

Implementation of Automated Door Unlocking and Security System

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ABSTRACT

By hearing the word 'CAR' creates a picture of luxury cars in the mind. Of course, riding a car is a dream for very one but securing the car is most important thing. This paper based on security system of car, by the use of multimodal biometric system in order to identify and to verify a person. The person who likes to ride the car has to go for following verifications. At the first, fingerprint sensor and the second voice recognizer. There are two possibilities: if the person is identified as the car owner or a known user, then he/she can take control over the car; if it's an intruder, the car will announce the security service by sending a text message to owner using a GPRS/GSM system. Car owner can also access the security system by sending text message.

Keywords

Multimodal, Biometrics, Fingerprint recognition, Voice recognition, Access control

1. INTRODUCTION

Individual identification is the main aim in criminology and in civil applications. The identification of individual can be done by scientific and mystical elements. One [2] of the most important innovation in personal recognition and registration belongs to Alphonse Bertillon [2], police functionary in France, who claimed and demonstrated in 1879 that if many body dimensions – such as waist, width, height, head circumference, the height of right ear, the length of some phalanges and of some bones from the left hand – are measured, then it would be almost impossible to find two individuals with the same characteristics. Biometric system [3] was first introduced for the identification of an individual. Biometric system, "the use of physical characteristics for the identification of an individual". The earliest [12] methods of biometric identification includes fingerprint and hand writing. The improved method includes iris scan, face scan, voice recognition and hand print. The main characteristics [16] of an ideal identification System are presented below:

1. Universality – every person must be identifiable after the proposed criteria.
2. Permanence – the identifier must not change during the time, or to be transformed at individual wish.
3. Necessity – the identifier must contain one or more natural characteristics, at which one person cannot renounce.
4. Uniqueness – every person must have a single identifier; there should not exist two persons with the same identifier.
5. Acquisition – the identifier must be easily obtained.
6. Conservation – the characteristic must be easily stored, in manual or automatic identification systems.
7. Precision – every identifier must be different enough from another, so that the recognition is made without

error.

8. Cost– the collection and storage of the characteristics must be cost-effective.
9. Acceptability – the users must agree that the identifier be collected and stored in a database.

The unimodal biometric system [4], consisting of single biometric system for the identification of individual. The unimodal biometric system faced a unique problems like noisy data, intra class variation, restricted degree of freedom, spoof attack and unacceptable errors. The limitations of unimodal system somehow overcome by multimodal biometric system.

Multimodal biometric system [5], "usage of more than one physical characteristic to identify an individual, involving a fusion of more than one biometric technology" The main biometrics identifiers used in this system are fingerprint and voice recognition

2. RELATED WORKS

Biometric identification is defined as "the use of physical characteristics for the identification of an individual". The earliest methods of biometric identification includes fingerprint and hand writing. The improved method includes Iris scan, face scan, voice recognition and hand print [1] [8]

Unimodal biometric system [3] [4], 'A single biometric technology for the identification of an individual'. The unimodal biometric system contained unique problems like noisy data, intra class variation, restricted degrees of freedom, spoof attacks and unacceptable error rates. The limitations was overcome by multimodal biometric system Multimodal biometric system, "usage of more than one physical characteristic to identify an individual". It involves the fusion biometric technology. We are using fingerprint recognition and voice recognition has two biometric inputs.

Fingerprint [9] identification is known as Dactyloscopy. Application of finger print is in many fields. Defense [8]: fingerprint are used in forensic science to identify suspects, victim and other person who touch the surface. Police agencies started using fingerprint from 19th century. Professional Standing [10][13]: on basis of fingerprint the forensic professional organization were formed. The international association for identification was started at 1915. The first program for forensic scientists was established in 1977. 'All fingerprint taken can be cross checked with 900000 unsolved crimes, called sinister'.

Fingerprint Of Children [11][12][15]: in various schools of UK, fingerprint of the children above the age of 11 are stored in database. The fingerprint is used for accessing of library cards and attendance which will save the time. In 2007, British government added fingerprint as one of the ID for passports. Login Authentication [14]: fingerprint are used in almost all software company for login and logout purpose for detection of individuals.

Voice Recognition System, [6] is defined as “the ability of a machine to receive and interpret the dictation”. Voice recognition is used to translate the spoken word into a specific response. Voice biometrics works by digitizing a profile of a person's speech to produce a stored model voice print, or template. Biometric technology reduces each spoken word to segments composed of several dominant frequencies called formants. Each segment has several tones that can be captured in a digital format. The tones collectively identify the speaker's unique voice print. Voice prints are stored in databases in a manner similar to the storing of fingerprints.

Voice [7] which is provided or acted upon on system microphone; this microphone amplified the voice of operated person then it is transferred to the microcontroller system. The microcontroller system checks the voice of particular person with the voice stored in the system. If the voice is satisfied then the security of the system is unlocked

2.1 Fingerprint Recognition

Fingerprint recognition method [8] is the most used in individual recognition. It is also one of the first methods of identification and verification. In crimes police undergo this method. Fingerprint recognitions can be used in civil applications in order to identify the persons. It can be used especially in the access control applications. The finger print identification is also known as ‘Dactyloscopy’ [9].

Fingerprint module (R303) consisting of two parts: Fingerprint enrollment and Fingerprint matching. While enrolling, the user has to enter the finger two times. The system will process the image two times and generates the templates of fingerprint which will be stored. When matching, user needs to enter the fingerprint through optical sensor and system will generate the templates. The generated templates are compared with the templates of fingerprint library and system will return with the result.

2.2 Voice Recognition

Voice recognition [6] is defined as “the ability of a machine to receive and interpret the dictation”. Voice recognition is used to translate the spoken word into a specific response. Voice biometrics works by digitizing a profile of a person's speech to produce a stored model voice print, or template. Biometric technology reduces each spoken word to segments composed of several dominant frequencies called formants. Each segment has several tones that can be captured in a digital format. The tones collectively identify the speaker's unique voice print. Voice prints are stored in databases in a manner similar to the storing of fingerprints. Voice [7] which is provided or acted upon on system microphone; this microphone amplified the voice of operated person then it is transferred to the microcontroller system. The microcontroller system checks the voice of particular person with the voice stored in the system. If the voice is satisfied then the security of the system is unlocked. Voice recognition [6] is used to translate the spoken word into a specific response. EasyVR is used as a voice recognition module. It is multipurpose speech recognition module. EasyVR can be used to interface with the PIC and Arduino board. It can support up to 6 languages and 32 user voice password. As it says, it is easy to use and also simple graphical user interface.

3. AUTOMATED DOOR UNLOCKING AND SECURITY SYSTEM

3.1 Block Diagram

Multimodality [5] is the usage of more than one physiological or behavioral characteristic to identify an individual. It involves the fusion of two or more technologies such as fingerprint, facial recognition, iris scanning, hand geometry, signature verification, or speech recognition. The fusion [3] is done by running the two (or more) biometric inputs against two (or more) different algorithms, to arrive at a decision. This technique is useful in large-scale civil ID applications, where the identity of thousands of people need to be authenticated at a time. The purpose of such model is to advance a system to detect the owner of the car. The main component of the system consists of fingerprint module, microphone and microcontroller to access the security of the car as shown in Figure 1.

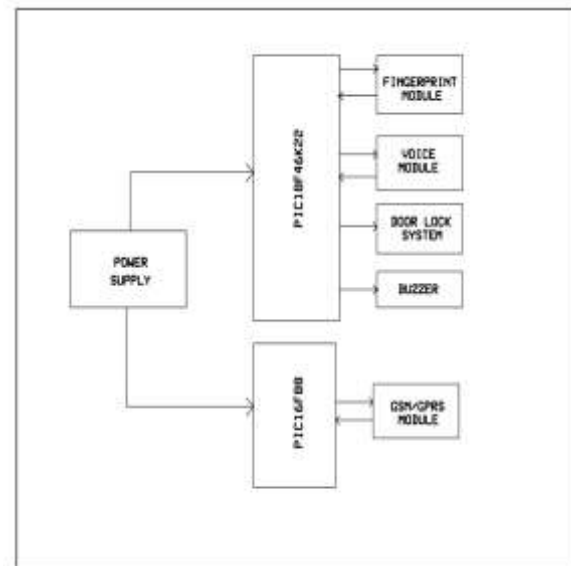


Figure1: Proposed Block Diagram

3.1.1 Sensing Unit

Microphone [8] and fingerprint [9] module are the two sensing unit. Basically voice is given by the user through microphone into the system. The voice is provided or acted upon on system microphone; this microphone amplified the voice of operated person then it is transferred to the microcontroller system. The microcontroller system checks the voice of particular person with the speech recognition algorithm and allows the person to access.

The [14],[15] Automatic Fingerprint Identification System procedure starts with taking of the fingerprint image, then the system automatically marks the zones of interest for the description of the ridges on the image; the points marked on the fingerprint are stored as Cartesian coordinates and are compared with the coordinates stored in the database.

3.1.2 Base Station Unit

Microcontroller [16] is a general purpose device, which integrates a number of the components of a microprocessor system on to single chip. It has inbuilt CPU, memory and peripherals to make it as a mini computer. Microcontrollers are smaller in size, Consumes less power, Inexpensive. There are two microcontrollers used: PIC18F46K22 and PIC16F88

3.1.2.1 PIC18F46K22

The PIC18F46K22 Have High Computational Performance, High Endurance And Flash Program Memory. PIC 18F46K22

have a design enhancement that makes these microcontroller a logical choice for many high performance, power sensitive applications. Extended watch dog timer from 4seconds to 131 seconds. PIC18F46K22 is self-programmable under software control

3.1.2.2 PIC16F88

This microcontrollers belongs to mid-range family of PIC microcontroller devices. These microcontrollers have extended watch dog timer, low voltage programming and read and write access to program memory. Initially the microcontroller is powered up by the voltage regulator. Microcontroller is having input signals from fingerprint module, voice recognition module and GSM unit. The image of finger and code of voice recognition of the owner is stored in microcontroller. When the user provides the fingerprint or voice for the access of car, the microcontroller will verify the finger print and voice code with stored copy. If the fingerprint image or voice code is not matching then the microcontroller operates the buzzer and send an alert message to the owner by using gprs/gsm module. A new fingerprint and new voice code can also be added to the microcontroller.

3.1.3 GSM Module

GSM is defined as Global System for Mobile communication. GSM is an open source system. GSM uses Time Division Multiple Access or TDMA technology as their air interface standard. GSM operates on the 900 MHz, 1800 MHz and 1900 MHz GSM uses Digital Communication System or DCS 1800 and is the world's main 2G standard. DCS 1900 is considered the GSM standard for North America and is called North American GSM. GSM module used in the project is SIM900. Global system for mobile communication is used to send and receive the message in the time of door tampering.

4. TESTING AND RESULT

4.1 Testing

The biometric technologies are adopted to control the theft of car. Initially, person has to register the fingerprint and voice in the respective modules for future accessing of door security system. Only family members of the owner of the car can access the security system. Every user has to undergo biometric verification to unlock the door security system of car. The testing procedure is as follows:

- Connect the finger and voice module to door locking system for security system of the car.
- Check whether the power supply is given to fingerprint module, voice module and GSM module.
- Make a check for available of network for GSM module.
- Press reset button to get modules on start mode.
- First step, the user who wants to access the car should place his\her finger on fingerprint module.
- The user is given 3 chance to access the security system. If the user fails, a message alert is sent to owner and buzzer is operated.
- Second step, if the user fail to access the car by fingerprint, he\she can access it through voice recognition through the misc. the user has to speak the particular code in a particular tone in which their voice has stored earlier.

- The user is given 3 chance to access the security system. If the user fails, a message alert is sent to owner and buzzer is operated.

4.2 Result

- If the user fingerprint doesn't match with the saved fingerprint in module, the message alert is sent to owner and buzzer is activated.
- If the voice of user do not match with the saved voice in the voice module, then a message alert stating "Door Tampering" is received by the owner of the car as shown in Figure2.
- If the owner friend wants to take the car in case of emergency, then owner can access the security system by sending a 'LOCK' and "UNLOCK" message to the GSM Unit as shown in the Figure2.
- When the owner receives door tampering message he/she can lock the ignition system of car by sending a text message saying "LOCK". Which will block the ignition system of the car.

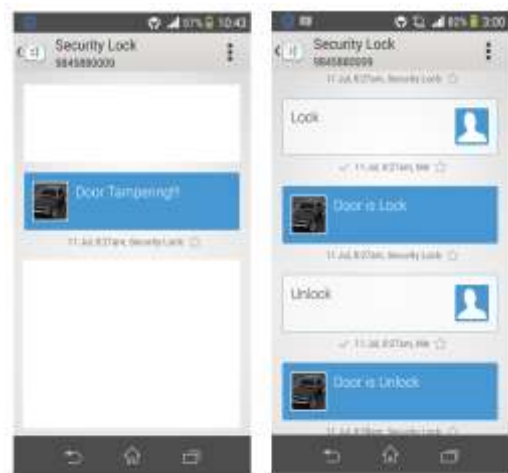


Figure2: The message alert received by the owner & the command sent by the owner.

5. CONCLUSION

Multimodal biometric technique, the combination of biometric for the better identification of the individual We have developed multimodal biometric system which makes up a decision for the recognitions of the individual. The two biometric system which are used in our project are fingerprint identification and voice recognition. In fingerprint recognition the user fingerprint is verified with the owner fingerprint which is saved in microcontroller. The user is given 3 chance for accessing the security system. If the user fails to access the security system, then buzzer is turned on and a message alert is sent to the owner. In voice recognition system, a code is sent to access the security system. The user need to announce the code through the microphone. The user is given three chance to access the system. If the user fails to do so, then a buzzer is operated and a message alert is sent to owner. The owner of the car is given an authority to access the security system by sending an alert message to access the door locking and ignition system by using GSM system.

5.1 Possible Improvement

It is said that there is no end for learning. Yes we also agree to this word, there is no end for science and there will be always improvement seen in this field. Implementation of Iris recognition along with the fingerprint and voice recognition would be more effective in security system of car. Using voice activated devices in automobiles would be more useful. As the work is done automatically with respect to the command given by the user. In GSM module during door tampering alert has announced, the message send by the owner should block the fuel supply system to engine, steering system should be locked, hand braking system should be automatically locked.

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