



Article Title: Anti-Theft Protection of Vehicle by Using IoT and GPS with Fingerprint Verification

Anti-Theft Protection of Vehicle by Using IoT and GPS with Fingerprint Verification

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ABSTRACT

Vehicle tracking systems are getting more popularity due to vehicle theft has been increased dramatically during the recent years. Normally vehicle theft is happening on parking areas sometimes driving in unsecured places. In this research work we can explore that how to avoid this kind of stealing and also providing more security to the vehicles. The implemented system contains a single board embedded system that is equipped with GPS, IoT, DC motor, fingerprint module and wi-fi module along with microcontroller installed in the vehicle.

Keywords: Vehicle Security, Arduino Uno, Fingerprint Module, Wi-Fi Module, Anti-Theft, DC Motor.

1 Introduction

Car theft has grown to be a serious problem in recent years and needs to be investigated and found. It is crucial that the car is secure and safe. Despite the large number of mechanisms already in use, they are expensive and have certain drawbacks. Therefore, an effective security system is required. This project tracks down auto theft. The primary part utilized for GPS and GSM, as well as the DC motor user interface, is Arduino. With the help of the ESP 8266 Wi-Fi module, the vehicle's location is detected using the Global Positioning System (GPS) and the Internet of things (IoT). GPS is a space-based navigation system used to track the vehicle and it gives the location of the stolen devices in all weather conditions.

Internet of things is used to provide information to the user and alert him with a message that has the latitude and longitude of the vehicle. The entire system is operated by a switch that is turned on when we park the vehicles outside. It provides the latitude and longitude coordinates of the device using GPS antenna. In the event that the car is stolen, the aforementioned process is carried out, the information is put online, and the DC motor starts. This car theft prevention and tracking system is installed in client's vehicle as a theft prevention and rescue equipment. The automakers are attempting to enhance the security aspects of their vehicles by incorporating cutting-edge methods to prevent thefts, especially when it comes to automobiles.



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Despite the numerous technologies that have been developed recently to track and discourage auto theft, it was stated that as many as automobiles were stolen globally each year. The National Crime Information Centre (NCIC) reports that 1,192,809 motor cars were reported stolen in 2006, resulting in losses of \$7.9 billion. Many security and monitoring systems are made to help businesses with many of cars and different uses for them. Employee expenses and time spent on road assignments can be reduced with the help of a fleet management system. Additionally, assignments can be planned according to the location of the vehicle at that moment. For this reason, central fleet management is necessary for all large businesses to satisfy the varying requirements of consumers and to increase the productivity. Nevertheless, there are still certain security flaws in these technologies. For example, they cannot stop a car from being stolen, they cannot aid in its recovery, and they cannot inform users of the vehicle's whereabouts. Even if the user discovers that their car has been stolen, they are unable to permit them to interact with the vehicle via the internet. when sending data wirelessly. All mobile network service providers share this functionality. Because Wi-Fi technology is inexpensive, its use has grown in popularity.

2 Recent Works

This paper has focussed on Anti-theft vehicle Tracking System using Smartphone stated having 2 units. Those are user and In vehicle units. For these two microcontrollers are used and one GPS and GSM modules are implemented for detecting vehicle as well as for real time monitoring. A camera is placed in this system for capturing the images and smart phone for sending the email to the owner. The used GPS tracks the coordinates of geographical area and GSM is used for sending the information about the vehicle to the user. After that, vehicle tracking system implemented for sending the text message to the owner from the mobile. If the owner wants to respond then he may send another text message for access with the help of his mobile to the modem of the GSM.

This paper contemplates the idea of vehicle tracking to the owner through a text message from his mobile phone. The implemented tracking system in this having the model of GSM and module of the GPS are interfaced along with microcontroller of ARDUINO. If the TRACK SMS received by Arduino from the person with the help of GSM which uses the GPS for tracking the current location. Next Vehicle tracking using RFID developed by considering the cyber physical as well as computing systems of ubiquitous. After that a self-motivated system developed for tracking systems which having the smart vehicle tracking system that already used in some of the smart cities. This brought the change in transportation industry.

After that Smart Vehicle tracking method online for security applications (AMOTSSA) used for big data applications. For dealing with big data, a data analytic algorithm sets for investigation the goals support. Mrinmoy Dey, Md. Asif Mahmood) stated the "Anti-theft Protection of Vehicle by GSM & GPS with Fingerprint Verification". It is completely based on microcontroller and two-way GSM module. Fingerprint module is used to verify the user



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access. Before starting the vehicle the driver or owner need to verify the finger prints. If the fingerprint does not match with predefined one then the SMS will be sent to owner. Then the owner of the vehicle can lock their vehicle.

This paper presents the school bus tracking system is developed for the safety of school children, where it compares the current route with the predefined route. If they are different, an alarm is triggered. Unfortunately, this system cannot show the routes that the vehicle travelled over a given time interval.

Basically, there are three types of VAT systems, namely, the cellular tracking system, the wireless passive tracking system, and the satellitebased tracking system. A practical VAT system is developed based on either of them. The cellular tracking system uses cellular phones to transmit fleet location information. In the wireless passive tracking system, users have to pay one time upon purchase and installation of the device. The main disadvantage is accessibility where data can only be accessed when the vehicle is home. The satellite-based tracking system can give detailed reporting and real-time updates on company fleets even in places where there is no cellular phone coverage, though it is very expensive with a monthly service fee.

This paper presents the vehicle tracking system was proposed to track the vehicles in a city using RFID (Radio Frequency Identifier). However, the RFID tag needs to be assembled on the vehicle, and RFID readers must be installed on every junction of roads. Besides, the proper information of the vehicle cannot be received when the RFID range is over. Thus, this system is too costly.

3 Existing Project

A microcontroller-based system equipped with a GPS and GSM has been created in this research project. Two-way communication is possible using a GSM modem. In order to protect the car from theft, this study also looks at using the biometric protection system and the driver's fingerprint verification. Fingerprint recognition, also referred to as fingerprint authentication, is the process of confirming that two human fingerprints match in an automated behaviour. The fingerprint is one of the many biometrics that are used to identify individuals and validate their identities. Every person is known to have a distinct fingerprint image.

If the driver presents a verified fingerprint image prior to initiating the vehicle, the system will be deemed to be in fair working order. If a vehicle's location is changed without obtaining a fingerprint, the system will identify it as abnormal. After that, the system will send an SMS to the car's owner with the current location coordinates of the vehicle and the URL "GOOGLE MAP". Following that, every ten seconds, the owner will receive an SMS with the most recent coordinates until the verification of the fingerprint is correct. In addition, the car's owner can send a "missed call" to get the vehicle's location by SMS at any moment.



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3.1 Existing Block Diagram

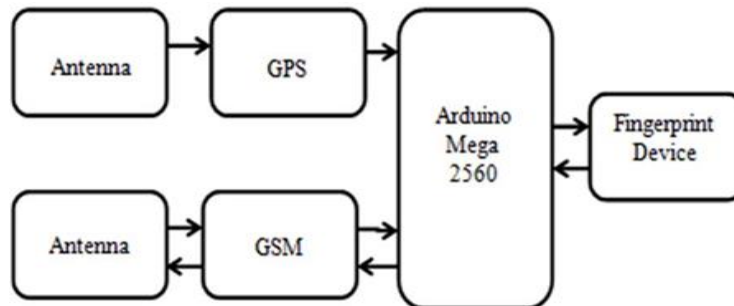


Figure 3.1: Block diagram of existing project

4 PROPOSED WORK EXPLANATION

The suggested system is a cutting-edge approach to car security designed to stop theft and illegal entry. This is how it operates: Assume you drive a vehicle that has this system installed. You place your finger on a unique scanner that is mounted on the door handle or next to the ignition when you get closer to your car. To verify that you are the rightful owner, this scanner scans your fingerprint. The mechanism activates and lets you start or unlock the vehicle if the fingerprints match.

Imagine for a moment that someone tries to meddle with your car. If they try to start the engine without permission, the system sounds an alarm right away, warning you and bringing the matter to light. However, the security goes one step farther. Additionally, the device has GPS technology built in, allowing you to track the whereabouts of your car in real time. You can easily keep an eye on your car's whereabouts and work with the police to get it back if it gets stolen. A user-friendly system with a single board incorporates all these characteristics. It offers strong theft protection while bringing ease and comfort to owners of cars. It guarantees your car stays safe in a variety of situations with encrypted communication and a backup power source. In conclusion, the suggested system creates a very effective antitheft solution for cars by combining fingerprint authentication, GPS tracking, and a wi-fi module, giving owners peace of mind about the protection of their priceless possessions. One of your car's distinctive features greets you as you go closer: a fingerprint scanner that's subtly mounted on the door handle or near the ignition. You shake hands with your car personally. The scanner instantly reads your fingerprint when you place your finger on it.

After verification, you can start the engine or open the doors, and it will seem like your automobile is acknowledging your touch and coming to life. If someone else tried to tamper with your vehicle, so this framework is alert at all times. An alarm is set off right away if someone not authorized tries to start the engine without your fingerprint. This alarm is more than just a sound; it's your car's method of calling for assistance and warning you and anybody in the area that something is wrong.



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5 SYSTEM DESIGN

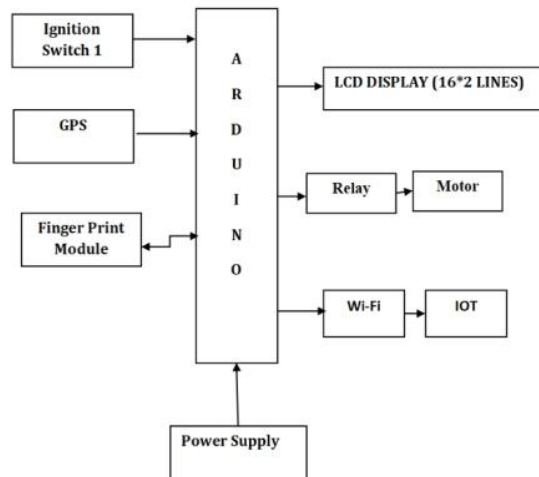


Figure 5: Proposed Project Block Diagram

6 System Description

Proposed system consists of various blocks for different methodologies that is discussed below.

A. Arduino UNO

Based on the ATmega328P, the Arduino UNO is a full microcontroller board that is suitable for use on a breadboard. Just use a USB cord to connect it to a PC. Six analog inputs, a reset button, an ICSP header, a power jacket, a USB port, and a ceramic resonator operating at 16MHz. Everything required to sustain the microcontroller is contained in it.

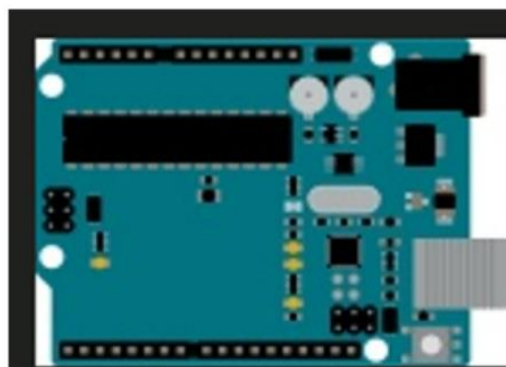


Figure a: Arduino uno

B. GPS (global position system module)

Ground-based equipment receives signals from the satellites that make up the Global Positioning System. GPS units do not transmit; instead, they passively receive satellite signals.



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GPS receivers need They are only utilized outside due to their unhindered vision of the sky, and they frequently struggle in places with dense vegetation or close to big structures. Atomic clocks on board supply an extremely precise time reference, which is essential to GPS operations. Every GPS satellite sends out information about its location and the time of day. To ensure that these repeating signals are sent at the same time, all GPS satellites coordinate their activities. Due to varying satellite distances, signals traveling at the speed of light arrive at a GPS receiver at somewhat various times. The different time it takes for a GPS satellite's signal to reach a receiver can be used to estimate the satellite's distance. The receiver can determine its three-dimensional position once it has estimated the separation from at least four GPS satellites. There are always several spare GPS satellites in addition to at least 24 active ones. The U.S. Department of Defence operates satellites that orbit at a height of approximately 11,500 miles every day, traveling at a speed close to 2,000 mph, for a duration of 12 hours (two orbits per day). Each satellite's orbit is precisely tracked by ground stations.



Figure b: *GPS Module*

C. WI-FI Module (ESP8266)

Computer game consoles, smart TVs, tablets, phones, computerized cameras, cutting-edge sound players, and modern printers. Devices with Wi-Fi perfection can connect to the Internet. via a remote passageway and a WLAN. A passage like this, also called a hotspot, can extend up to 20 meters (66 feet) inside and out to a more noticeable distance. Hotspot inclusion can be as little as a solitary stay with dividers that square radio waves.

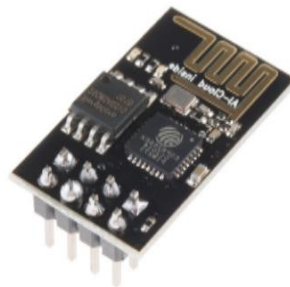


Figure c: *Wi-Fi Module*



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D. Fingerprint Module

Technology known as a fingerprint scanner recognizes and verifies a person's fingerprints in order to allow or prohibit access to a computer system or physical location. This kind of biometric security system uses a combination of hardware and software methods to recognize a person's fingerprint scans.



Figure d: *Fingerprint Module*

E. Relay

An electromagnet powers an electrical switch found in power relay modules. A separate low-power signal from a micro controller activates the magnets. The electromagnet pulls to open or close an electrical circuit when it is turned on. An iron yoke that provides a low reluctance path for magnetic flux, a moveable iron armature, a wire coil wound around a soft iron core, or solenoid, and one or more sets of contacts make up a basic relay. The moveable armature is connected to one or more sets of moving contacts and attached to the yoke. When the relay is de-energized, the armature, which is held in place by a spring, opens a gap in the magnetic circuit. Under these circumstances, one of the two sets of contacts is closed and the other is open while in this state. An armature is activated by a magnetic field created when an electrical current flows through a coil.



Figure e: *Relay*

A connection with the fixed contact is established or broken by the movement of the moveable contacts. The contacts that were closed when the relay is de-energized become open, breaking



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the connection, and vice versa if the contacts were open. The armature is forced back to its relaxed posture when the current to the coil is cut off. Usually, a spring provides this force, although in some situations, gravity can also be employed. The majority of power relays are designed to function quickly.

F. DC Motor

A DC motor, also known as a direct current motor, is an electrical device that uses direct current to create a magnetic field in order to convert electrical energy into mechanical energy. A DC motor's stator generates a magnetic field when it is powered. The rotor rotates as a result of the magnets on it being attracted to and repelled by the field. The commutator, which is affixed to brushes linked to the power source, supplies current to the motor's wire windings in order to maintain the rotor's continuous rotation. One of the reasons DC motors are preferred over other types of motors is their ability to precision adjust their speed, which is a prerequisite for industrial gear. The instantaneous start, stop, and reversal of DC motors is crucial for controlling.



Figure f: *DC Motor*

G. LCD Display

LCD is an abbreviation for liquid crystal display. It is one type of electronic display module that is utilized in many different circuits and gadgets, such as TV sets, computers, calculators, mobile phones, and so on. Seven segments and multi-segment light-emitting diodes are the major applications for these displays. The primary advantages of utilizing this module are its low cost, ease of programming, animations, and unrestricted character, special, and animation display options.



Figure g: *LCD Display*



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7 Result And Discussion

In a world where transportation is vital, detecting vehicle theft is crucial. Workplace safety can be attained with the system provided, and it also has a very low maintenance cost. Future applications can be developed using this system's theft detection capabilities, and it is essential for system applications focused on the Internet of Things.

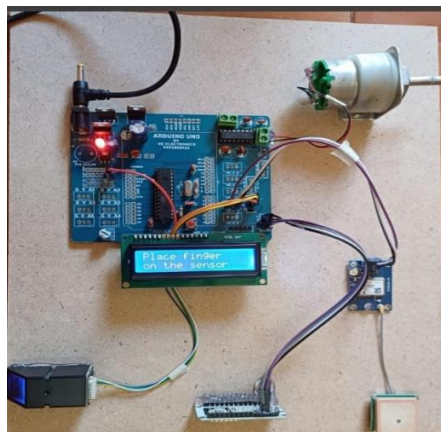


Figure 7.1: System Implementation.

The entire system was tested in a car after the hardware and software-related tasks were finished to make sure the IoT is operating effectively and meeting our needs.

Only the car will start after the fingerprint module has been successfully confirmed, and a text message containing the vehicle's status will be delivered to the owner's mobile device. Here the dashboard of ubidots is used to analyse the longitude, latitude and also the status of the vehicle.

- When vehicle is started ubidots shows the following reading about longitude and latitude.

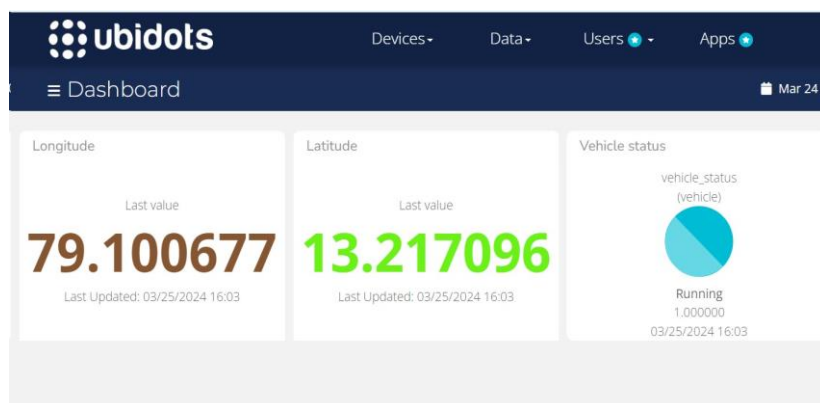


Figure 7.2: Vehicle Starting Status



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- When vehicle is stopped ubidots shows the following readings about longitude and latitude.

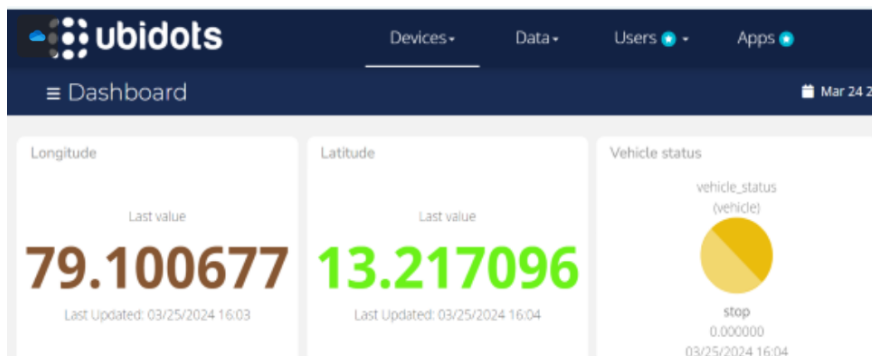


Figure 7.3: Vehicle Stopping Status.

- When the vehicle is started then the wi-fi module (ESP8266) send an email to the owner's mobile.

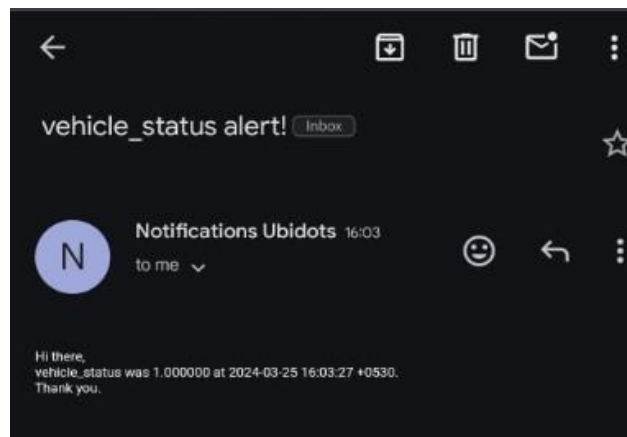


Figure 7.4: Mail Notification

8 Conclusion

GPS technology is used in an Internet of Things (IoT) based vehicle theft detection and remote engine locking system to assist users in identifying the vehicle while it is in theft mode and to activate the controlling mechanism technique. This improves the vehicle's controlling mechanism and lowers crime rates.

9 Future Scope

In the future, this system's reach could be increased by including more infrared emitting systems to identify a person's face when they wear a mask. Even though the person had their



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face covered, we could still recognize them because to the installation of this extra mechanism. In addition, we can use sensors such as fire, smoke, and gas sensors to send out alarms, respectively. An additional use for security systems is as a clever control device, such as a thermostat, which can be programmed online. The house's warming system can be controlled by the thermostat or other control device, which can also be used to adjust the system to the desired temperature. We want to provide a wireless relay connection in addition to a moveable wireless sensor. It is both mobile and controlled, suitable for business use, and assigns security to the entire building through a single system.

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