REVIEW OF FINGERPRINT BASED AUTOMOBILE ANTI-THEFT SYSTEM

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Abstract - *Every day the number of crimes in the country is increasing at a significant rate. This alarming rate calls for some innovative ideas for increasing the security of the systems. Of all the crimes one of the most trending is the theft of Automobiles. Here we propose a Fingerprint Detection System to unlock and use the automobile. The owner of the automobile will be able to unlock his/her car only after authentication through an application on his/her phone. The data is verified every time they have to use the vehicle. The owner has an option to make multiple accounts on the application as well.*

Keywords: Fingerprint Recognition and Authentication, Biometrics, GSM/GPRS Module

1. INTRODUCTION

In this 21st century various kinds of luxurious and comfortable automobiles have been invented by mankind. However there is least security provided for these systems. Here we come up with the antitheft system which uses biometric techniques. With the advancement of biometrics in this period, iris recognition and fingerprint recognition techniques have become major research fields. Iris recognition and fingerprint techniques works on certain algorithm which will restrict the access for all the users. Fingerprint recognition refers to the automated method of identifying or confirming the identity of an individual based on the comparison of two fingerprints. Optical readers, capacitive readers, ultrasound readers and thermal readers are four types of fingerprint reader hardware. Here we use R305 fingerprint read/sensor module which is a type of optical reader.

2. MOTIVATION

In this 21st century security has become must in everybody's life. Automobile theft has drastically increased from the previous decade. As per the crime report of India, there were 213765 incidents and 214009 victims of auto theft reported during 2016 in India. The top 10 States having highest cases of auto theft in India during 2016 included, Delhi, Haryana, Chandigarh, Manipur, Rajasthan, Puducherry, Madhya Pradesh, Maharashtra, Karnataka and Uttar Pradesh . As per the report of 2017, it was said that approximately 4 vehicles were stolen every hour in Delhi. Security systems for automobiles currently depend on sensors which are very expensive. So there is a need for a greater level of security in a cost effective manner.

3. AVAILABLE TECHNOLOGY

Biometric technology have great scope in the current changing world. Biometrics of a person is something which changes only under the worst of cases. Biometrics has now grown into a separate industry whose standardization has made exponential advancements [1]. In Table – 1 we can see that fingerprint recognition has high universality, very much convenient, high stability, high reliability and also cost efficient. It is implemented in PDA's, cellular phones and smart phones.

Figure – 1: Different Biometric Recognition Technologies

Technologies	Cathalicity	Uniqueness	Stability	Collectible	Feasibility	Deceivability	Cost
Face shape	High	Low	Mid	High	Low	High	High
Ear shape	Mid	Mid	High	Mid	Mid	Mid	High
Hand shape	Mid	Mid	Mid	High	Mid	Mid	High
Fingerprint	High	High	High	Mid	High	Mid	Low
DNA	High	High	High	Mid	High	Low	High
Iris	High	High	High	Mid	High	Low	High
Retina	High	High	Mid	Low	High	Low	High
Palm	Mid	High	High	Mid	High	Mid	Low
Voice	Mid	Low	Low	Mid	Low	High	Low
Signature	Low	Low	Low	High	Low	High	Low

4. IMPLEMENTATION AND TOOLS

4.1 Fingerprint recognition and authentication

We implement the biometrics system using a R305 fingerprint read/sensor module with TTL UART interface for direct connections to a microcontroller UART. Here the user can store the fingerprint data in the module and can configure it for 1:N or 1:1 mode depending on the applications. This module can directly interface with and 3.3V or 5V microcontrollers. But for interfacing with a serial port of a computer it will require a suitable level controller/serial adapter.

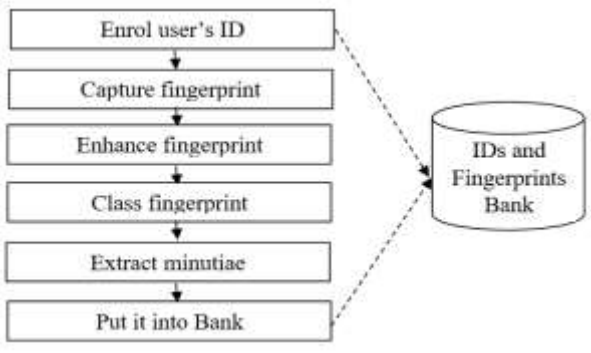

Figure – 2: Saving of Fingerprint Minutiae

First, fingerprint enrolment has to be done. When enrolling, user needs to enter the fingerprint two times [1]. The system will process the two finger images, then generate a template of the finger based on processing results and store the template.

Next, while matching the fingerprint, user enters the fingerprint through the optical sensors and the system will generate a template of the finger and compare it with templates of the finger library. The two modes of matching the fingerprint viz. 1:1 and 1:N, where the former will compare the live finger with specific template designated in the module while the latter will search the whole fingerprint library for a match. In both the modes the system will return the matching result, either success or failure.

The fingerprint module itself does all the complicated work behind the reading and identifying the fingerprints with an on-board optical sensor and fingerprint algorithm. The database of the prints can even be downloaded from the unit and distributed to other modules. We can even pull the raw images from the sensor. A large number of sensor modules with slight variations are available, most of them have a 4-pin external connection interface. Using this serial interface the module can communicate with a microcontroller and runs on a power supply of 3. 3V or 5V power supply. TX/TD pin connects with RXD, and RX/RD connects with the TXD.

4.2 Anti-Theft System

If an automobile gets stolen, we will have installed another which sends a message to the owner about the location of the vehicle. We will need to use a SIM 900A GSM module, Arduino Uno board and a Ublox NEO-6M GPS Module. Once the car is confirmed stolen, the GSM module requests the GPS module for the location (co-ordinates) of the automobile. Once the GPS module sends the location which are the longitude and latitude of the location of the car every 5 to 10 seconds. Location of the car is sent to the owner's phone.

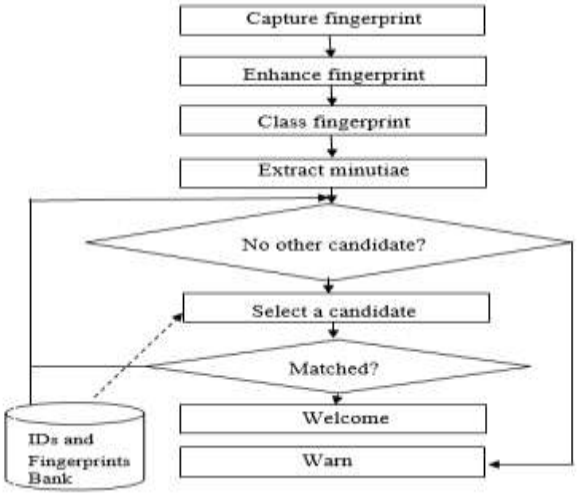

Figure – 3: Fingerprints Matching

The interval with which the location is sent can be set by the owner along with his phone number (if he needs to change any).

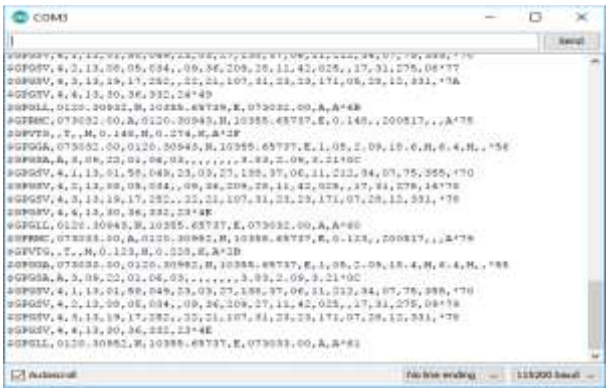

Figure – 4: Raw GPS Data from the GPS module

As you can see the above Raw Data from the GPS module cannot be understood easily by anyone we will make use of a library called TinyGPS++. This module converts different characters and the string to a general readable format.

This data is then passed to the GSM Module which sends the location and the time of data recording to the owner's phone via text message.

Also we will include a camera inside the automobile which can store and send the image to a remote server which can be then accessed by the mobile application. This image will be sent to the server by the GSM/GPRS module.

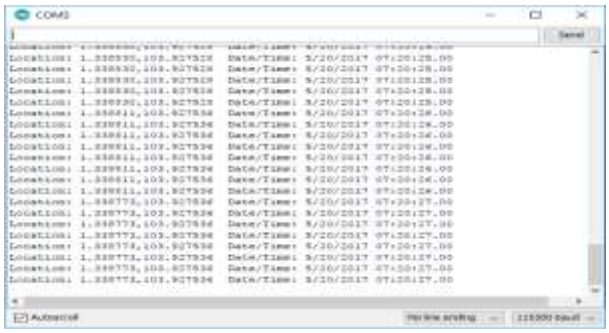

Figure – 5: Raw GPS Data parsed by TinyGPS++

5. CONCLUSIONS AND FUTURE WORKS

In this system we implement fingerprint as a biometric technique for authentication. This system ensures that nobody other than the owner can use the car without his/her authentication. This system provides a greater extent of security compared to the existing system. Also in the future we can implement iris scanning instead of fingerprint or add it as a two-step authentication process. Also we can log the location information to server which can then be read on the mobile application on the owner's phone.

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