

Fingerprint based Car Ignition System using GPS/GSM Module

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Abstract—As car theft is becoming a serious issue worldwide; car manufacturers are looking for advance ways to enhance the security of their vehicles. Fingerprint-based car ignition system is becoming popular as it provides an additional layer of security to a car, which makes it harder for the thieves to steal. This technology uses biometric technology, global positioning system (GPS) and global system for mobile communication (GSM) modules to provide real-time tracking and monitoring of the vehicle's location, speed, and other important data so that the owners will monitor their vehicles remotely. In this, car will start only if driver fingerprint matched with database of registered fingerprints. If it starts then GPS and GSM modules send a message to the owner's phone with the car's location and status. The system is highly customizable and can be adapted to different vehicles. Overall, the fingerprint-based car ignition system using GPS/GSM module is a robust and an innovative solution to the modern vehicle security concerns as this will be helpful in the case of theft or any other emergencies.

Index Terms— Global Positioning System (GPS), Vehicle tracking, Global system for mobile communication (GSM).

I. INTRODUCTION

Using the GPS/GSM module, the fingerprint-based car ignition system is a technology that allows the vehicle to start by simply verifying the owner's identity through fingerprints. A fingerprint scanner integrated into the ignition system is used to scan the fingerprint of the car owner. This scanner is connected to a microcontroller that verifies the owner's identity by comparing the scanned fingerprint with the stored fingerprint and sends the necessary signal to the vehicle's ignition system. The GPS (Global Positioning System) module will track the location of the vehicle and the GSM (Mobile Communication for Global System) module will communicate with the mobile phone of the vehicle owner. These modules are usually mounted on the vehicle dashboard and can be controlled remotely via a mobile app. If the scanned fingerprint matches the stored fingerprint, the microcontroller sends a signal to the GPS/ GSM module [1], which in turn sends a signal to the car's ignition system to start the engine, if not, it requires a login and sends an alert to the owner if done without permission. This technology provides an additional layer of security to prevent car theft and unauthorized use of the vehicle. This ensures that only the authorized owner can start the car, even if the key is lost or stolen. In summary, a fingerprint-based car parking system using a GPS/GSM module is a high-tech solution that combines fingerprint authentication, GPS tracking and GSM communication to provide enhanced security and control to car owners, as an advanced security measure to prevent this, increase car theft and vehicle security [6]. The system uses

biometric technology to verify the identity of the owner and includes GPS tracking and GSM communication, allowing real-time tracking and recovery of the vehicle in case of theft.

II. PROPOSED SYSTEM

A fingerprint-based car tracking system using GPS / GSM module is a complex system that includes several different technologies as shown in Fig.1. This system is designed to allow only authorized drivers to start the vehicle by scanning their fingerprints [2]. To implement such a system we need fingerprint scanner, microcontroller, GSM, GPS and relay module. The microcontroller will control the system and will interface with the fingerprint scanner, GSM and GPS modules. Here the relay module will be used to control the ignition system of the vehicle. Thus, the circuit diagram shown in Fig.2. Below is a list of components used in the proposed system, an overview of the components, and an overview of how the system will work.

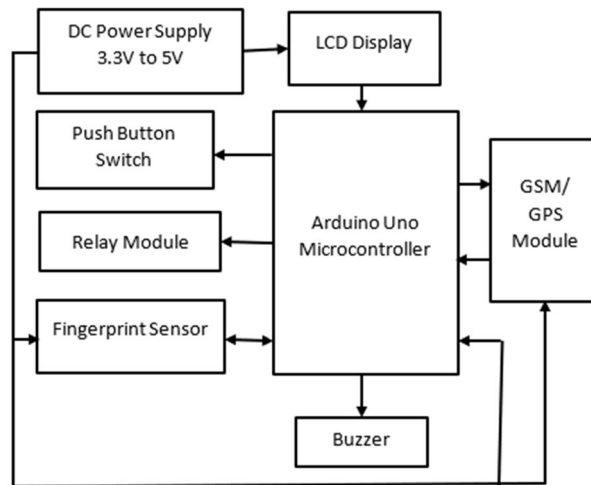


Figure 1. Proposed System

The main components used in this project are listed below:

- i. Fingerprint Scanner
- ii. Arduino Uno Board/Microcontroller
- iii. LCD (Liquid Crystal Display)
- iv. Buzzer
- v. DC Motor
- vi. GPS / GSM Module
- vii. Relay

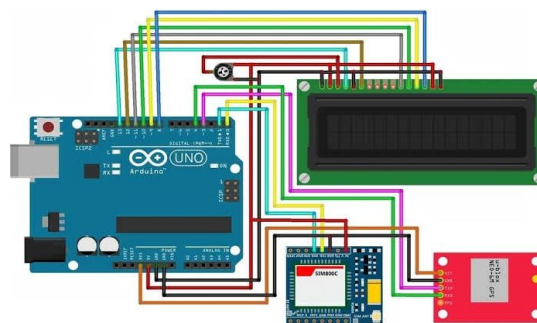


Figure 2. Circuit diagram of proposed system

III. OVERVIEW OF THE COMPONENTS

Microcontroller: A microcontroller can be used to control the vehicle's ignition system which is interfaced with the fingerprint sensor [3]. The microcontroller will also need to communicate with the GPS/GSM module to provide real-time location and monitoring of data remotely.

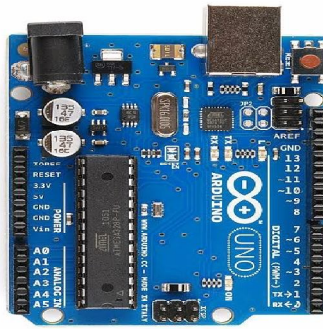


Figure 3. Arduino

Fingerprint Sensor: A fingerprint sensor is a biometric security technology that scans and analyzes a person's fingerprint for authentication purposes. It is used to grant access to secured areas, devices, and applications. Fingerprint sensors capture the unique ridges and valleys of a person's fingerprint and convert them into a digital template, which is then compared to a database of known fingerprints to determine if there is a match.

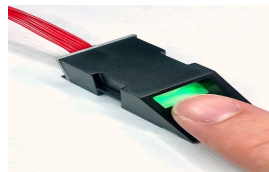


Figure 4. Fingerprint sensor

Liquid Crystal Display (LCD): A flat panel display device that displays several discrete or static images, usually with low information content.

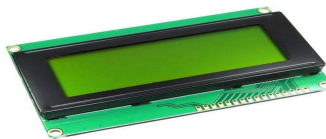


Figure 5. Liquid Crystal display

Buzzer: A buzzer or a beeper is an audio signalling device that produces a sound or tone when an electrical signal is applied to it. They can be easily controlled by microcontrollers, and can be programmed to produce different tones and patterns for different applications.



Figure 6. Buzzer

DC Motor: A DC motor is an electrical machine or motor that converts electrical energy into mechanical energy. DC motor take electrical power through direct current, and convert this energy into mechanical motion or rotation.



Figure 7. DC Motor

GPS/GSM Module: A GPS/GSM module can be used to send SMS alerts to the car owner's phone when unauthorized access is attempted. The module can also provide real-time location data of the car to the owner's phone, allowing for remote tracking and recovery of the vehicle in case of theft.

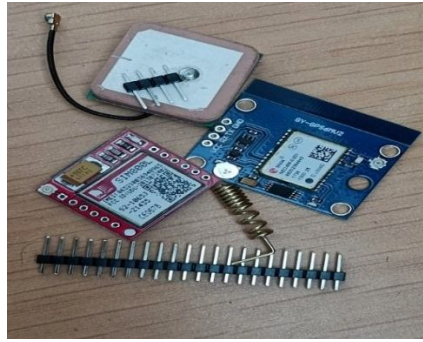


Figure 8. GPS/GSM Module

Relay: A Relay is an electronic device that is used to switch on or off an electrical circuit they are electrically operated switches that open and closes the circuits by receiving electrical signals from outside sources.



Figure 8. Relay

Ignition System: The ignition system can be modified to only activate when a valid fingerprint is detected by the fingerprint sensor. Here a relay module is introduced to ignite the vehicle as it will prevent unauthorized access to the vehicle.

Power Supply: A stable power supply will be needed to power the system. A rechargeable battery or a car's electrical system can be used.

The following steps for the proposed system are as:

Step 1: User have to register to the vehicle security system in order to access the vehicle by scanning his/her fingerprints using fingerprint scanner as it will generate an image of the finger and it will be processed by the microcontroller which will store the data of the user.

Step 2: To start the car, driver has to place their finger on the fingerprint scanner to authenticate themselves.

Step 3: The fingerprint scanner sends the fingerprint data to the microcontroller for processing.

Step 4: The microcontroller compares the fingerprint data with the stored fingerprints data to determine if the driver is authorized to start the vehicle.

Step 5: If the fingerprint is recognized, the microcontroller sends a signal to the relay module to activate the ignition system of the vehicle. At the same time, the microcontroller sends a message to the GSM module to notify the owner or authorized user that the vehicle has been started.

Step 6: The GPS module will continuously send the location data to the microcontroller, which can be used to track the vehicle in real-time.

Step 7: If the vehicle is stolen or in case of any emergency, the owner can use their smartphone to send a message to the GSM module, which will disable the ignition system and send the current location of the vehicle so that it can be easily tracked by the owner.

Overall, a fingerprint-based car ignition system using GSM GPS technology can greatly enhance the security of a vehicle and provide peace of mind to its owner. However, it is important to ensure that the system is properly designed, tested, and installed to prevent any potential security vulnerabilities or malfunctions.

IV. ADVANTAGES

The fingerprint-based car ignition system using a GPS/GSM module provides several advantages. Some of them are:

Increased Security: The system provides an additional layer of security to the car, making it harder for thieves to steal. As the system requires the driver's fingerprint to start the car, which will prevents it from unauthorized access.

Convenience: The system eliminates the need for keys to start the car, making it more convenient for the driver. It also saves the driver from the hassle of carrying keys around.

Personalization: The system can store multiple fingerprints, allowing different drivers to use the car. This feature is particularly useful for families that share a car.

Real-Time Tracking: The GPS/GSM module installed in the car provides real-time tracking of the vehicle. This feature is useful in case of theft.

V. RESULTS

A biometric based ignition system has been developed that can ensure vehicle safety and security. The ignition chain can only be secured by the authorized user's fingerprint. The system checks and unlocks the connection circuit in seconds, making the system more robust in nature. The system includes a built-in SMS facility that will notify the vehicle's owner of unauthorized access, so it can be redirected to the URL where the location will be located, or it can be tracked by searching for geographic coordinates and location via SMS. After authorized personal login and verified fingerprint, the final analysis of this vehicle tracking system will activate the vehicle ignition. In case of invalid vehicle identification, the vehicle connection will be disabled and a short SMS will be sent directly via the registered mobile phone owner.

VI. CONCLUSIONS

Fingerprint based car tracking system using GPS / GSM module helps to protect vehicles from theft. The main role of this system is to provide real-time location tracking of the vehicle, which can be useful in case of theft or other emergency situations. This technology can help locate vehicles quickly and accurately, increasing the likelihood of recovery. With this system, the vehicle can be turned off easily with just a simple SMS. This setting is more interactive because it has a screen to display some basic information about the vehicle. This system is further improved due to the presence of GPS support, which makes the system more effective, because the owner can prevent the car from being stolen and even track if the car has gone several kilometres without stopping.

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