

Biometric Security System in Vehicle Start

Puja Kumari^{1*}
puja.hit01@gmail.com

Tilak Mukherjee²
mukherjeetilak@gmail.com

Kushal Roy³
kushalroy1979@gmail.com

¹B. Tech Undergraduate Student, Department of Electronics and Communication Engineering
Haldia Institute of Technology, Haldia, West Bengal

^{2,3} Assistant Professor, Department of Electronics and Communication Engineering, Haldia Institute of
Technology, Haldia, West Bengal and Research Scholar, Department of Electronics and Communication
Engineering, Brainware University, Barasat, Kolkata, West Bengal

*Corresponding Author

Abstract

This project paper aims at designing a Biometric Security System to start vehicles. For owner identification, a fingerprint recognition-based identification system is used. Fingerprints are considered to be the efficient method for biometric identification. They possess security, unique for every person and do not change in one's lifetime. Fingerprint recognition is a mature field of interest today, but still identifying individuals from a set of enrolled fingerprints is a time-consuming process. Improvement in the fingerprint identification system for implementation on large databases e.g. of large numbers of vehicles etc. is a challenging part of modern technology. The issue of vehicle hijacking or car theft due to easy access to vehicle's functional system can be considerably reduced using a biometric system. The starting of a vehicle's engine involving the necessity of protection and access restriction in many luxurious assets is very important. Biometric systems have served as a strong security system in many different applications including the automobile sector. It relies on specific data about unique biological traits in order to work effectively. This technical system involves running data through algorithms for a particular result, usually related to a positive identification of a user or other individuals. The signals are generated by the Arduino to the appropriate module circuit. This system was implemented in ARDUINO UNO, LCD SCREEN, ONE CHANNEL RELAY MODULE, R305 FINGERPRINT SENSOR and analysis of our one-to-many identifications.

Keywords: Fingerprint Sensor(R305), Relay module, Biometric Security System, Vehicle, Arduino, LCD, Push Buttons.

1. Introduction

Biometric Identification Systems are widely used for unique identification of humans mainly for verification and identification. Biometrics is used as a form of identity access management and access control. So, use of Biometric to start a bike system is a secure approach. There are many types of biometric systems like fingerprint recognition, face recognition, voice recognition, iris recognition, palm recognition etc. In this project, we have used a fingerprint recognition system. A Biometric device is a security identification and authentication device. Such devices use automated methods of verifying or recognizing the identity of a living person based on a physiological or behavioral characteristic. These characteristics include fingerprints, facial images, Iris prints and voice recognition [1,2].

2. Fingerprint Module (R305)

A fingerprint is the pattern of ridges and valleys on the surface of a fingertip. The endpoints and crossing points of ridges are called minutiae. It is a widely accepted assumption that the minutiae pattern of each finger is unique and does not change during one's life.



Figure 1: R305 Fingerprint Module

3. Arduino UNO and Relay Module

Arduino UNO is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists of other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, a Power barrel jack, an ICSP header and a reset button.



Figure 2: Arduino UNO

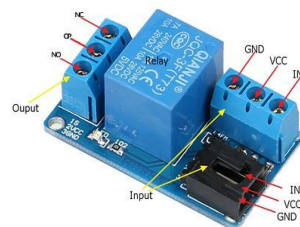


Figure 3: One Channel-Relay Module

A relay is an electrically operated device. It has a control system and (also called input circuit or input contactor) and controlled system (also called output circuit or output contactor).

4. LCD

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals in a digital clock.

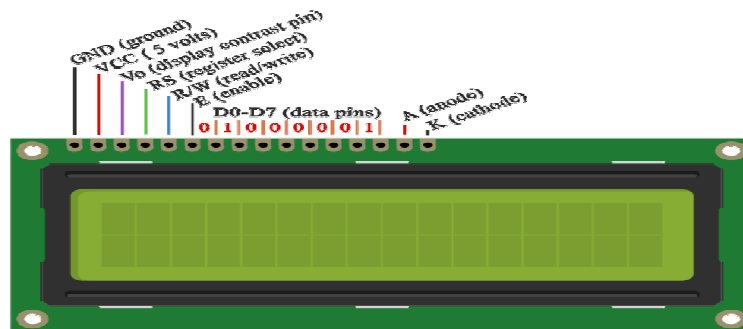


Figure 4: 16*2 LCD Screen

5. Vehicle System working

In this fingerprint Security system circuit, we have used the Fingerprint Sensor module to authenticate a true person or employee by taking their finger input in the system. Here we are using 5 push buttons to ENROLL, DEL, UP & Down. The MATCH key has triple features. ENROLL key is used for enrollment of a new person into the system. So, when the user wants to enroll a new finger then he/she needs to press the ENROLL key then LCD asks for the ID, where the user wants to be stored the fingerprint image. Now if at this time the user does not want to proceed further then he/she can press the ENROLL key again to go back. This time ENROLL key behave as Back key, i.e. ENROLL key has both enrollment and back function. Besides, the enroll key is also used to download attendance data over the serial monitor. Similarly, DEL/OK key also has the same double function as when a user enrolls a new finger, then he/she needs to select the finger ID by using another two keys namely UP and DOWN. Now the user needs to press DEL/OK key (this time this key behaves like OK) to proceed with the selected ID. And DEL key is used for reset or delete data from EEPROM of Arduino and so MATCH key is used when a user wants to start the vehicle with his/her already stored fingerprint so in that case MATCH Key is used to start the vehicle with the previous stored fingerprint sensor.

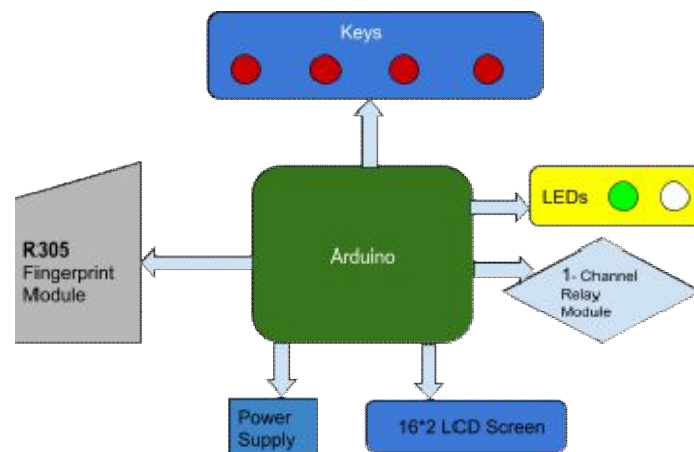


Figure 5: Block Diagram

Working on this fingerprint-based vehicle security system project is fairly simple. First of all, the user needs to enroll fingerprints of the user with the help of push buttons. To do this, the user needs to press

the ENROLL key and then the LCD asks for an ID for the fingerprint to save it in memory by ID name. So now the user needs to enter an ID by using UP/DOWN keys. After selecting the ID, the user needs to press the OK key (DEL key). Now LCD will ask to place a finger over the fingerprint module. Now the user needs to place his finger over the fingerprint module and then the module takes a finger image. Now the LCD will say to remove finger from fingerprint module, and again ask to place finger again. Now the user needs to put his finger again and the module takes an image and converts it into templates and stores it by the selected ID into the fingerprint module's memory. Now the user will be registered and he/she can feed attendance by putting their finger over the fingerprint module. By the same method, all the users will be registered into the system.

Now if the user wants to remove or delete any of the stored ID or fingerprint, then he/she needs to press the DEL key. Once the delete key is pressed LCD will ask to select the ID that needs to be deleted. Now the user needs to select ID and press OK key (same DEL key). Now LCD will let you know that the fingerprint has been deleted successfully [1-3].

6. Working in Security System Project

Whenever the user places his finger over the fingerprint module then the fingerprint module captures the finger image, and searches if any ID is associated with this fingerprint in the system. If fingerprint ID is detected then LCD will show Start bike and at the same time LED will turn off glowing green to blue until the system is ready to take input again.

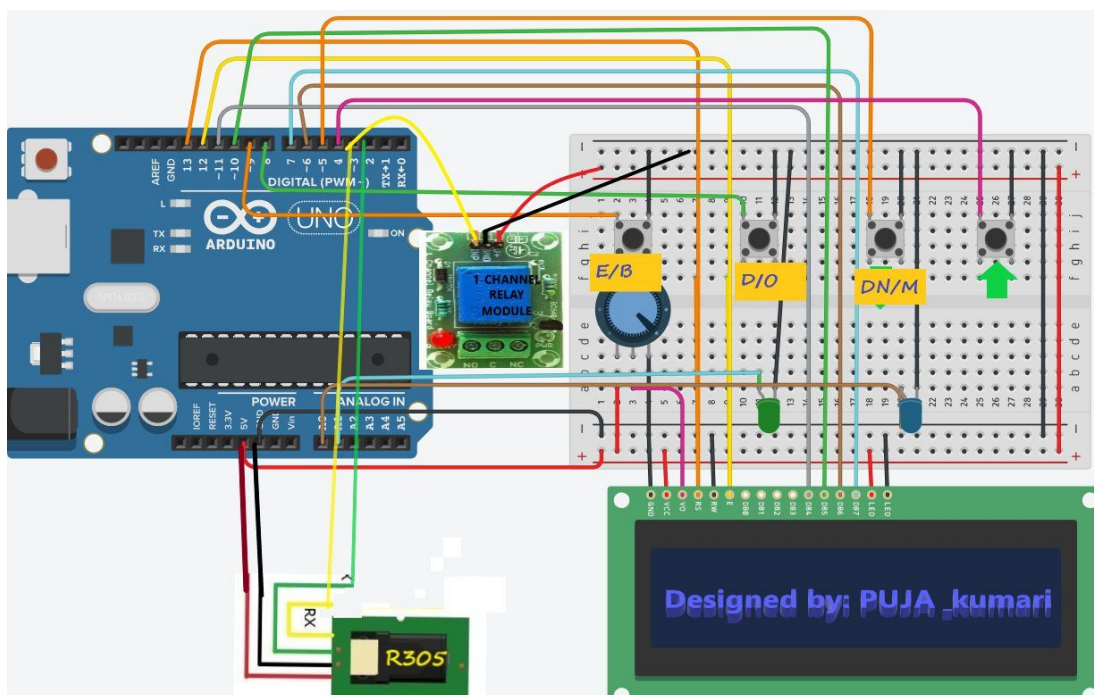


Figure 6: Circuit Overview

7. Storing System in Biometric Start& Access during Accident: Future Scope

In this prototype model, we are utilizing memory spaces only from Arduino. We have used Arduino UNO i.e. ATMEGA328P having simplified features in which there is EEPROM. Use of registers in the SD Card module with the microcontroller as well can be incorporated for the storage system in the biometric model prototype. We have used R305 Fingerprint Sensor which is comparatively cheaper but on the contrary less sensitive but during accident vehicle will be safe. It is important to state here that we can improve certain limiting features of the design by adding some another robust technology like different use of Fingerprint Sensor R307 or some better optical sensors which are readily available in market. Unnecessary delay of start is also one impediment that can be improvised in the system model with enhanced processing speed that reduces scanning time for feature extraction. Biometric attributes can be categorized into physiological or behavioral as the case may be. The possible merits of biometric control and security systems are numerous over manual counterparts. As a future scope of the project work, such security systems can be made more effective over the existing design by overcoming such limitations in a feasible way.

8. Conclusion

This report is a complete operating prototype of a fingerprint-based security system to start a vehicle. The system intelligent prototype is able to communicate well and appropriate output is given under user input. The system requests for the user's finger, processes it and gives appropriate output based on if the finger is stored in the fingerprint module or not. The system is also able to enroll a new user's finger at request but prompt for passcode before it could be done. Hence, fingerprint technology improves the security of an automobile making it possible for the vehicle to be used by only authorized users. Therefore, implementing this system on vehicles makes the achievement of our security system come in a cheap and easily available form. The output is viewed with the use of an LED and tested upon a bike. Biometric recognition systems present security and convenience than conventional methods of personal recognition.

References

- [1] Mudholkar, S. S., Shende, P. M. & Sarode, M. V. "Biometrics Authentication Technique for Intrusion Detection Systems Using Fingerprint Recognition", International Journal of Computer Science, Engineering and Information Technology.
- [2] Ajinkya Kawale, "Fingerprint based locking system", International Journal of Scientific & Engineering Research.
- [3] <https://circuitdigest.com/microcontroller-projects/fingerprint-based-biometric-security-system-arduino-uno>.