the vehicle. To overcome this limitation we need to add on other features such as it scans the iris or heartbeat of the concerned user and after that it allows permissibility to the user, which would enhance the level of security up to a new apex. Our proposed works deals with the project in 2 modules that consists of an LCD crystal display which shows and display the value and the other one it comprises of fingerprint sensor which takes input from the user side. The results and observation described in the previous section assures the optimal and working results generated by the system. It improves the existing system by reducing the cost of the existing and overcoming the conventional system. As an application of it we can implement the same basic concept in other domains also , which requires more security from thefts such as authorized user entry only, verified users access in unauthorized regions only. Addition of more functionality would make it useful to applied in domains also. The fingerprint vehicle starter system offers a secure and convenient alternative to traditional key-based vehicle access. By leveraging biometric authentication, this system ensures that only authorized individuals can start the vehicle, enhancing overall security. While challenges related to accuracy, integration, and user management may arise, overcoming them can lead to an improved and widely applicable solution. With its potential for future enhancements, the fingerprint vehicle starter system holds great promise in the field of vehicle security and user convenience. Fingerprint-based vehicle starters offer a range of advantages that make them an attractive option for modern vehicle security and convenience. With enhanced security through fingerprint authentication, these systems provide a strong defense.

## REFERENCES

- [1]. Omidiora E. O.(2011) "A Prototype of a Fingerprint Based Ignition Systems in Vehicles" Published in European Journal of Scientific Research ISSN 1450- 216X Vol.62 No.2 (2011), pp. 164-171 © Euro Journals Publishing, Inc. 2011.
- [2]. Karthikeyan.a " Fingerprint Based Ignition System" Published in Karthikeyan.a, Sowndharya.j /International Journal Of Computational Engineering Research / ISSN: 2250–3005
- [3]. Prashantkumar R.(2013) "Two Wheeler Vehicle Security System" Published International Journal of Engineering Sciences & Emerging Technologies, Dec. 2013. ISSN: 2231 – 6604 Volume 6, Issue 3, pp: 324-334 ©IJESET
- [4]. Pandit VR, Joshi KA, Bawane NG. ATM Terminal Security using Fingerprint Recognition. 2013.
- [5]. Pingat S, Rakhecha S, Agrawal R, Mhetre S, Raushan P. Real Time Smart Car Security System by Using Biometrics. International Journal of Innovative Technology and Exploring Engineering (IJITEE). 2013.
- [6]. Sasi A, Nair LR. Vehicle Anti-theft System Based on an Embedded Platform. International Journal of Research in . Mudholkar SS, Shende PM, Sarode MV. Biometrics Authentication Technique for Intrusion Detection

- Systems Using Fingerprint Recognition. International Journal of Computer Science, Engineering and Information Technology (IJCSEIT), 2012; 2(1). 53
- [7]. Omidiora E, Fakolujo O, Arulogun O, Aborisade D. A Prototype of a Fingerprint Based Ignition Systems in Vehicles. European Journal of Scientific Research 2011.
- [8]. Thai R. (2003) "Fingerprint Image Enhancement and Minutiae Extraction", Unpublished B.Sc Thesis, School of Computer Science and Software Engineering, The University of Western Australia, Australia
- [9]. Olufemi Sunday Adeoye "A Survey of Emerging Biometric Technologies" International Journal of Computer Applications (0975 – 8887) Volume 9– No.10, November 2010.
- [10]. PINGAT, S., AGRAWAL, R. MHETRE, S., RAKHECHA, S. 2013. Real Time Smart Car Security System by Using JHU Biometrics. International Journal of Innovative Technology and Exploring Engineering (IJITEE).