Fingerprint based Vehicle Ignition System

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Abstract—**Fingerprints are the oldest and most widely used form of biometric identification. Biometric systems have overtime served as robust security mechanisms in various domains.A critical step in exploring its advantages is to adopt it for use as a form of security in already existing systems, such as vehicles. The work mainly focuses on real time project on fingerprint based vehicle ignition system with a view of reducing theft and to eradicate the usage of the vehicle from unauthorized users. Traditional locks available in the vehicles can be easily broken and there are chances of usage of vehicles from the unauthorized users. The issue of vehicle theft due to easy access to vehicle's functional system can be reduced by using a biometric system. Biometric system is a technological system that uses information about a person to identify that person. Vehicle Ignition System (VIS) uses fingerprint scanning, as part of the vehicle security system, to protect the vehicle from unauthorized access. This paper also aims at tracking the location of the vehicle using GPS module. The running vehicle can be stopped using a fingerprint (thumb finger) instead of using key.**

Index Terms— **Biometric, Fingerprint, Arduino UNO, Vehicle Ignition System, LCD, Relay motor, Global Positioning System (GPS), Global System for Mobile (GSM), Smart phone.**

I. INTRODUCTION

Vehicles have been used in one form or other since the invention of wheel. With theinvention of wheel, came in the 2nd most advanced technology, the Steam Engine. With the development of steam engine vehicle took the form of what we see today. In earlier times crank shaft mechanism were used to ignite the vehicles. Leaving that conventional method behind came in the concept of igniting the vehicles using key. The sole purpose of this paper is elimination of keys as conventional method of starting the vehicle. Because of the increasing number of theft cases of the vehicles as there is a need to enhance the security level of the vehicles. Traditional and commonly used key locks available in the bikes are wellknown to the thieves and thus it can easily be unlocked by the professional thieves. With the help of master key it becomes very easy to unlock the lock of the bikes 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 type. This type of feature is available in the biometrics locks. Biometrics is formed from the Greek words 'Bio' and 'Metrics' where 'Bio' means 'life' and 'Metrics' means to measure the four major methods used in Biometrics are: Palm, Iris, Voice, Face etc. There are many more methods i.e. the lock which can only be locked and unlocked by the

human body features. Biometric recognition techniques the fingerprint recognition is the most widely used because fingerprint of every person on the earth is unique and can provide good reliability. Also, the implementation of the fingerprint recognition system is easy and cheap than the other ones. Thus, fingerprint recognition locking system can provide better reliabilitythan the traditional locks and also is cheaper and easier than the other biometric locking system. Thus, here we are proposing a model which utilizes the concept of fingerprintrecognition in the motorcycles and cars to enhance the security level of the vehicle.

A. Objectives

1.   To eliminate the use of key completely for igniting the vehicle.
2.   To provide proper authentication for the owner of the vehicle.
3.   To control the theft of the vehicles by fingerprint based vehicle ignition system and to provide the security for the vehicle by adding GPS module by tracking the location of the vehicle in case of theft.

II. LITERATURE SURVEY

In this chapter a review of detailed literature survey conducted is presented. Topics covered are simulation of spark ignition engine processes. Since the present work involved variationof valve timing, literature pertaining to variable valve timing is also reviewed.

The history of fingerprint started in China. That was when the first record of the teck neck was being used with thumb prints being imprinted in clay. In the 14th century, various Persian government papers had impression of fingers. Observation had it that no two fingerprints were exactly alike. In 1880, Henry Faulds proposed an article where friction ridges can be extensively used in crime scenes to identify criminals. He gave two examples which are; a sooty finger marks on a white wall exonerated an accused individual and a greasy print on a drinking glass that revealed who had been drinking some distilled spirits (Faulds, 1923) Fingerprint matching techniques are of two types: graph based and minutiae based. The template size of the biometric information based on minutiae is much smaller andthe processing speed is higher than that of graph-based fingerprint matching. These characteristics are very important for saving memory and energy on the embedded devices (K and J., 1990). So much work as been done using the fingerprint for one kind of security system or the other, among whom are the works of Kumar, Mudholkar, Pandit, Kawale, to mention but a few (Kumar and Ryu, 2009, Kumar and Kumar, 2014, Mudholkaret al., 2012, Pandit et al., 2013, Kawale, 2013). Modern vehicles uses computer controlled battery ignition system; no matter the type of mechanism used, all ignition systems use battery, switch, coil, switching device and spark plug Delmar (2008). However, in this modern technology dispensation, j, 2012, Pingatet al., 2013).

Omidiora E. O. etal [1] in his paper basically focuses on the replacement of keys with the biometric specially fingerprint based lock systems in the vehicles because fingerprints are the oldest and most widely used form of biometric identification and also provide a robust security mechanism for various security domains. Their prototype consists of fingerprint software module used to store the database of the valid users, a hardware unit for interfacing and the ignition system module to ignite the vehicle. Database of the valid users is stored in the module. Now when a person tries to operate the vehicle then the system matches the fingerprint of the person with the stored database if the match result is successful then the vehicle is ignited with the help of traditional key method. The result was successful and the controller was able to differentiate between the authentic user and the false user.

The recognition software was able to distinguish high, medium and low quality test imageson the basis of the minutiae extraction. Logic 1 was transferred on the matched case and the logic 0 was transferred when the mismatch occurs.

Nagaraja et al. [2] describe the outline and improvement of a GSM based vehicle robbery control framework for a car. The created framework makes utilization of an inserted framework focused around GSM innovation. An interfacing mobile or GSM modem isassociated with the microcontroller, which in term is joined with the engine through relay. In the event that the vehicle is stolen, the data is sent to the owner that somebody has stolen his vehicle.

Ashraf [3] designed a biometric access control system using fingerprint for restricted area. The system was designed to register fingerprints in a database. A personal computer and a Bio Entry plus Scanner were the main components. A MATLAB code for image filtering and processing; and a C# for matching were used. Thus registration, verification andidentification were implemented.

Rashed et al. [4] describe a GPS based tracking system that keeps track of the location of a vehicle and its speed based on a mobile phone text messaging system. The system is able to provide real-time text alerts for speed and location. The present location can be locked and the system will alert the owner if the vehicle is moved from its present locked location. In every one hour the GSM modem or mobile will inform the owner by messaging its location in the form of latitude, longitude and speed information. The owner or user can control or stop the vehicle by simply sending the message stop to GSM modem or mobile connected to circuitry board. After receiving that message ignition system will turn off.

Z. Brijet et al. [5] combined Fingerprint sensor and arduino. The connection from the ignition switch that supplies voltage is given to the voltage regulator which is connected to arduino in-order to turn it on and off. Fingerprint sensor activated the relay which in turn controlled the starter relay resulting in the vehicle turning on. If the finger image does not match any of the images stored in the database, then the starting system is disabled.

III. ALGORITHM

1. Start
2. Pre-processing the test Fingerprint.
3. Extract the minutiae points.
4. Matching test Fingerprint with the database
5. Fingerprint is binarized
6. Thinning on binarized image
7. Minutiae points are extracted. Data matrix is generated to get the position, orientation andtype of minutiae.
8. Matching of test fingerprint with template
9. Matching score of two images is computed, if matching score is 1 images are matched andif it is 0 then they are mismatched.
10. Stop

IV. FLOWCHART
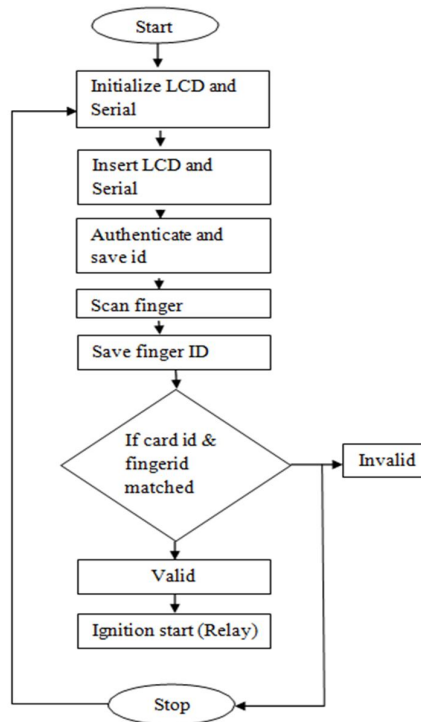
V. PROPOSED METHODOLOGY

The proposed system overcomes all the security problems in existing system and provides high security and efficiency. The ignition system gets "on" by giving their thumb finger and gets "off" by giving the same finger again, where the message is shown through LCD display i.e., "IGNITION ON" or "IGNITION OFF". Then the GPS location of the vehicle can be trapped and the continuous message is sent to the owner through SMS and through message he can navigate his vehicle.

This is a perfect/optimal solution for saving/protecting one from the hassle of stolen/lost key or an unauthorized accessing. The pattern of friction ridges on each finger is unique and immutable. This makes fingerprint a unique identification for everyone. Fingerprint scanner scans the fingerprints of users and used for ensuring authentication. Fingerprint scanning is more accurate and cost effective method and duplication is virtually impossible. A Fingerprint recognition system can easily perform verification where in verification, the system compares an input fingerprint to the enrolled fingerprint of specific user to determine whether they are from the same fingers. A user cannot start the vehicle until the user gets the permission from owner of the vehicle and even owner can track the location of the user. The running vehicle can be stopped using a button instead of using traditional method.

VI. BLOCK DIAGRAM

The 16 bit AVR microcontroller is inbuilt in the arduino and which is the centre of the user authentication and the vehicle ignition. We have used Fingerprint Sensor Module (FSM) to take thumb impression of owner as input in the system. Thumb impression of the owner is already stored in a FSM. When the fingerprint sensor scans the fingerprint of the user it sendsthe signals to the microcontroller. The microcontroller then matches the scanned fingerprint with the ones that are stored in its database. Once the fingerprint is matched, the microcontroller sends the desired signal to the driver circuit, then driver circuit gets closed and then will get starts. In the same way, when we again give the thumb impression as an input if the fingerprint gets matched then the vehicle stops.
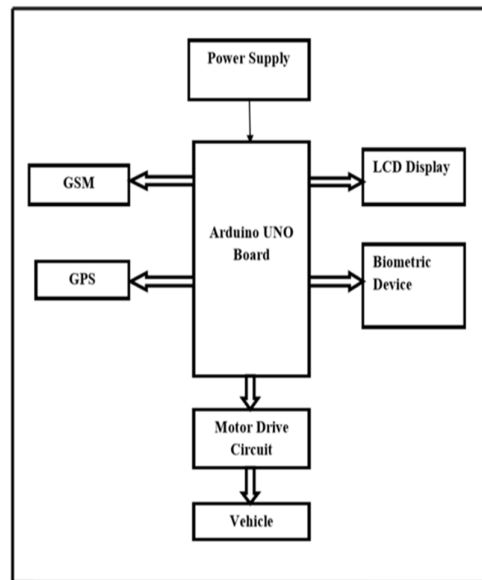

Figure 1: Block Diagram of Smart Vehicle

Since the microcontroller has a little bit of flash memory available, the fingerprints can be stored in it. Now user can start the scooty by placing the same finger that he/she have enrolled into the system. Since the vehicle will not start without the fingerprint. The vehicle needs to have Fingerprints saved off all the users who are going to drive the vehicle. An LCDdisplay is also used which would display the status whether the fingerprints are being successful authenticated or not. And he stops the running vehicle using thumb finger. The GPS and GSM

model is also used for extra security against the theft or misuse of yourvehicle where, it tracks the present location of the vehicle.

VII. ADVANTAGES

1. With the biometric based ignition system, the vehicle is safe with the authenticated user. Unauthorized users are restricted from accessing the vehicle.
2. The system is user friendly and can be used by anyone who lacks the knowledge.
3. Better reliability than the traditional locks.
4. Economically benefit.
5. User friendly.

VIII. RESULTS AND DISCUSSION

Snapshots of Smart Vehicle
This section gives the results with the snapshots of smart vehicle.

Figure 8.1.1 Real time Working Model Smart Vehicle

The ignition system gets "**on**" by giving them thumb finger and gets "**off**" by giving the samefinger again, where the message is shown through LCD display i.e., "IGNITION ON" or "IGNITION OFF".
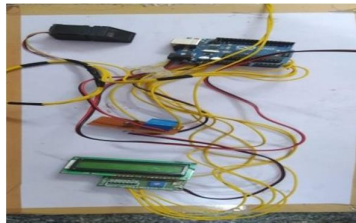

Figure 8.1.2 Circuit Diagram of ignition system

Then the GPS location of the vehicle can be trapped and the continuous message is sent to theowner through SMS and through message he can navigate his vehicle.
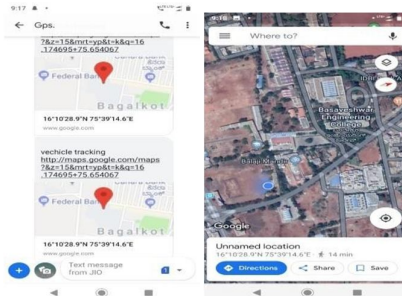

Figure 8.1.3 GPS Location

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IX. CONCLUSION

By the realization of the above proposed system one can learn many aspects of a digital electronics circuit. It gives the complete knowledge of designing microcontroller based system and developing embedded software. Thus fingerprint identification enhances the security of a vehicle and makes it possible only for some selected people to start the vehicle. 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. The reliability of any automatic fingerprint system strongly relies on the precision obtained in the minutia extraction process. A number of factors are detrimental to the correct location of minutia. In future we want to develop the same project but by adding a default user identifier and in future we can make this project very bright, by using a snapshot video camera whenever a thief ready for stealing the vehicle, as it records the total scenario happens.

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