

Fingerprint Based Vehicle Starter.

Avadesh Kumar Sharma¹, B, Raghav Sain², Rahul³, Ritika Singh⁴, Saurabh Kumawat⁵.

B.Tech Final Year Students, Department of Electrical Engineering, SKIT, M&G, Jaipur,

¹Assistant Professor, Department of Electrical Engineering, SKIT, M&G, Jaipur

Abstract: Our team has designed and developed an innovative fingerprint-based vehicle starter system that offers enhanced security and convenience to vehicle owners. This system utilizes cutting-edge fingerprint recognition technology to identify authorized users and allow them to start their vehicles, eliminating the need for traditional keys or remote fobs. By incorporating a fingerprint scanner, microcontroller, and relay module to control the vehicle's ignition system, this system provides a secure and reliable alternative to traditional keys, reducing the risk of theft and unauthorized access. The system's software has been carefully crafted to prevent tampering or hacking attempts, ensuring maximum security for the vehicle. Our fingerprint-based starter system is a game-changer for vehicle security and convenience, providing drivers with increased peace of mind and ease of use.

there is no need to keep track of physical keys or remember complex passwords or PINs. The use of a fingerprint-based lock offers an excellent solution to the typical inconveniences associated with traditional security methods. Biometric systems come in various types, including face recognition, voice recognition, fingerprint recognition, and eye recognition. Among these methods, fingerprint recognition is the most widely used due to the unique nature of each individual's fingerprint, providing high levels of reliability compared to other conventional methods. Implementing fingerprint biometrics is also relatively simple, with identification and authentication being the two critical components of such systems.

2. BLOCK DIAGRAM-

1.INTRODUCTION-

Fingerprint recognition technology provides secure access only to individuals whose fingerprints have been previously stored in the system's memory [1]. This ensures that authorized users can access the system even in the event of a complete power failure or battery drain. Unlike traditional key or combination-based security systems,

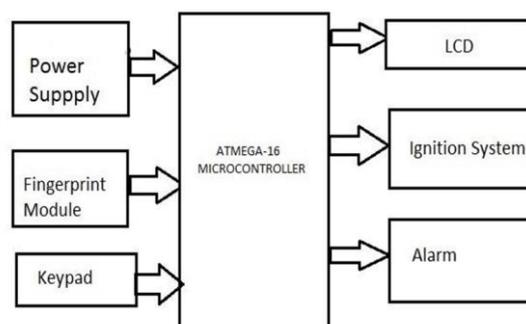


Figure 1 – Block diagram of fingerprint based vehicle starter

2. FINGERPRINT SENSOR-

A fingerprint sensor is an electronic device that is specifically designed to capture a digital image of an individual's fingerprint pattern [1]. This image is commonly referred to as a live scan, which is then processed digitally to create a biometric template that is stored and used for future matching purposes. Optical fingerprint imaging is a commonly used technique that involves capturing a digital image of the fingerprint pattern using visible light.

This type of sensor can be thought of as a specialized camera, with the top layer known as the touch surface, where the individual places their finger. Beneath this layer is a phosphor layer that emits light, which illuminates the surface of the finger, allowing the sensor to capture a clear and accurate image of the individual's unique fingerprint pattern.

The fingerprint sensor works by reflecting light from the finger through the phosphor layer and onto an array of solid-state pixels, which then captures a visual image of the fingerprint. However, a scratched or dirty touch surface can negatively impact the quality of the fingerprint image. One of the main disadvantages of this type of sensor is its sensitivity to the condition of the skin on the finger being scanned. For example, a dirty or marked finger can make it difficult to obtain a clear and accurate image of the fingerprint, leading to potential errors in the matching process.

3. GSM MODULE-

The GSM Module is a versatile device that can be utilized for making calls,

sending text messages, and even sending emails when an internet-based SIM card is in use. With a dual-band 900/1800 MHz GSM modem, this module requires a 4 V DC regulated power supply controlled by the microcontroller. One of the benefits of this module is that it is a plug-and-play device, eliminating the need for any drivers to be installed. Its primary purpose is to send a message to a registered mobile number when someone attempts to access a vehicle illegally. This serves as an added layer of security, ensuring that the owner is promptly alerted in case of any unauthorized access attempts.

4. ATmega328 Controller-

The ATmega328 Controller is a microchip-based open-source controller board that was created by Arduino.cc. The board is designed to provide users with digital and analog input/output (I/O) pins, which can be connected to a variety of expansion boards (shields) and circuits. The board has 14 digital pins, 6 analog pins, and can be programmed using the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by either a USB cable or an external 9-volt battery, with a voltage range of 7 to 20 volts. The ATmega328 Controller is similar to other Arduino boards, such as the Nano and Leonardo, and is a versatile tool for developing a wide range of projects.

5.LCD-

Liquid crystal displays (LCDs) implemented perusing [5] are a type of display technology that utilizes materials with properties of both liquids and crystals. Unlike typical solids, LCD materials have a temperature range where molecules are almost as mobile as they would be in a liquid, but are arranged in an ordered form similar to a crystal. LCDs are composed of two glass panels with a layer of liquid crystal

material sandwiched between them. Transparent electrodes are coated on the inner surface of the glass plates, defining the characters, symbols, or patterns to be displayed. Polymeric layers are located between the electrodes and the liquid crystal, ensuring that the liquid crystal molecules maintain a defined orientation angle. Used [2] for the implementation

6.Arduino IDE-

To automate the system with a BT module and Arduino, we need to program the Arduino board from [4] using the Arduino IDE (Integrated Development Environment).

Arduino is a widely used open-source platform for developing electronic projects. It includes a physical programmable circuit board and software that runs on a computer to write and upload code to the board.

6.1.System Design-

- **Fingerprint Scanner:** The fingerprint scanner is responsible for capturing the user's fingerprint and converting it into a digital format that can be processed by the microcontroller.
- **Microcontroller:** Microcontroller processes data received from the fingerprint scanner and compares it with data stored in the database to authenticate the user.
- **Database:** The database stores the biometric data of authorized users that are used for comparison during the authentication process.

6.2.Working-

A fingerprint-based vehicle starter system is an access control system that

uses biometric fingerprint authentication to provide secure access to vehicles. The system works by verifying the user's identity through their fingerprint before allowing them to start the vehicle's engine. Here is how the system works:

- **Enrollment:** To use the fingerprint-based vehicle starter system, the user must first enroll their fingerprint. The fingerprint is captured by a high-quality fingerprint scanner and stored securely in the system's database.
- **Authentication:** When the user wants to start the vehicle, they place their finger on the fingerprint scanner. The scanner captures an image of the user's fingerprint and compares it with the fingerprint data stored in the system's database. If the fingerprint matches the data in the database, the system authenticates the user and allows them to start the engine.
- **Ignition Control:** Once the user is authenticated, the system sends a signal to the vehicle's ignition control system to start the engine. The ignition control system then activates the engine, and the user can operate the vehicle as normal.
- **Security:** The fingerprint-based vehicle starter system provides a high level of security for the vehicle. The system ensures that only authorized users can operate the vehicle, preventing theft and unauthorized use.

7.APPLICATIONS-

- **Personal Vehicles:** The system can be used in personal vehicles to prevent theft and unauthorized use. Only authorized individuals with registered fingerprints can start the vehicle, ensuring that the vehicle is secure at all times.

- **Commercial Fleets:** The system can be used in commercial fleets to monitor the usage of the vehicles. Only authorized drivers with registered fingerprints can start the vehicle, enabling fleet managers to keep track of the vehicle's usage and ensure that the vehicles are not being misused.
- **Car Rental Companies:** The system can be used by car rental companies to provide a more secure and convenient rental experience.
- **Public Transportation:** The system can be used in public transportation systems, such as buses or trains, to prevent unauthorized access to the vehicles. Only authorized personnel with registered fingerprints can start the vehicles, ensuring the safety of passengers and preventing theft.
- **Military Vehicles:** The system can be used in military vehicles to prevent unauthorized access and theft. Only authorized personnel with registered fingerprints can start the vehicles, ensuring that the vehicles are secure at all times.
- **Enhanced Security:** The system provides a high level of security by using biometric authentication to ensure that only authorized individuals can start the vehicle. This prevents theft and unauthorized use of the vehicle, providing peace of mind for vehicle owners.
- **Convenience:** The system is convenient to use, as the user only needs to place their finger on the scanner to start the engine. This eliminates the need for keys or other access control devices, making it easier to operate the vehicle.
- **Improved Efficiency:** The system can improve the efficiency of vehicle usage by enabling fleet managers to monitor the usage of the vehicles. This can help identify inefficient use of vehicles and optimize fleet management practices.
- **Cost-Effective:** The system can be cost-effective in the long run, as it eliminates the need for keys or other access control devices that can be lost, stolen, or damaged. This reduces the need for replacements and can save money in the long run.
- **Easy Enrollment:** The system is easy to enroll in, as the user only needs to provide their fingerprint. This process is quick and simple, reducing the time and effort required for enrollment.
- **Durability:** The fingerprint scanner is durable and can withstand harsh environments, ensuring that the system remains functional in extreme conditions.

7.ADVANTAGES-

The fingerprint-based vehicle starter system provides numerous advantages over traditional vehicle starter systems, including:

Overall, the fingerprint-based vehicle starter system provides numerous

