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Advanced Vehicle Tracking with Fingerprint Security

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ABSTRACT

The primary objective of this project is to keep the car safe from theft. Theft of motor vehicles is on the rise in today's society. People have begun to make advantage of the theft-deterrent systems that have been installed in their automobiles. A low-cost car theft control strategy is being created utilizing a microcontroller with GPS and GSM technologies, in contrast to the costly commercially available anti-theft vehicular systems already on the market. In addition, if the car is involved in an accident, the accident detection element of this system will send an emergency alert message to the police, family, and ambulance along with the vehicle's specific position. Our technology is connected to a Google map, which allows us to pinpoint the precise location of automobiles.

Keywords- Fingerprint, GPS, GSM, Microcontroller

Introduction

Any equipped vehicle can be tracked from any location at any time using the vehicle tracking system, which is created and implemented specifically for this purpose. The global positioning system (GPS) and global system for mobile communication (GSM)/general packet radio service (GSM/GPRS) technologies are used in the development of the designed in-vehicle device. The gadget is installed inside a vehicle whose location is to be detected and tracked in real time with the help of the device. The GSM and GSM/GPRS modules are controlled by the usage of a microcontroller. Geodetic coordinates are obtained using GPS modules at regular intervals of time, and GSM/GPRS modules are used to communicate and update the vehicle's location to a database.

Because of the increasing number of stolen automobiles, vehicle monitoring systems have gained considerable appeal in recent years. Vehicle theft occurs when vehicles are parked or driven in unsafe areas, which is becoming more common. [1] This research investigates ways to prevent this kind of theft from occurring and how to make automobiles more secure. [2] The system that has been built consists of a single board embedded system that is equipped with the Global System for Mobile Communication (GSM) and the Global Positioning System (GPS), as well as a microcontroller that has been integrated into the vehicle. Using GSM and GPS technology, the system is able to follow the car and deliver the most up-to-date information about continuing excursions. [3] Furthermore, a fingerprint sensor is included in the system that has been established to guarantee that the proper person is behind the wheel. [4]

The system that has been established is relatively simple, provides more security for car anti-theft protection, and is a low-cost approach when compared to other systems. [5] If the car is involved in an accident, an instant alert is issued to the family, the ambulance, and the police, notifying them of the vehicle's present position. [6,9]

This strategy aids in the execution of quick actions in the course of attempting to steal the automobile. The design is both durable and straightforward. [7,8,10]

Currently, with practically all of the general population owning a car, theft occurs in parking lots and in some cases while driving in high-risk areas. [11] The safety of cars is vitally important, especially for public transportation vehicles. [12-14] Car tracking and locking system put in the vehicle, which tracks the vehicle's location and locks the engine motor while it is not in use. [15] It was determined where the car was located by utilizing the Global Positioning System (GPS) and the Global System for Mobile Communications (GSM). [16] These systems are always monitoring a moving vehicle and may provide status reports on demand. When the theft is discovered, the accountable party sends an SMS to the microcontroller, and the

microcontroller responds by sending control signals to the engine motor to shut it off. [17] To restart the car and access the door, an authorized individual must submit the password to the controller. This is more secure, more dependable, and less expensive. [18-20]

GPS tracking units are devices that use the Global Positioning System to detect the precise location of a car, person, or other asset to which they are attached and to record the asset's current location on a periodic basis. With the use of cellular technology, recorded location data may be retained within the tracking unit or communicated to a central location data bank, or internet-connected computer, for further analysis (GPRS). In this way, the location of the asset can be presented against a map backdrop, either in real time or later on while evaluating the track using specialised software. The primary goal of the project is to keep the car safe from potential thefts. Everyone must make use of a vehicle at some point. Defensive driving is also highly important when it comes to keeping your vehicle safe from theft. The impediment of car theft can be accomplished remotely by a qualified individual. Embedded computer technology is a new field that is being employed in a variety of applications. Implementation of a competent car security system utilising embedded systems, as well as the Global System for Mobile (GSM) and Fingerprint Recognition, is possible. Using person identification techniques, this research conducts a review of the literature on the topic of vehicle security systems. The survey focuses primarily on the most widely used approaches for automatic person identification, such as fingerprint recognition and other types of car security systems now in use.

In order to accomplish this, we are implementing security measures such as biometrics, such as a fingerprint. The owner of the car must initially store his or her own fingerprint in the finger print module in order for it to function properly. The GSM modem is used to send and receive communications between the owner and other people in the world. While coding, it is necessary to set the owner's mobile number as a fixed number. To start the four-wheeler, one must first put the permitted fingerprint into the vehicle's ignition. The owner will be notified instantly if an unregistered fingerprint is entered, and the local alarm system will be activated as a result. In order to prevent theft, we may also track the four-wheeler by making a phone call to the GSM modem that has been embedded in the system's hardware. The real-time tracking of the vehicle begins after that, and the GPS location of the vehicle is reported to the owner by SMS message. Controlling the ignition of a vehicle can also be accomplished by system-wide messages to the driver.

Literature Review

The Internet of Things (IoT) has been evaluated for the purpose of determining the precise location of a moving vehicle. The bus tracking system is based on GPS and a manual framework that is meant to display the current location of the bus. The framework necessitates the formation of a working organisation and may or may not include a GPS tracker. This framework included a transmitter that was installed on the cars as well as a recipient. The GPS system, which is installed in each vehicle, is responsible for the operation of the framework.

It makes use of external hardware and software implementation, and the purpose of these GPS tracking devices is to gather data in order to improve the efficiency, the safety of the employees, and the general operation of the organisation.

These real-time tracking systems are also employed in the Internet of Things. The web of things is the interconnected network of body devices, cars, structures, and other disparate objects that function together via the use of hardware, programming, sensors, and a system network, among other things. The Internet of Things (IoT) also anticipated advanced network gadgets, frameworks, and administrations that went beyond M2M communication [8-10].

The Continuous Bus Monitoring System [3], which makes use of GPS technology, displays the current locations of the transportation system [11]. The framework consisted of a transmitter that was mounted on receiver boards that were installed on the buses, as well as recipient sheets that were installed on the bus terminals. It provided its consumers with crucial transportation courses as well as other information [12].

We foresee a GPS-based following framework that monitors a vehicle's region of operation and velocity in response to information obtained from a smartphone ontent-informing framework.

By sending a second SMS to the framework, you may lock and unlock the current GPS directions of the engine car. Obtain the current location of the car at any time. This framework provides a constrained manner for drivers to cope with track and maintain control of their car. The current location of the car may be obtained at any time by the owner of the vehicle. Lock and unlock the car's current GPS directions in order to detect unauthorised development, and lock and unlock the vehicle's maximum speed in order to get a warning if the vehicle wanders out in front of that speed [13].

A variety of anti-theft methods have been developed throughout the course of the last several years. Many automobiles are equipped with an intelligent computerised anti-theft system [ICAT] that makes use of the notion of radio frequency identification (RFID) to deter theft. The drawback here is that keyless RFID cards can readily stolen, which makes them unusable. It is also possible for keys to become unresponsive when they come into touch with a metallic item [19].

a circuit board for information and security that connects with the engine control unit (ECU) and sensors located inside the vehicle Bus, Flex Ray, and the majority of the bus are capable of communicating with other vehicles, roadside infrastructure, and cellular phones equipped with wireless interfaces, among other things. Among the system's shortcomings is that the data is not updated in a timely manner, and the network is slow to provide dependable secure automobile communications [20].

The Auto cop mechanism, which is a video surveillance technology that can be installed in a car, is used by several systems.

The activities taking place inside the system will be continually monitored by the camera. When there are changes in the lighting conditions inside and around the system, the camera will not detect them effectively, which is the system's most significant flaw [21]. Other systems incorporate an in-vehicle anti-theft component that prevents the appliances from functioning if they are found to have been unlawfully transported to another vehicle. Among the disadvantages of this approach is the need for a secure processor and smart card chips for storing the Group Identification Number [22], which may be expensive. The Global Positioning System (GPS) is used by the sophisticated system to track the location of the targeted vehicle and its current location.

The GPS system makes use of the global navigation satellite system. When using Google Earth, it is possible to display the position information given by a GPS system. When utilising GPS, the most significant issue is that the signal might get weakened and the receiver system will not offer position information if the view of the sky is significantly restricted. Other elements, such as rainfall, fog, and snowfall, have an impact on it as well [23].

Because each of the other biometrics has its own set of disadvantages, the fingerprint recognition approach is unique in that it gives better levels of security and accuracy. Furthermore, the False Acceptance Rate (FAR) and False Rejection Rate (FRR) are kept to a bare minimum .

Problem Statement

Customers will be informed of their current location by GPS application, which is based on the source and destination for which they have enquired. The clients' location will be shared with a central server, which will have a social database containing all the records of the transportation and their voyaging plans on which they will participate in games. On the guide, the customer will be given the exact location of the transportation. As a result, the passengers may arrive at their destination in record speed and instantly board the transportation.

It is important to note that the Vehicle Tracking System (VTS) is a completely validated and armada organisation setup. It is the application that is utilised to identify the exact location of a vehicle by using various strategies such as Global Positioning System trackers and other course finding frameworks that function via satellite and earth station communications.

Everyone must make use of a car at some point. Defensive driving is also highly important when it comes to keeping your car secure from theft. The impediment of car theft may be accomplished remotely by a qualified individual. Embedded computer technology is a new field that is being employed in a variety of applications. Implementation of a competent car security system using embedded systems, as well as the Global System for Mobile (GSM) and Fingerprint Recognition, is possible.

Implementation and Results

The fingerprint sensor in this vehicle is the result of the vehicle locking system's efforts. The relay switch we utilised in our project is activated when the finger is saved in the finger print module, and it is closed otherwise. To begin, the user must register his or her finger with the help of push buttons or keyboard keys. To do so, press the ENROLL key and then verify that the finger is pointing in the direction of a shop. As a result, the user must now enter the ID (Location) by using the UP and DOWN buttons on their keyboard. Select the location / ID user from the drop-down menu and press the OK key (DEL key). After that, the LCD will instruct you to place your finger over the finger print block on the screen. The user must now place his finger over the finger print block to complete the process. As a result, the LCD will advise you to withdraw your finger from the finger print module and then to set it back in its place. The user must now place his or her finger on top of the finger print block once more. The finger print module now takes a photo and transforms it into templates, which it then stores in the memory of the finger print module along with the ID that was previously specified. In order to open the gate, the user must use the same finger on the computer that he or she has previously inserted or removed, and then press the MATCH key (up or down key). The user can easily add other fingerprints using the same procedure.

A very simple circuitry is used for the construction of an Arduino fingerprint security system; it consists of the Arduino, which controls the entire process, as well as a push button, a buzzer, and an LCD. Arduino is in complete command of the operation. The Arduino's pins D14 (ENROLL), D15 (DEL), D16 (UP), and D17 (DOWN) are used to connect the push button to the ground. D14 (ENROLL), D15 (DEL), and D17 (DOWN) are used to connect the push button to the ground (DOWN). In this example, the Arduino's digital pin D7 is linked to ground by a 1K resistor connected to a yellow LED, and the Arduino's digital pin D6 is connected to ground through the same way. In the Arduino, the Rx and Tx pins of the finger print module are connected directly to the software serial or digital pin D2 and the Arduino's D3 respectively. The Arduino board's 5v power supply is used to power the finger print module, which is connected to the board's PWM pin D5. The servo motor is attached to the Arduino board's PWM pin D5.

In the design of this fingerprint-based vehicle startup system, signals are generated by the arduino for the appropriate volume circuit, which is connected to the vehicle's ignition. The entire system is intended to be enclosed in a plastic shell, which will increase the heat discharge and overall efficiency of the system. The Arduino determines whether the input buttons are in the positions 1 or 0. The signal from the input button instructs the Arduino on what to perform at that particular moment. In this project, the push-button on the vehicle ignition will be replaced with a fingerprint pattern, which will be more dependable and safer than the current method of starting the vehicle ignition. Beginning programmers and electronics enthusiasts with no prior software or electronic skills will find the Arduino environment to be extremely user-friendly. Create items that are responsive and/or control light, sound, touch, and movement using the Arduino platform. Music instruments, robots, light sculptures, games, interactive furniture, and interactive clothes are just a few of the things that have been made possible with the Arduino microcontroller. This board has been utilised in a variety of educational projects all over the world, particularly by designers and artists who needed to quickly develop prototypes but did not need to have a detailed understanding of the technical intricacies behind their creations. Because it is intended for non-technical users, the programme includes a large amount of example code that demonstrates how to use the various functionalities of the Arduino board in a straightforward manner.

The development of a system that was based on Internet of Things technology was attempted by our team. We are employing a finger print authentication approach that is based on an image-based finger authentication method in this instance. It is necessary for the owner to place his finger on the start button before the finger print is compared to the datasets provided by the owner in order to start the bike. The system then determines if the user is a super user or a normal user, and if he is a super user, the system classifies him as such.

After that, he will be able to start the vehicle. In the event that the user is a normal user, the car will transmit the notification to the IOT web server.
The server will then send an automated SMS to the vehicle's owner as a result of this.
Following that, the vehicle will request an authentication from the owner.
In order to authenticate, the owner must first generate an authenticated key from the IOT web server, which can be done by pressing the authenticated button. After that, just the average user will be able to start the bike.
Otherwise, the vehicle will come to a complete stop. He also has the option of declining the request made by the normal user himself.
In the event that a thief attempts to start the vehicle, the system will quickly send an alert message to the owner and lock the vehicle in its current location.
Block diagram is shown in fig. 1

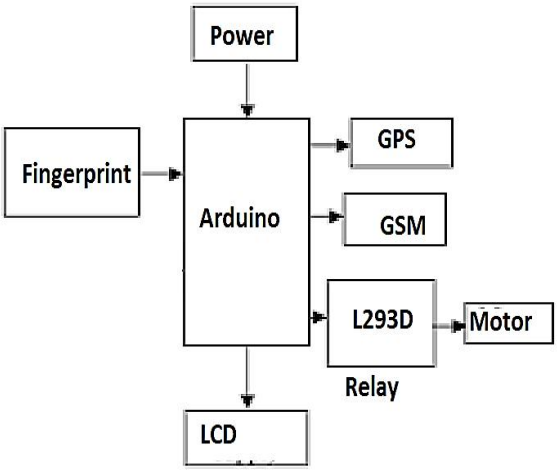

Fig. 1 Block Diagram
Fig. 2 shows the implementation picture prototype result.

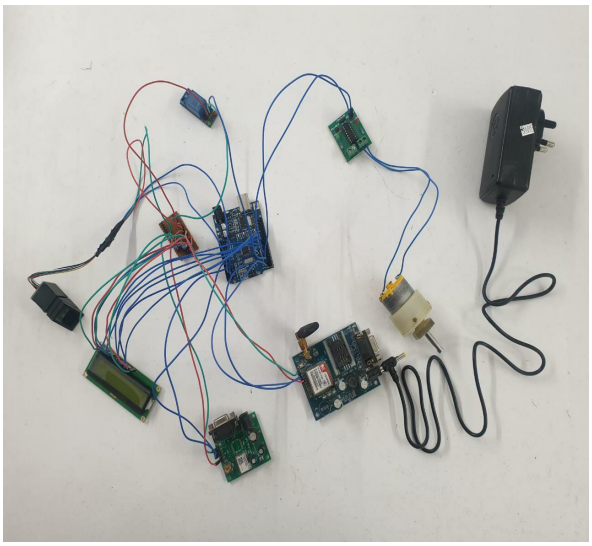

Fig. 2 Implementation Prototype Result

Conclusion

This work is a well-functioning prototype of a fingerprint-based vehicle gazing system that has been successfully tested. The intelligent agents in the system were able to interact effectively, and suitable output is provided in response to user input. The system asks the user's finger, processes it, and generates suitable output depending on whether the finger has been saved in the fingerprint module or not, according to the user's preference. The system is also capable of enrolling a new user's finger upon request, but it must first ask for a pass code before it can proceed. On-demand pass code modification is also available in the system upon request.
As a result, fingerprint technology enhances the security of an automobile by making it possible for only authorised people to use the vehicle. As a result of installing this system on automobiles, we are able to fulfil our car security system goals in a very inexpensive and readily accessible manner. An LED is used to display the output of the circuit. Biometric recognition technologies provide more security and convenience than traditional methods of personal identification.

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