

Security for Vehicle Ignition System by Finger Print Technology

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Abstract: *In this paper a security for vehicle ignition system by fingerprint technology is implemented. Using this paper the access to a car can be controlled using finger prints. For this an embedded finger print module is used in which the finger prints of the owner and his other authorized users will be fed into the embedded module. This finger print module is further connected to a microcontroller that controls the connection to the ignition of the car. Hence the car can only be started using a proper finger print match. Else the vehicle will not be started and sends an SMS to owner. The project will also include GSM module connected to the controller. In case of some unauthorized person trying to access the car using a unauthorized finger print then the controller, using the GSM module can automatically send SMS to the actual owner of the vehicle. Furthermore, since the controller already has a GSM modem it can also be used for additional applications like alcohol detection, over speed driving. In all these cases, automatic SMS updates can be sent to the owner of the vehicle if someone else is driving the vehicle. If required the vehicle can also be stopped if any of these conditions are detected.*

Keywords: Finger print sensor, GSM module, LCD, DC motor, Microcontroller, Arduino

I. INTRODUCTION

The main objective of the project is to prevent security from theft, so we proposed a new system. An important and reliable human identification method is fingerprint method is fingerprint identification. Fingerprint identification is one of the most popular and reliable personal biometric identification methods. Increasing number of theft cases of the vehicles, there is a need to increase the security level of the vehicles. Traditional and commonly used key available in the vehicles are well known to the thieves and thus it can be 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 levels. As embedded system complexity and computing power continue to grow, they are starting to control more and more of the safety aspects of the overall system. These safety measures may be in the form of software as well as hardware control. Mechanical safety backups are normally activated when the computer system loses control in order to safely shut down system operation. Software safety and reliability is a bigger issue. Software doesn't normally "break" in the sense of hardware. However software may be so complex that a set of unexpected circumstances can cause software failures leading to unsafe situations. Discussion of this topic is outside the scope of this book, but the challenges for embedded designers include designing reliable software and building cheap, available systems using unreliable components. The main challenge for embedded system designers is to obtain low-cost reliability with minimal redundancy.

II. LITERATURE SURVEY

Vehicle theft has become a matter of concern these days. In most of the cases the vehicle which is stolen is not traceable by the owner of the vehicle and also any Accident occurrence. So there is a demand for better security systems. This project presents a novel security system which makes use of GPS and GSM technologies. The Global Positioning System is a satellite based communication system. The GPS satellites transmit signals at L1 and L2 frequencies containing the ephemeris data, navigation data, codes etc which are used to determine the location of the vehicle in three-dimensional coordinates i.e., latitude, longitude, and altitude along with the precise time. The signals

from GPS satellites are available free of cost which enable the GPS receivers to determine the location, the time, along with the velocity. As the usage of vehicles is increasing rapidly with the growing population the number of vehicle thefts are also increasing day by day. And also the number of deaths due to the accidents in the remote areas are also increasing. As accidents are one of the major causes of deaths the road safety has also become a challenging task. According to reports thousands of vehicles are being stolen every year and recovering of the vehicle had also become a tough job as most of the stolen vehicle parts are separated and sometimes, they are sold to other persons as second-hand vehicles. According to road accident report lakhs of accidents took place in the country every year. And hundreds of people are losing their lives everyday due to the accidents as there are not getting help at the right time. This project is used to provide solution for the vehicle theft situations and also to prevent the loss of lives due to accidents in the remote areas. When the user sends the predefined message to the modem, the modem receives the message and intimates the same to the microcontroller. The microcontroller retrieves this message from the modem by issuing certain AT and T commands to the modem. Thus, after receiving the message from the modem, the microcontroller automatically locks the vehicle. This will be done perfectly without the involvement of any human. The locking of the vehicle is shown by the relay in this project. The smart card consists of finger print of the authorized driver. If this smart card is inserted into the vehicles security system only then the driver's authenticity will be verified by the system and will be allowed to drive the vehicle. In the prototype developed we used a relay and a motor to replace the conventional ignition system. The seat belt safety system incorporated with proximity sensor. So the output from the IR module will be read by and ignition will be given access through relay. Thus a multilevel safety system will help in authorized use of vehicle. Life is precious and short, and a large number of lives are lost due to accidents every day. There is a need to have accident detection system, location and information sharing system in place to save victims. [H. M. Sheriff[1], M. A. She did [2]and S. A. Senbel[3]] designed a "Real time traffic accident detection system using wireless sensor network" using Wireless Sensor Network and Radio- Frequency Identification technologies. In this they have explained the hardware prototype setup, the algorithms used, configuration of the setup advantages and the limitations of the entire system. The sensor in the vehicle is used to detect the accident happened. The sensor then the control to microcontroller. The microcontroller is used to send the alert message to respective members. They track the location where the accident has occurred using GPS[4] and directs the alert message to the respective authorities using GSM[5].

III. EXISTING METHOD

3.1 Voice Recognition

This technique that facilitates a natural and convenient human-machine interface using the voice recognition module. It extracts and analysis voice features of human delivered to a machine or computer through the mic. Voice recognition technique is the classified into many types based on different criteria such as the scope of the users, a number of words used for recognition, the naturalness of speaking. If the voice recognition level is more than 95% , then only the voice recognition is practically used.

3.2 Face Recognition

Face recognition system begins first with the localization of the human faces in a particular image. Detecting due to the variability of factors such as pose, expression, position orientation, skin color and pixel values, the presence of glasses or facial hair, and differences in camera gain, lighting conditions and image resolution.

3.3 Eye (Iris) Recognition

Eye recognition and tracking has been an active research field in the past years as it adds convenience to a variety of applications. It is considered a significant untraditional method of human computer interaction. Head movement detection has also received researches attention and interest as it has been found to be a simple and effective interaction method.

3.4 Drawbacks of Existing Method

- Can be hacked with prerecorded verbal messages.
- Less accurate when there is background noise.
- Has an initial period of adjusting to each user's voice.
- Problem with false rejection when people change their hairstyle, grow or shave beard or wear glasses.
- Face recognition systems can't tell the difference between identical twins.
- Iris scanning being a new technology is incompatible with most electronic gadgets present.
- As with other photographic biometric technologies, iris recognition is susceptible to poor image quality.

IV. PROPOSED METHOD

In the design of this fingerprint-based vehicle starting system, signals are generated by the Arduino to appropriate module circuit. The whole system is aimed to be constructed in a plastic casing to enhance heat evacuation and working efficiency of the system. The Arduino reads the state of the input buttons which could be either a 1 or a 0.

The signal Arduino gets from the input button tells what to work on at that time. This project is aimed to replace the push-button in vehicle ignition and create a more reliable and secured way of starting the ignition with fingerprint pattern only as shown in below fig 4.1

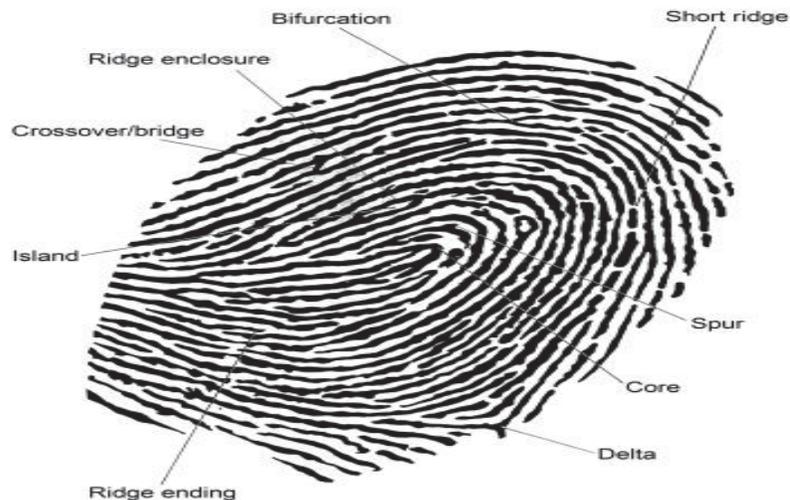


Fig 4.1: Fingerprint

4.1 How Fingerprint Matcher Works

The purpose of the matcher is to compare two fingerprint templates. The matcher doesn't use the original fingerprint image but rather the resulting templates. It then produces a similarity score which indicates whether two fingerprint templates originate from the same finger or not. Fingerprint recognition is the process of the verification of a person's identity by comparing their fingerprints with previously recorded samples. Fingerprints are impressions of human fingers, consisting of a series of ridges and grooves. Fingerprints captured in the system are located by minutiae points – points at which scars begin or terminate. These are further mapped with lines between them, creating a minutiae template.

Biometrics is a very strong authentication mechanism as it based on something that you are as opposed to something you know or something you have. Passwords and tokens are highly vulnerable to being lost or stolen. A weak or compromised password is the primary reason for the rising cases of security and data breaches. Passwords are the weakest link in an organization's security system and even strong passwords cannot resist sophisticated hacker attacks. Further, the costs of maintaining password and token-based systems are very high and inefficient. Resetting lost or forgotten passwords takes up IT support time and reduces employee productivity.

4.2 Typical Use Cases of Fingerprint Technology

Biometric systems are used in a wide range of applications, where accurate identification or verification is needed. Modern use cases of fingerprint technology are:

- Border control
- Identity verification in banking and finance
- Attendance management
- General elections
- Civil identification
- Law enforcement and criminal investigation

4.3 Fingerprint Module

A fingerprint sensor is an electronic device used to capture a digital image of the fingerprint pattern. The captured image is called a live scan. This live scan is digitally processed to create a biometric template which is stored and used for matching. Optical fingerprint imaging involves capturing digital image of the print using visible light. This type of sensor is, in essence, a specialized camera. The top layer of the sensor, where the finger is placed, is known as the touch surface. Beneath this layer is a light-emitting phosphor layer which illuminates the surface of the finger. The light reflected from the finger passes through the phosphor layer to an array of solid-state pixels which captures a visual image of the fingerprint. A scratched or dirty touch surface can cause a bad image of the fingerprint. A disadvantage of this type of sensor is the fact that the imaging capabilities are affected by the quality of skin on the finger. For instance, a dirty or marked finger is difficult to image properly.



Fig 4.2: Fingerprint sensor

Fingerprint sensor module is used as a way to verify identity. It is widely applied to computers, mobile phones, electronic door locks, access control systems, security safes, etc. This ultra-thin optical fingerprint sensor module is designed and manufactured by Jingly technology.

4.4 Working

The motorcycle will be ignited only when the authorized person scans his/her finger on the fingerprint module. The fingerprint of the authorized persons are stored in the fingerprint module. When any person put his/her finger on the fingerprint module then the data of the placed finger is matched with the stored data in the module. If the fingerprint data is found in the module, then match the condition occurs and the microcontroller ignites the bike otherwise bike will not start.

4.5 Applications

- Cars
- Motorcycle
- Transport vehicles
- Home Security Systems
- Lockers
- ATM's

4.6 Advantages

- Highly reliable
- Highly secure than other security systems.
- Processing speed is fast
- Economical biometric technology
- Less Memory Space
- Easy to use and user friendly

V. HARDWARE COMPONENTS

5.1 GSM Module

It can be used to make calls; send text messages and emails in case it is an Internet based SIM card. The GSM Module uses a dual band 900/ 1800 MHz GSM modem. It works on 4 V DC regulated power supply that is controlled by the microcontroller. Apart from that it is a plug and play device which means no drivers are required for this module to be installed. The purpose for this Hardware's usage is to send a message to the registered mobile number, when someone tries to access the vehicle illegally.



Fig 5.1: GSM Module

5.2 ATmega328 Controller

The ATmega328 Controller is an open-source controller board based on the microchip ATmega328 controller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and

programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share- Alike 2.5 license and is available on the Arduino website. The ATmega328 comes preprogrammed with a boot loader that allows uploading new code to it without the use of an external hardware programmer.

5.3 LCD

Liquid crystal displays (LCD's) have materials, which combine the properties of both liquids and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped together in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal materials and witted in between them. The inner surface of the glass plates are coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules to maintain a defined orientation angle.

5.4 DC Motor

A direct current (DC) motor is a type of electric machine that converts electrical energy into mechanical energy. DC motors take electrical power through direct current, and convert this energy into mechanical rotation. DC motors use magnetic fields that occur from the electrical currents generated, which powers the movement of a rotor fixed within the output shaft. The output torque and speed depends upon both the electrical input and the design of the motor. The term 'DC motor' is used to refer to any rotary electrical machine that converts direct current electrical energy into mechanical energy. DC motor can vary in size and power from small motors in toys and appliances to large mechanisms that power vehicles, pull elevators and hoists, and drive steel rolling mills. DC motors include two key components: a stator and an armature. The stator is the stationary part of a motor, while the armature rotates. In a DC motor, the stator provides a rotating magnetic field that drives the armature to rotate.

5.5 Relay

A relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal. Most of the high-end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications.

VI. SOFTWARE TOOLS

Here is some software which is used in proposed system.

6.1 Arduino IDE

For the automation using BT module and Arduino, we use the Arduino IDE (Integrated Development Environment) for programming of Arduino. Arduino is an open-source platform used for building electronics projects. Arduino consists of a both physical programmable circuit board and piece of software, or IDE that runs on your computer, used to write and upload computer code to the physical board. The Arduino Integrated Development Environment - or Arduino Software (IDE)[10] - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuine hardware to upload programs and communicate with them.

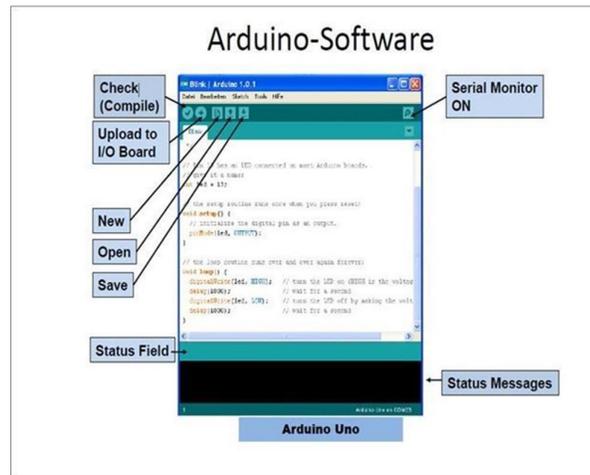


Fig 6.1: Arduino Software

Introduction to Arduino IDE:

- Arduino IDE is an open-source software that is mainly used for writing and compiling the code into the Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.
- It is easily available for operating systems like MAC, Windows, and Linux and runs on the Java Platform that comes with inbuilt functions and commands that play a vital role for debugging, editing and compiling the code in the environment.
- A range of Arduino modules available including Arduino Uno, Arduino Mega, Arduino Leonardo, Arduino Micro and many more.
- Each of them contains a microcontroller on the board that is actually programmed and accepts the information in the form of code.
- The main code, also known as a sketch, created on the IDE platform will ultimately generate Hex File which is then transferred and uploaded in the controller on the board.
- The IDE environment mainly contains two basic parts: Editor and Compiler where former is used for writing the required code and later is used for compiling and uploading the code into the given Arduino Module.
- It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process.

How to install Arduino IDE:

You can download the Software from Arduino main website. As I said earlier, the software is available for common operating systems like Linux, Windows, and MAX, so make sure you are downloading the correct software version that is easily compatible with your operating system. • If you aim to download Windows app version, make sure you have Windows 8.1 or Windows 10, as app version is not compatible with Windows 7 or older version of this operating system. The IDE environment is mainly distributed into three sections

1. Menu Bar
2. Text Editor
3. Output

VII. RESULTS AND DISCUSSIONS

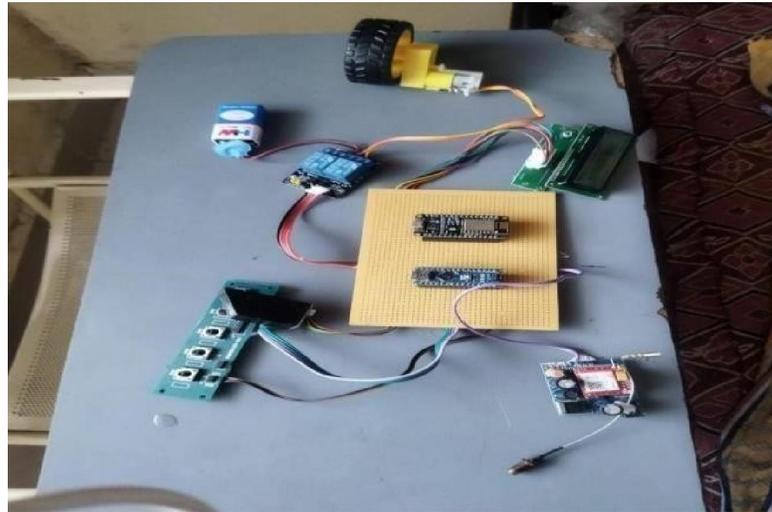


Fig 7.1: Before Implementation



Fig 7.2: After Implementation

The above figure shows after implementation of vehicle ignition system by fingerprint technology. The vehicle will be ignited only when the authorized person scans his/her finger on the fingerprint module. The fingerprint of the authorized persons are stored in the fingerprint module. When any person put his/her finger on the fingerprint module then the data of the placed finger is matched with the stored data in the module. If the fingerprint data is found in the module, then match the condition occurs and the microcontroller ignites the vehicle otherwise vehicle will not start.

VIII. CONCLUSION

This project may helpful to the people who are earning a very less salaries and the people who are richest, earning high salaries by keeping a powerful security on their own vehicles, they can move anywhere they want by parking the vehicles at unknown place. This may useful to each and every person in day-to-day life and they will never afraid of the vehicle's theaters. By this project come to existence that our country is developing and they move forward the leg with full of darkness in their mind.

A novel method of designing a low-cost, compact theft control system for a vehicle was designed & demonstrated in this paper. This work is an ultimate threat for vehicle thieves. Now a days, the vehicles are least secured when it is stolen by thieves. By this work which is presented in this project, it is very easy to track the vehicle at a higher degree of accuracy, since it is based on GSM Technology, which is very developed now. So, it is very much easy to get back the vehicle.

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