

BIOMETRIC VEHICLE SECURITY SYSTEM AND POLLUTION MONITORING

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Abstract - The main objective of this paper is to study the biometric security system and pollution monitoring. Normally available locks in the vehicles do not provide enough security. Traditional locks available in the vehicles can be easily broken. Thus, there is a need for more security options to be available for the vehicle which is unique and must be different from the traditional key locks. Biometrics system can be used as a good and effective security option. An important and very reliable human identification method is fingerprint identification. As fingerprint of every person is unique thus it can be used in various security options. This security system can also be employed to control ignition and fuel control. A detailed comparison is shown in the paper related to this work. Various other methods that can be used to enhance the security have been shown in a comparative way. Related work also include pollution monitoring.

Key Words: Sensor, Locks, Biometric security, Pollution monitoring, Electronic solenoid valve

1. INTRODUCTION

Because of increasing number of theft cases of the Automobile there is a need to enhance the security level of the vehicles. Traditional and commonly used key locks available in the vehicles are easily unlocked by the professional thieves. With the help of master key it becomes very easy to unlock the lock of the vehicles by the thieves. This creates the demand of such type of lock which is new and provides an additional security level. The new and modern lock must be unique in itself i.e. it must be only unlocked by special and specific key. This type of feature is available in the biometrics locks i.e. the lock which can only be locked and unlocked by the human body features. Biometrics can include: face recognition, voice recognition, fingerprint recognition, eye (iris) recognition.

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 paper 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'. Fingerprint of

a person is read by a special type of sensor. Fingerprint sensor can be interfaced with a microcontroller. Through keypad we can, also identify the user by selecting corresponding option through keypad by the specific operational password

1.1 FINGERPRINT MODULE

This paper we use a fingerprint module to read once identity to start the equipment. For this we use a ARDUINO-microcontroller to enable the ignition system if the matching between scanned data and the already existing data is correct. Comparison is done inside the fingerprint module itself and its output is given to microcontroller. Result is displayed in a LCD display whether the user is authorized or not.

1.2 LOCKING SYSTEM AND POLLUTION MONITORING

The next alternating things that are interfaced with this control system are electronic solenoid valve, locking system, pollution monitoring and relay for fuel tank. The main purpose of the electronic solenoid valve in this paper is to control the fuel by only fingerprint recognition. The locking system is controlled by limiting switches which is connected to the microcontroller. When a signal is received to the microcontroller from the keypad by pressing the lock switch, it opens and closes based the action. Pollution monitoring is done by fixing a MQ7 sensor which is used to detect CO gases that are emitted from the vehicle. This displays the amount of gases that are emitted will be shown in the LCD display.



Figure 2 CO Pollution sensor

1.3 RELAY FOR FUEL TANK

The fuel tank can also be operated by relay switch. Since it involves a large mechanism, in this paper we are just using a switch with a LED that shows the opening and closing of the tank.

1.4 FUEL CONTROL SOLENOID VALVE

The main objective of using electronic solenoid valve is to control the fuel and to avoid theft of fuel in case of off condition. In this paper, there will be flow of fuel only during the ON state of the vehicle. Which needs a fingerprint recognition to start and this electronic solenoid valve works only when a fingerprint is recognized.



Figure 1 Electronic solenoid valve

2. CIRCUIT DESCRIPTION AND IMPLEMENTATION

This development process occurs in such a way that, in the entire course of human history, there is virtually no possibility of the same exact pattern forming twice. Consequently, fingerprints are a unique marker for every person, even identical twins. No matter how similar two prints may look at a glance, a trained investigator or suitable software can pick out clear, defined differences. This is the basic idea of fingerprint analysis, in both crime investigation and security. The two fundamental principles underlying the use of fingerprints as a means of identifying individuals are:

Immutability and individuality or uniqueness. contrast, a switched-mode power supply regulates either output voltage or current by switching ideal storage elements, like inductors and capacitors, into and out of different electrical configurations, Ideal switching elements.



Figure 3 Arduino microcontroller

2.1 FINGERPRINT MODULE

R305 background highlight optical fingerprint verification module is the latest release of Mi axis Biometrics Co., Ltd. It consists of optical fingerprint sensor, high performance DSP

processor and Flash. It boasts of function such as fingerprint login, fingerprint verification, fingerprint deletion, fingerprint upload, fingerprint download, etc. This can be used as a memory storage element to store the data of the fingerprint.

2.2 FINGERPRINT ALGORITHM

Mi axis owns fingerprint verification algorithm with self-independent IP and gains several national invention patents. Mi axis algorithm has the below three generations per the realization theory. 1) Minutiae-based Fingerprint Matching Algorithm. 2) Ridge-based Fingerprint Matching Algorithm. 3) Image-based Fingerprint Matching Algorithm. Three algorithms have their respective advantages and meet the different needs of applications. Mi axis algorithm has the following characteristics:

1) Intellectualized Intelligent image processing as human thinking way, faithfully deliver the original fingerprint image characteristics, effectively sort the characteristics and ensure its differentiability, stability and independency.

2) Small Volume Code length of Mi axis algorithm is less than 48KB, data buffer less than 16KB, and the memory demand is less than 64KB, it is the most reduced fingerprint verification algorithm in the world.

3) Rapid Speed Mi axis algorithm just needs 60 MIPS. To process and verify a 64KB fingerprint image, it can affect the fingerprint verification easily on all normal processor platforms.

4) High Portable Ability Mi axis algorithm adopts standard C Language which is easily porting in different platform. At present, Mi axis algorithm has been widely used in DSP etc. embedded platform, and Windows, UNIX, LINUX etc. operation system. The analysis of fingerprints for matching purposes generally requires the comparison of several features of the print pattern. These include patterns, which are aggregate characteristics of ridges, and minutia points, which are unique features found within the patterns. It is also necessary to know the structure and properties of human skin in order to successfully employ some of the imaging technologies. Fingerprint matching, among all the biometric techniques, fingerprint-based identification is the oldest method which has been successfully used in numerous applications. Everyone is known to have unique, immutable fingerprints. A fingerprint is made of a series of ridges and furrows on the surface of the finger. The uniqueness of a fingerprint can be determined by the pattern of ridges and furrows as well as the minutiae points. Minutiae points are local ridge characteristics that occur at either a ridge bifurcation or a ridge ending.

2.3 FINGERPRINT MATCHING TECHNIQUES

Fingerprint matching techniques can be placed into two categories: minute-based and correlation based. Minutiae-based techniques first find minutiae points and then map

their relative placement on the finger. However, there are some difficulties when using this approach. It is difficult to extract the minutiae points accurately when the fingerprint is of low quality. Also, this method does not consider the global pattern of ridges and furrows. The correlation-based method can overcome some of the difficulties of the minutiae-based approach. However, it has some of its own shortcomings. Correlation-based techniques require the precise location of a registration point and are affected by image translation and rotation.

2.4 FINGER PRINT SENSOR

It is a 4 pin device which is an optical biometric fingerprint reader which can be used for various applications such as access control, safety deposit locks, banks, and car locks etc. . The model used in this paper is the R305 fingerprint scanner module. The reason being it is one of the cheapest fingerprint reader available in the market. One of the main features is that it consumes very less power, and it gives the similar performance as to the expensive ones. The fingerprint sensor is used to read the fingerprint of the already registered user/users. It can also be used to add/delete new/existing fingerprints.

Its four pins are Tx-In, Rx-Out, GND and +5V . Tx-In and Rx-Out pins are used for Input and Output purpose. The GND and the +5V are used for power supply and grounding purpose. It is very easy to implement, being a simple connector.

When the user places his finger on the sensor for the first time, a 3-Dimensional image of the fingerprint is captured. It is then stored on the memory of the controller using various algorithms. Internally, it just converts it pieces of code which the microcontroller stores it in its memory and verifies it. Along with the fingerprint sensor three buttons are also used among which one of them is used for sensing the fingerprints.

The other two are used whenever a fingerprint is too added or deleted. It scans the edges of the fingers and stores it in the memory of the controller. In case of deleting the fingerprint, we should first place the fingerprint that needs to be deleted, and on pressing the delete button we must scan that same fingerprint again. This deletes the fingerprint from the memory of controller.

2.5 FINGERPRINT IMPLEMENTATION

Fingerprint Identification enhances the security of a vehicle and makes it possible only for some selected people to start the vehicle. Not every person with the key will be able to start the bike. There will be matching of the person's data with the stored one and only in the case of match the bike will start otherwise not. Thus, by implementing this relatively cheap and easily available system on a vehicle one can ensure much greater security and exclusivity than that offered by a conventional lock and key.

Fingerprint identification enhances the security of a vehicle and makes it possible only for some selected people to start the car. By implementing this relatively cheap and easily available system on a car one can ensure much greater security and exclusivity than that offered by a conventional lock and key. In actual case a success would initiate a trigger in the spark plug. But due to limitation in initiating a spark plug and due to safety reason a prototype has been developed here. The output can be seen using an LED.

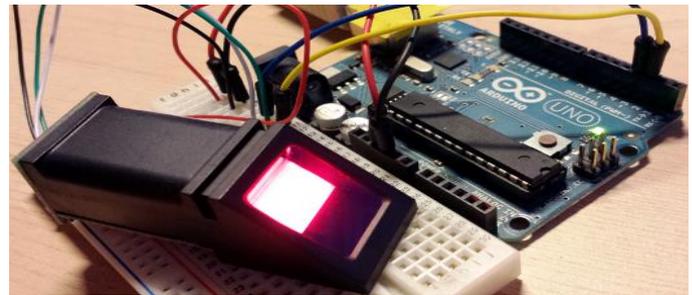


Figure 4 finger print module

2.5 DEVELOPMENT OF FINERPRINT IGNITION SYSTEM

The researchers have several conclusions and observations during the development of the Fingerprint Engine Starter among which are the following existing Electric Engine Starter still has more rooms for improvement. The developed Fingerprint Engine Starter is a better alternative to the existing Electric Engine Starter. There is significant difference in the over-all acceptance of the respondents of the existing starter system and the developed starter system.

2.6 START-UP THE ENGINE USING FINGERPRINT

Fingerprint Recognition was the first biometric approach to verify the person by downloading the images of sample in the database. The image is first analyzed and then identified, extracted and stored the images in the file of database. For the identification process, first it compare the query image against with the image stored in the database and then it verified. From the above result, it has been cleared that the use of the biometric system offers the better and more reliable resultant. Moreover, it is restricting the starting of the vehicles by unauthorized user. Only the fingerprint image verified has this ability to access the engine of the vehicle.

2.7 A PROTOTYPE OF FINGERPRINT BASED IGNITION IN VEHICLES

The prototype of a fingerprint based ignition system developed has a specific sequence that must be followed before it can be used to ignite a vehicle. Basically, the fingerprint recognition software must be first initialized before fingerprint images can be loaded from a file of sample images. The last acquired fingerprint image is then analyzed and its minutiae identified, extracted and stored as a

template. The next step involves either enrolling the template or matching the template with other templates. The enrollment process button saves the last extracted template into the database. The identity number of the enrolled template is displayed in the log window. The identification process compares the query template against reference templates in a database. For verification, the identity number of the reference template to be matched with the query template must be supplied.

BLOCK DIAGRAM

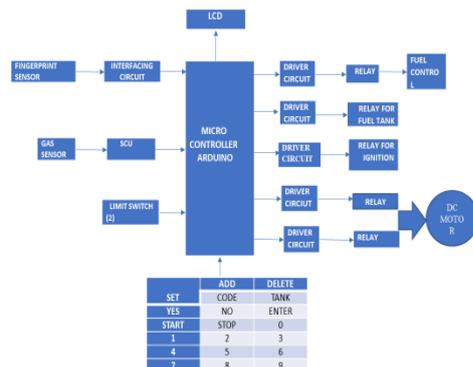


Figure 5 Block diagram

2.8 GENERAL DESCRIPTION

Finger print based security system can be used at many places like Industries, Offices, and Colleges or even at our home. This paper is a fine combination of Biometrics technology and Embedded system technology.

Fingerprint sensor is the main part of this system. It makes use of Biometric sensor to detect fingerprint. It is also called as Biometric sensor. Fingerprint sensor uses various types of techniques like ultrasonic method, optical method or thermal technique. In this paper we have used optical fingerprint sensor.

Main blocks of this paper are Arduino Microcontroller, Fingerprint module, Relay, Keypad, LCD display, electronic solenoid valve, limit switches, MQ7 pollution monitoring sensor and Motor. User should place his/her finger on the optical sensor part of fingerprint module. We have seen Password based security system RFID based security system. The main feature or specialty of fingerprint is that it is unique. It gives this paper the high-level security than other security systems.

2.9 APPLICATIONS

1. Industrial application
2. Home or domestic application
3. Bank Lockers or security safes
4. Vehicle security systems

2.10 ADVANTAGES

1. Fingerprint based security system is most secured system as compared to other systems. Reason is that RFID card or Keys of lock can be stolen, password may be leaked. However thumbnail of every human being is unique, so lock will not open unless the same person is present to give the impression of fingerprint.

2. No need to carry the keys to open the lock. Or even there is no need to remember the password or any Pin number.

3. It can be accommodated in all the vehicles and easy to use. This also provides a more security for the vehicle.

3. CONCLUSION

The main motive of implementing the fingerprint sensor for the two wheelers is to provide the security for vehicles. It enhances the level of security for vehicles. As the unique finger impression is a promising biometric design for recognizing it is used in case of both security and usability. This technology easily reduces the theft cases.

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