FINGERPRINT VEHICLE STARTER USING ARDUINO

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ABSTRACT

Due to the rising number of vehicle thefts, vehicle security is a pressing concern in today's society. Handling keys in automobiles is another issue. Keys must be carried, and losing or misplacing them will be a serious problem. Using a fingerprint-authenticated vehicle starter system, this issue can be resolved. The system makes it easy and secure to start or stop the engine of a vehicle. To start the vehicle, the user only needs to scan their finger, no key is required. Only authorized users are permitted to start the vehicle by the system. By scanning their fingerprints, users can first sign up for the system. Multiple users can sign up to be authorized by the system. When the system enters monitoring mode, it checks the authenticity of the users. The system checks the user's authorization before starting the vehicle for only authorized users during scanning. Here Arduino microcontroller is made use of. The microcontroller is connected to the fingerprint sensor, push buttons, a motor driver, a starter motor and LCD display are used. The motor serves as the vehicle's starter in the demonstration. Using a fingerprint-based system, this system automates vehicle security in addition to doing so.

Keywords: Arduino microcontroller, Automobiles

1. INTRODUCTION

In the contemporary world, automobiles are a big part of daily life. It is fundamentally necessary for every family. The history of automobile started with the invention of wheel and has been advancing ever since. The automobile we know today evolved as a result of the development of the steam engine. In the past, vehicles were ignited by crank shaft mechanisms.

Leaving that regular technique behind came in the idea of lighting the vehicles utilizing key. Push start buttons are taking the place of keys right now. The primary objective here is to eliminate the traditional use of keys for vehicle start-up. Since the introduction of biometrics in the 18th century, technological advancements in security have reached new heights. The Greek words "Bio" and "Metrics," where "Bio" means "life," and "Metrics" means "to measure," are what give rise to the field of biometrics. The four significant techniques utilized in Biometrics are: Voice, face, palm, iris. There are numerous additional approaches, but these four are the most significant.

Nowadays, there is a lot of emphasis placed on vehicle security because of the rise in vehicle thefts. Handling the keys to the automobiles is another problem. Keys must be carried, and losing or misplacing them will be a severe problem. This issue has a remedy that involves a fingerprint-authenticated vehicle starter system. Biometric-based security, is now being used by almost all automobile manufacturers. In comparison to other biometric sensors, fingerprint sensors are relatively inexpensive. Additionally, they are somewhat simpler to maintain. The justification behind going into biometrics is that its possibilities being copied are extremely less. The technology offers a convenient and safe way to start and stop a vehicle's engine. The owner doesn't need a key to start the vehicle; instead, they just have to scan their finger. The automobile can only be started by people who are authorised by the system. Owners can sign up for the system by scanning their fingerprints. Multiple people can register as authorised users on the system. When in monitoring mode, the system searches for users to scan. Utilising an Atmega 32 microcontroller, the system uses scanning to determine whether the user is an authorised user and only allows them to start the vehicle. The starter motor, push buttons, LCD display, Arduino micro-controller, and all other components are linked to the fingerprint sensor. The motor is used to show how to start a vehicle. This system automates access control and vehicle security using a fingerprint-based mechanism.

The second goal is to lower the price of this technology, which in the present day is available only from premium manufacturers. This is compatible with any two-wheel drive vehicle. Here simplification has been done keeping in view four-wheelers.

Amit Saxena,[1] As fingerprints are the oldest and most popular type of biometric identity and also provide a strong security mechanism for different security domains, the article primarily focuses on the replacement of keys with biometric lock systems, particularly fingerprint-based lock systems in the automobiles.

Prashant Kumar R,[2] Since each person has a distinct fingerprint, the study focuses on fingerprint security. Additionally, eligible users in the module can be added or removed using a keypad.
2. BLOCK DIAGRAM

![Block Diagram Image]

3. COMPONENTS

**Regulated power supply:**
An embedded circuit known as a regulated power supply transforms unregulated AC into a consistent DC. It transforms the AC supply into DC with the aid of a rectifier. Its job is to provide a circuit or device that must work within specific power supply parameters with a stable voltage (or, less frequently, current). The output of the regulated power supply is almost always DC but may also be alternating or unidirectional.

**Arduino UNO:**
A serial communicator is necessary in order to programme the ATmega328P microcontroller. The most common interface between a microcontroller and a computer is serial communication. One of the most used serial interfaces is UART. A piece of computer hardware called a Universal Asynchronous Receiver/Transmitter (UART) converts data between parallel and serial formats. Traditionally, the majority of serial interfaces between microcontrollers and computers use serial port (DB9). However, a level shifter is required between these interfaces because the microcontroller used TTL UART and the computer serial connection used the RS232 protocol. The market offers a variety of level shifters, some of which feature USB plug and play. Most of the times the level shifter is unstable to use due to its design and more than one software is required to convert the programming on C to hex or machine language and maybe another software to interface between the Microcontroller and computer.

**Arduino UNO** is an alternative to this solution; the internal board of Arduino consists of all the necessary ICs for communication. It is also built compact into a PCB which has connectors for fast and easy prototyping.

**R305 Fingerprint module:**
High-precision, high-performance matching algorithms and a high-capacity flash chip make up the R305 biometric fingerprint module. It operates by processing fingerprint image data, matching data, searching data in memory, and carrying out specified functions. The R305 communicates with the microcontroller through serial communication. It has a TTL UART interface and is a fingerprint sensor module. When recognizing a person, the user can configure the module in 1:1 or 1: N mode and save the fingerprint data there. A 3V3 or 5V microcontroller can directly connect with the fingerprint module. For PC interface, a level converter (like MAX232) is needed.

**16*2 LCD display:**
The LCD is a type of electronic display that shows information and messages. The 16×2 LCD, as its name implies, has 16 Columns and 2 Rows, allowing it to display 32 characters (16×2=32), each of which is made up of 5×8 (40) Pixel Dots. The total number of pixels in this LCD can therefore be computed as 32 x 40, or 1280 pixels. The majority of 16X2 displays rely on multi-segment LEDs. There are many alternative display kinds and configurations on the market, including 8x2, 8x1, 16x1, and 10x2. However, the LCD 16×2 is widely utilized in gadgets, DIY circuits, and electronic projects due to its lower cost, programmability, and ease of access.

**Neo-6mv2 GPS module:**
For navigation, utilize the NEO-6MV2 GPS (Global Positioning System) module. The module only verifies its position on the planet and outputs data, including its longitude and latitude. It belongs to a group of standalone GPS receivers powered by the powerful u-blox 6 positioning engines. These adaptable and reasonably priced receivers come in a small (16 x 12.2 x 2.4 mm) design and provide a wide range of connectivity choices. NEO-6 modules are perfect for battery-operated mobile devices with very severe budget and space restrictions thanks to their tiny architecture, power, and memory options. Even in the most difficult environments, the NEO-6MV2 performs excellently because to its innovative design.

**Wemos d1 mini-IOT module:**
A low-profile, affordable ESP8266-based Wi-Fi board called the WeMos D1 Mini is just as potent as any NodeMCU- or ESP8266-based microcontroller. Because it is affordable, WiFi-capable, and completely compatible with the Arduino platform, the D1 Mini is highly versatile. To make the D1 Mini function like an Arduino board, the ESP8266 library and board manager will be introduced in this tutorial. Then, a straightforward web page will be introduced with the goal of utilizing the
module's WIFI capabilities. Any WIFI-connected device will be able to communicate with the board and wirelessly control its pins thanks to the D1 Mini’s role as a web server.

4. WORKING

The first step here is enrolment of fingerprints to create a database of authorized users. To enrol the fingerprints 4 pushbuttons are used. Even to delete the fingerprints those 4 pushbuttons can be used. For enrolling the fingerprint, the system asks to place the finger on the sensor for two times and then we get a LCD display showing stored. After storing the fingerprints in few locations start button will be pressed. Then the system asks the user to place the finger on the sensor. Now the sensor verifies whether placed finger is authorized or not. Once the finger is verified as authorized the motor gets started. If the finger does not get matched with the stored fingerprints, then motor will not get started instead we get an alert message to the telegram chat box which is created using Bot Father application in telegram. Here, Wi-Fi module is used to get the messages to the chat box.

By using GPS module, the exact location of the automobile can be tracked by giving a command as “/track” in the telegram chat box. As this is a prototype, the DC motor is used indicating as an engine. This system not only used in two-wheeler vehicles, and also used in automobiles, financial, banking and military etc.

5. FLOW CHART

A fingerprint sensor module is utilised in this system to authenticate a real person by reading their finger input. Here 4 push buttons are used to register new fingerprint or delete stored fingerprint or match stored fingerprint. For this purpose, an input unit consisting of the four push buttons is used. In this project, the very first step is to capture the fingerprint by using fingerprint scanner. After capturing the fingerprint image, the fingerprint template will be extracted and generate unique id per user.

During the enrolment procedure, a user needs to enter the finger two times. The system will examine the fingerprints, create a finger template based on the analysis, and save the template. For 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. In order to match a real finger 1:1, the system will compare it to a specific template specified in the module; in order to match a finger 1:1 or search for a matching finger 1:1, the system will search the entire library of finger images. The system will return the appropriate outcome in any case, success or failure.

The motorcycle will be ignited only when the authorized person scans his/her finger on the fingerprint module. The fingerprint of the authorized persons is stored in the fingerprint module. Anytime a person places a finger on the fingerprint module, the data from that finger is compared to the data already stored in the module. If the fingerprint data is found in the module, then the microcontroller ignites the bike otherwise bike will not start. If the fingerprint data is found in the module, then an alert message is sent to the telegram chat box that created using BOT FATHER.
6. RESULTS

Figure 3 LCD displaying “Press START key”

Figure 3 illustrates the system when turned on, “PRESS STRAT KEY TO VERIFY FINGER” is displayed on the LCD.

Figure 4 LCD displaying “Fingerprint STORED”

In figure 4, enrollment of fingerprints is done using pushbuttons and the system asks to place the finger on the sensor for two times. Once the fingerprint is stored in the particular location the LCD displays “stored”.

Figure 5 LCD displaying “Put your finger”

Figure 5 illustrates, once the system is turned on, it asks to place the finger on the sensor so that it verifies the placed finger is authorized or not.

Figure 6 LCD displaying “Fingerprint matched”

Figure 6 depicts f the finger is matched, LCD displays “Finger Matched” otherwise it displays “Finger Not Matched.”

Figure 7 LCD displaying “Motor ON”
Once the fingerprint is verified as authorized, the Motor gets started and “VEHICLE STARTED MOTOR ON” will be displayed on the LCD.

![Figure 8 LCD displaying “Motor OFF”](image)

If the fingerprint is verified as non-authorized, then motor does not get started and “INVALID FINGER MOTOR OFF” will be displayed on the LCD.

![Figure 9 Alert Message](image)

If the fingerprint is verified as non-authorized, an alert message is sent to the telegram chat box that was created using BOT FATHER in our mobile phones.
If automobile needs to be tracked then, a command called "/track" is typed in the chart box of telegram so that exact location of the automobile is sent using a link.

7. CONCLUSION

The module is made to concentrate on the engine starting process using a fingerprint. This type was created in order to improve the cars' level of security and their resistance to common threats. The user touches the fingerprint sensor and it authenticates the user, if the user is authorized then it automatically starts to engine. The wires are attached so that the sensor can start the engine when it is directly connected to it. The main reason for using this is low in cost and the fingerprint which is used it cannot be matched of any to people.

As a result, the implementation of this system on automobiles results in the achievement of our automobile security system in a form that is inexpensive and readily available. An LED is used to display the output. Compared to traditional methods of personal identification, biometric recognition systems offer convenience and security.

REFERENCES