

# Anti-Theft Protection of Vehicles by using Fingerprint

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**Abstract**—The use of vehicle is a must for everyone. In the same way, safeguarding the vehicle against theft is also very essential and it is done by vehicle tracking system. The roots of Vehicle Tracking Systems lie in shipping industry. They required some sort of system to determine where each vehicle was at any given time and for how long it travelled. Modern vehicle tracking uses the active vehicle tracking and GPS technology. This technology provides with a split screen view when reviewing your driver's route. Stop and transit times, as well as speed information, are displayed in the bottom pane. It can easily toggle between stops by clicking the stop number on the track detail pane and the system can save the information about the engine that it is in working condition or stop by ignition ON/OFF detection. Fingerprint sensor captures the fingerprint images, matches the uniqueness of each print read by the sensor and compares it to the one stored in its module or local system database. A vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM).

**Keywords**—Vehicle tracking, GPS technology, fingerprint sensor, GSM technology, anti-theft system.

## I. INTRODUCTION

The vehicle tracking system is designed and Implemented for tracking the movement of any equipped vehicle from any location at any time. The designed in-vehicle device works using global positioning system and global system for mobile (GSM) communication/general packet radio service (GSM/GPRS) technology. The device is embedded inside a vehicle whose position is to be determined and tracked in real time. A microcontroller is used to control the GSM and GSM/GPRS modules. GPS modules get geographic coordinates at regular interval of time and GSM/GPRS module is used to transmit and update the vehicle location to the database.

A GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS). This allows the asset's location to be displayed against a map backdrop either in real-time or when analyzing the track

later, using customized software. The prevention of the vehicle from probable theft is the main aim of the project. To achieve this we are incorporating security by including biometrics, i.e. a fingerprint. In the beginning the owner of the vehicle must store his/her own fingerprint in the fingerprint module. The GSM modem is used to send and receive messages to and from the owner. The owner's mobile number has to be set fixed during the coding. To start the ignition of the four-wheeler one should enter the authorized fingerprint. If anyone enters an unregistered fingerprint, the owner will immediately receive a message and the local alarm system will be turned on. For theft prevention, we can also trace the four-wheeler by giving a call to the GSM modem which is embedded on the system. Then real time tracking begins and the GPS location of the vehicle is sent to the owner by SMS. The ignition of the vehicle can also be controlled through notifications to the system.



Fig 1.1-Image of fingerprint

### 1.1 Vehicle tracking

The vehicle tracking system consists of a GPS receiver which provides real time position of the automobile. This real time data is deposited in MMC (Main Memory Module) after a set time of intermission by the MCU (Main Control Unit). GSM module is undoubtedly associated with the MCU which is then used to propel and receive the SMS. GSM module takes the information from the MMC and sends this information to the registered user's mobile cell phone. This data consists of longitude, latitude, altitude, the speed over ground, and the course over ground, the real time and date. By using Google maps we can then locate the exact location of vehicle. The vehicle tracking system also has another singular feature which tells not only

the whereabouts of vehicle but also securing the automobile. To know the location of the automobile, it is necessary to stop the automobile as soon as possible. For repossessing the automobile, we are using to convey the message in such a way they are allied to the buzzer and other is associated to the power supply of the engine of automobile. User can simply deactivate the engine of automobile by sending a message from his cell phone and we can get the automobile back very soon. Passwords are the weakest component of many important security systems, so there is an interrelated push from various directions towards passwords with less friable security measures. The main emphasis while developing this vehicles anti-theft system was to assimilate the above features equally. The most significant feature is the vehicle security from theft and it has been guaranteed by providing certain layers of anti-theft protection.

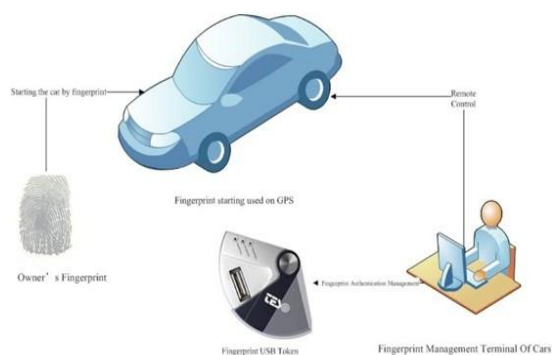


Fig 1.2 Illustration of anti theft protection and tracking of automobiles using GPS and GSM

## II RELATED WORK

**“Anti-Theft System For Vehicles Using Fingerprint Sensor”** The preventing car theft using microcontrollers and GSM modules, to achieve the incorporating security by including biometrics, i.e a fingerprints[1].

**“Fingerprint based authentication and security system using GSM and GPS technology”** Fingerprint sensor captures the fingerprint images, matches the uniqueness of each print read by the sensor and compares it to the one stored in its module or local system database[2].

**“A Study of Biometric Approach for Vehicle Security System Using Fingerprint Recognition”** vehicle security system using person identification techniques. The survey mainly emphasizes on major approaches for automatic person identification, namely fingerprint recognition and various existing vehicle security system[3].

**“A Review of Bike Security System Using Fingerprint GSM&GPS”** The Fingerprint

matching is done by utilizing the minutiae based Fingerprint recognition scheme. The vehicle is became on only with the bike key. If finger matches failed, it will result in vehicle getting immobilized and an alert message is sent to the mobile number of the owner[4].

**“Fingerprint Based Vehicle Security Monitoring and Tracking Using GSM & GPS Technology”** The level of supervision and management for cargo transport vehicles, especially trucks carrying coal it is important to develop transport vehicles remote monitoring module[5].

**“GSM and GPS Survey of Bike Security system using Biometric”** Biometric installment framework is much sheltered and secure and simple to utilize and even without utilizing any watchword or mystery codes to recall as contrast and past framework like Visa installment framework, remote framework and versatile framework[6].

**“Vehicle Ignition using Fingerprint Sensor”** The ignition of vehicle using fingerprint sensor and liquid crystal display, we are generating the same results along with same proficiency and accuracy in it by reducing its cost factor, so that it is easily affordable by customers and we can widely spread and implement the security in different domains[7].

**“Anti-Theft Vehicle Locking System using CAN”** high speed reliable Control Area Network (CAN), a sensor based mechanism is interfaced with Engine Control Module (ECM) using ARM7 TDMI microcontroller. In order to prevent vehicle from theft fuel flow sensor observes ignition of engine and attached GSM sends an alert message to owner[8].

**“car tracking anti-theft system”** The design and implementation of a Car Tracking Anti-theft System that protects and secures vehicles insurance companies suggest to their clients to equip their vehicles with a Global Positioning System (GPS) that can locate in real time their cars all over the country. The design and implementation of a Car Tracking Anti-theft System that protects and Secures vehicles[9].

**“A Smart Anti-theft System for Vehicle Security”** The Security, especially theft security of vehicle in common parking places has become a matter of concern. An efficient automotive security system is implemented for anti-theft using an embedded system integrated with Global Positioning System (GPS) and Global System for Mobile Communication (GSM). The preventive measures like engine ignition cutoff, fuel supply cutoff, electric shock system are installed in the vehicle which is controlled using user or owner GSM mobile. The owner can lock or unlock his/her vehicle with the help of SMS. This complete system is designed taking in consideration the low range vehicles to provide them extreme security[10].

**“ Real Time Vehicle Tracking Using Arduino Mega”.**To avoid these challenges, the Global Positioning System (GPS) is increasingly being used for management of vehicle fleets, recovery of stolen vehicles, mapping and surveillance. the design and implementation of a real time GPS tracker system using Arduino. When a user makes a call on the number that is registered on the GPS-GSM shield attached to Arduino, the user receives the location coordinates with data being stored continuously on an SD card simultaneously[11].

**” Cloud Based Multiple Vehicle Tracking and Locking system”.**The task of tracking of multiple vehicles and scaling such a system to track an enormous number of vehicles is a rigorous task. The need for similar inexpensive system is quite demanding. A cloud based multi-vehicle tracking and locking system is presented that lets the owner of the vehicle to track any vehicle in real time. In the event of a malicious activity such as burglary, the owner can lock the system[12].

**” Smart Vehicle Tracking System”.** It is amazing to know how simple ideas can give a whole new dimension to the tracking and navigation industry and smart vehicle tracking system is used for tracking the vehicles. You can optimize driver routes, save petrol or gas and time, reduce theft and control the vehicle functions. Many a times it is not required to track your vehicle or target globally. In majority of cases tracking is more restricted to local purposes only, such as tracking movement of vehicle within city[13].

**” Global Positioning System for Object Tracking”.** It is designed to describe how GPS Tracking System works and where it is useful in real world environment. GPS is mainly used in the military, farming, civil, transportation and commercial users around the world[14].

**“Anti-theft Protection of Vehicle by GSM & GPS with Fingerprint Verification”**The use of GSM and GPS technologies allows the system to track the object and provides the most up-to-date information about on-going trips. Moreover, fingerprint verification is done in the implemented system to ensure the driving of correct person. The implemented system is very simple with greater security for vehicle anti-theft protection and low cost technique compared to other.

### III .METHODOLOGY

In this paper an alternative design has been proposed to increase the security features of the device by integrating a fingerprint module with the Arduino microcontroller. The proposed design is an extended approach for automatic control of the device. Fig.3.1 shows the block diagram of the proposed design. The proposed design uses GSM/GPS based module to track

the device and to provide access to a person in a remote location. Vehicle locking framework pledges the best ensure way to secure the vehicle from various types of theft cases. It is a vehicle security gadget that offers a better and fancy insurance to one's vehicle.

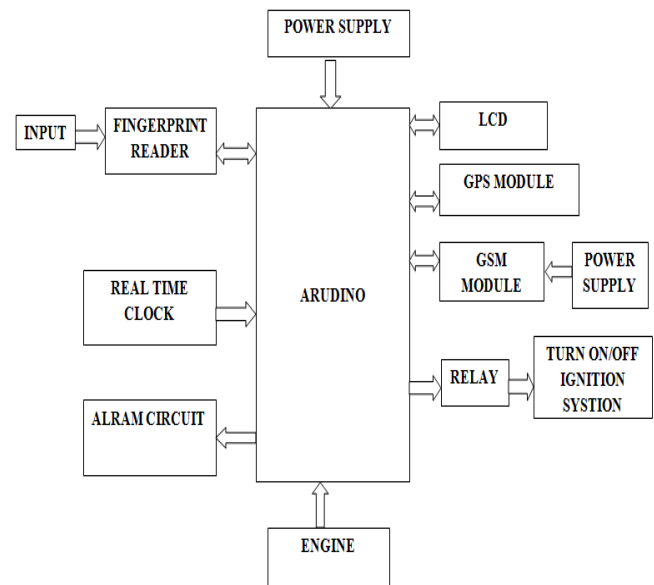


Fig 3.1 Block Diagram of the Vehicle Ignition System

The design involves incorporation of a fingerprint identification module which provides high security and authentication features. Inclusion of this module along with GSM and GPS module helps us to detect and correct the various faults in the device at a faster rate. Various components required for this design implementation are described in the following sub-sections.

#### 3.1 GSM Module

GSM module facilitates functionalities like sending and receiving messages on mobile phone. The GSM module contains an antenna for receiving signal from the network through the user's cell-phone. This GSM module is programmed with AT commands for communication. Here the serial communication with the microcontroller is done through receiver (RX) and transmitter (TX) pins. AT commands are used to check the SIM status, signal strength and connection.

#### 3.2 GPS Module

GPS is an acronym of Global Positioning System and it is used as a navigation system to find the locality of a device or a place accurately. GPS helps us to find the exact location of the device and thereby theft of the device is minimized.

#### 3.3 Arduino Microcontroller

In the proposed design we have used Arduino Mega 2560 microcontroller board which is based on ATmega2560. All the modules are controlled by

microcontroller and it acts as a driving force in obtaining the desired output.

### 3.4 Fingerprint Module

In this design a fingerprint sensor module is interfaced and powered through Arduino board. The user can use the Arduino IDE to enroll his fingerprint into the ATmega2560 microcontroller.

### 3.5 Liquid Crystal Display (LCD)

A LCD is a tool used for visual display of the output and it follows the properties of light modulation for its display. An LCD is required in this project to display various messages to user and thus making the device convenient. The various types of messages include a welcome message or an access request message or a permission granted message.

### 3.6 Relay circuit

Relay is an electronic component that can be used as a switch to control several circuits by one signal. In this project a junction box is used for real time implementation of the proposed design. Various appliances are connected to the junction box and they are operated with the AC power supply.

The owner of the vehicle must store his/her own fingerprint in the finger print module. The owner's mobile number has to be set fixed during the coding. To start the ignition of the four-wheeler one should enter the authorized fingerprint. If anyone enters an unregistered fingerprint, the owner will immediately receive a message and the local alarm system will be turned on. Then real time tracking begins and the GPS location of the vehicle is sent to the owner by SMS. The ignition of the vehicle can also be controller through notifications to the system. There are using two serial ports. One, for the GSM modem and another one for the GPS modem. The device is fitted on to the automobile. The whole monitoring of entire device is done by the mobile phone which delivers wireless connection amongst the vehicle tracking system device and the customer. The vehicle tracking device also has a dedicated SIM card slot in which a GSM SIM card is inserted in to receive and send SMS. The user can send an SMS through his mobile phone, know the location of its vehicle and also the facility to safeguard the vehicle.

## IV.SIMULATION RESULTS

The process of implementation starts with the initialization of LCD and GSM modem. After all the components are initialized, the user can directly control the device by sending a text message. This design also allows a person near the device to access it, if that person is given permission by the authenticated user. The person near the device terminal, inputs his fingerprint in the fingerprint sensor. If the fingerprint is a valid image, then a message will be sent to the device owner for access permission. If the owner of the device sends an access granting message, then

the person near the device can control it manually. But if the fingerprint image is found invalid, the LCD will show "invalid user" message and access will not be given to that person. The testing conditions for this project include several authorized and unauthorized attempts to access the system. These include:

- Authorized access i.e., registered fingerprint to access the system.
- Unauthorized access i.e. unregistered fingerprint.
- Vehicle being dragged for a specific duration.
- Notification from the user to activate and deactivate the system

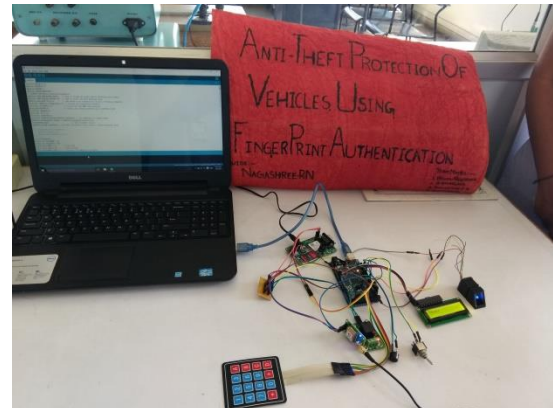


Fig 3.2(a): setup of the model

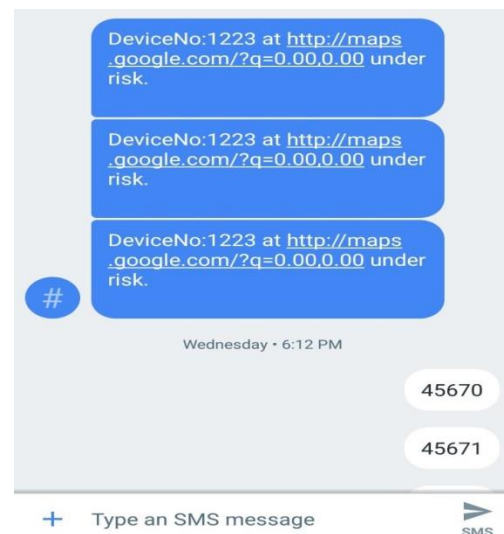


Fig 3.2(b): SMS alert

Finger print identification enhances the security of a vehicle and makes it possible only for authorized person. There future improvement in terms of efficiency and accuracy which can be achieved by improving hardware to capture the image or by image enhancement techniques.

## IV.CONCLUSION AND FUTURE WORK

In this paper an alternative approach for device switching which combines fingerprint identification technique with GSM and GPS functionalities has been proposed. This approach allows more than one person to control the device functionality and the authentication facility provided by the



fingerprint sensor helps to reduce the fault correction time. The Arduino board used in this model is least expensive and can be implemented in various applications. The application of device switching is not limited to control device from a long distance, but it can also be used in automobile applications.

The proposed design not only provides switching functionality, but also provides the exact location of the device. Hence theft of the device can easily be detected. It gives complete knowledge of designing microcontroller based system and developing embedded software.

In the future work cloud computing can be included to this project so that every activity performed on the device can be closely monitored. This reduces the need for storing all the log-in information in the computer storage.

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