

A Fingerprint Based Ignition System in Vehicles

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Abstract - Biometric Systems are computer-assisted techniques of authenticating or recognising a living person's identity based on physiological traits such as a fingerprint or face pattern, or behavioural features such as handwriting or keyboard patterns. Fingerprint-based systems, in particular, have been shown to be effective in securing information and resources in a wide range of applications. Radio Frequency Identification (RFID) is the wireless non-contact use of radio frequency waves to transfer data. Tagging items with RFID tags allows users to automatically and uniquely identify and track inventory and assets. Adopting it as a form of security in already existing systems, such as vehicles, is a critical step in exploring its benefits. In contrast to the traditional way of employing keys, this study work focuses on the use of RFID card and fingerprints for car ignition. RFID sensor will validate the license of the user and the fingerprint sensor will only allow an authorized person in the vehicle. The project serves as a catalyst for future research aimed at developing more robust and embedded real-time fingerprint-based ignition systems in vehicles.

Index Terms – Biometrics, Fingerprints, Ignition, RFID, Vehicles

1 INTRODUCTION

BIOMETRICS are physical or behavioral human characteristics that can be used to digitally identify a person in order to grant access to systems, devices, or data.

Fingerprints, facial patterns, voice, hand geometry, voice recognition and typing cadence are all examples of biometric identifiers. Each of these identifiers is considered unique to the individual, and they can be used in accordance to improve the accuracy of identification.

The biometric method requires the person to be physically present in order to be identified. This emphasises its preference for classical methods of identifying such as passwords, smartcards, and so on. Because biometrics can provide a reasonable level of confidence in authenticating a person with

less friction for the user, it has the potential to dramatically improve enterprise security. Computers and devices can unlock automatically when they detect the fingerprints of an approved user. This proves that biometric recognition system offers much superior security than any other traditional method of personal recognition.

One of the most well-known and well-publicized biometrics is fingerprint identification. Fingerprints have been used for identification for over a century due to their uniqueness and consistency over time, but have only recently become automated (i.e. a biometric) due to advances in computing capabilities. Fingerprint recognition is popular due to its inherent ease of acquisition, the numerous sources (10 fingers) available for collection, and law enforcement and immigration's long history of using and collecting it.

RFID stands for "radio-frequency identification," and it refers to a technology in which a reader captures digital data encoded in RFID tags or smart labels (defined below) using radio waves. In the same way that data from a tag or label is captured by a device and stored in a database, RFID is similar to barcoding. RFID, on the other hand, has several advantages over barcode asset tracking software. The most notable difference is that RFID tag data can be read without needing to be aligned with an optical scanner, whereas barcode data must be aligned with an optical scanner.

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Because of the rising number of vehicle thefts, vehicle security is becoming increasingly important. Another issue with vehicles is the management of their keys. Keys must be carried, and losing or misplacing them can be a serious problem. Using an RFID card and a fingerprint-authenticated vehicle starter system, we propose a solution to this problem.

2 EM18 RFID READER MODULE

Radio frequency identification is the abbreviation for RFID. It is a technology in which digital data is encoded in RFID tags and decoded using radio waves by an RFID reader. RFID is similar to barcoding in that it uses a device to decode data from a tag. RFID technology is used in a variety of applications, including security, employee attendance, RFID door locks, RFID-based voting machines, and toll collection system, etc.

The EM18 Reader is a module that can read the RFID tags' ID information. When the RFID tag comes into range with the reader, it stores a 12-digit unique number that can be decoded by an EM18 reader module. This module has an inbuilt antenna and operates on a 5 volt DC power supply. It operates at a frequency of 125 kHz.

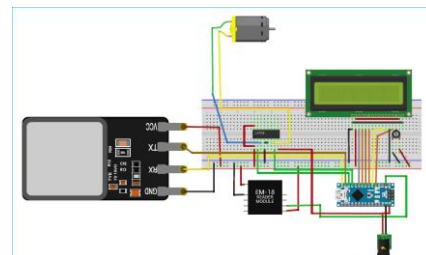
It gives a serial data output, and it has a range of 8-12 cm. The serial communication parameters are 8 data bits, 1 stop bit, and 9600 baud rate.



2.1 EM18 Features:

- Operating voltage: +4.5V to +5.5V DC
- Current consumption: 50mA
- Operating frequency: 125KHZ
- Operating temperature: 0-80 degree C
- Communication Baud Rate: 9600
- Reading distance: 8-12 cm
- Antenna: Inbuilt

RFID tags have a unique 12-digit code that can be decoded with an RFID reader. When we swipe the RFID tag near the Reader, the Reader outputs the unique codes via the serial port output. Connect the Arduino to the RFID reader as shown in the circuit diagram, and then upload the code below to the Arduino. After the code has been successfully uploaded, open the serial monitor and change the baud rate to 9600. Then, as close as possible to the Reader, swipe the card. The serial monitor will then begin to display the 12-digit code. Carry out this procedure for all RFID tags in use and keep a record of it for future reference.



3 FINGER PRINT SENSOR MODULE

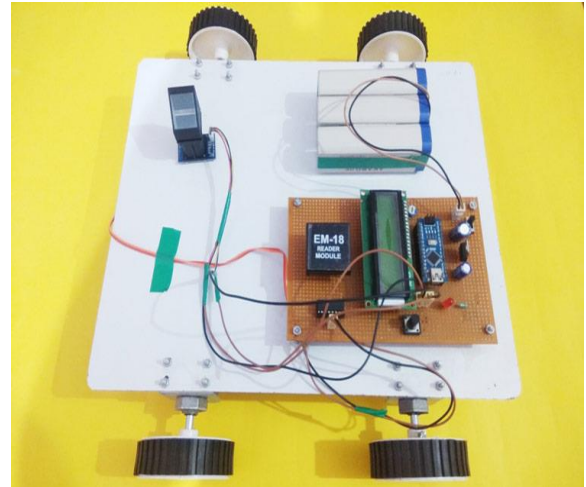
The Finger Print Sensor Module, also known as the Finger Print Scanner, is a module that captures the image of a finger's print, converts it into an equivalent template, and saves it in its memory on a designated ID (location) by Arduino. All of the processes, such as taking a fingerprint image, converting it into templates, and storing location, are controlled by Arduino.

3.1 Steps for Fingerprint Enrolment

1. In the Arduino IDE, go to File > Examples > Adafruit Fingerprint Sensor Library > Enroll.
2. Upload the code to the Arduino, and open the Serial monitor at a baud rate of 9600.
3. You should enter an ID for the fingerprint in which you want to store your fingerprint. As this is my first fingerprint, I typed 1 in the top left corner, and then, click the Send button.
4. Then the light on the fingerprint sensor will blink which indicates that you should place your finger on the sensor and after that follow the steps showing on serial monitor till it acknowledges you for successful enrolment.

4 PROGRAMMING FOR RFID KEYLESS IGNITION

1. The first thing is to include all the required libraries. Here, "Adafruit_Fingerprint.h" is used for using R305 fingerprint sensor. Then configure the serial port in which the fingerprint sensor will be connected. We have declared 12 as RX Pin and 11 as a TX pin.
2. In the next step, declare all the variables, which will be used throughout the code. Then define the LCD connection pins with Arduino followed by the declaration of an object of LiquidCrystal class.
3. Next, inside the loop(), code is written to get the unique 12 digit codes of the RFID tags and they are stored in an array. Here the elements of the array will be matched with the stored unique codes in the memory, to get the authenticated person details.
4. Then, the received array is compared with the stored tag codes. If the code is matched, then the license is considered as valid, which allows the user to put valid fingerprint. Otherwise, it will show an invalid license.
5. In the next step, a function getFingerprintID is written which will return a valid fingerprint ID for an already enrolled fingerprint.
6. Inside function fingerprint(), which is called after successful RFID match, getFingerprintID function is called to get a valid fingerprint ID. Then it is compared using the if-else loop to get the information regarding authenticated person data and if data is matched, then the vehicle is ignited, otherwise, it will prompt for the wrong Fingerprint.
7. So this is how this RFID Car Ignition System works which adds two layers of security to your car.



5 RESULT

Some vehicles were used to test the fingerprint-based ignition system that was developed. Some of them had their information entered into the database. All of the test images used with the recognition software were correctly identified, and the software reported whether or not a match was found.

A match meant the fingerprint had been found in the database, and logic 1 was sent to the parallel port's relevant data pins as a result. This logic 1 had a voltage of 4.8 volts, which closed the interface control circuit connected to the ignition system, allowing the vehicle to start and move properly.

A fingerprint mismatch, on the other hand, resulted in logic 0 with a value of 0volts being sent to the parallel port's data pins. As a result, the interface circuit remained open, preventing the vehicle from being ignited. After the vehicle had been started, the recognition software was able to stop it.

Given that the engine and batteries were in good working order, it took about eight (8) seconds to ignite the vehicle after identification. Between the ignition system and the computer system, the interface control circuit provided the necessary protection and isolation.

6 CONCLUSION

As a result of the findings, it can be concluded that the use of RFID and biometric security systems provides a far more effective and fool proof method

of preventing unauthorised users from starting vehicles. Furthermore, it is logical to conclude that fingerprint images can be used to control the ignition system of a motor vehicle based on the findings of this study.

7 FUTURE WORK

This can also be implemented in other automobiles apart from cars. Other types of bio-metrics can also be used.

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