Detection and Intimation of Vehicle Theft in Parking Slots

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Abstract

Now-a-days, vehicle thefts have very high impact on public safety. There is a need in preventing those thefts. For vehicle theft detection and tracking system, we design a device which is cheap, compatible and also efficient. This device is vehicle tracking hardware which consists of GPS and GSM module for tracking the location of vehicle using co-ordinates and also it has a camera for live face capture of the intruder. In our system, whenever the vehicle's engine starts, an OTP will be sent to the owner's mobile for verification, if the OTP is not verified or incorrect OTP is entered, buzzer starts and an alert intimating theft will be sent to the owner. This hardware device is installed on the vehicle in the place where the intruder finds it difficult to identify and remove. The proposed system is an updated version of existing locking system in such a way that the device alerts the owner and notifies with updated location of vehicle at regular intervals and image of the intruder can be seen using live face capture system which secures the vehicles from theft.

1. Introduction

As the economy is developing rapidly along with the living standards of the people, the vehicles like automobiles have become the important modes for travelling. However, the popularity and use of vehicles are increasing which also leads to increasing thefts. In many places there are number of vehicles, vehicle components and contents that are being stolen. Vehicle theft that frequently occurs is something that causes huge loss to the property of people and threat to the safety of the public. Therefore, the vehicle theft should be recognized on time which will be of great

significance to ensure the public safety. Fortunately, as every city is being covered with the equipment for surveillance in ensuring public safety, there are surveillance videos being generated. The security features are being improved by the automobile manufacturers for their products by advanced technologies being introduced for avoiding the thefts particularly in the case of cars. This will provide the valuable information of the vehicle like its location to the owner. The tracking system also combines the location of the device in individual vehicles with software. In modern vehicle tracking and monitoring system we generally use GPS and GSM for finding the vehicle. The global positioning system is used for tracking the position or location and the global system for mobile communication technology is used to send and receive the message. The security system will recognize and check whether the person who enters in the car is authorized person or not. When an unauthorized person tries to start the car, the GPS and GSM modules that are attached to the system sends the thief's or unauthorized person's image and the current location as coordinates of the vehicle through SMS to owner of the vehicle. The camera will be installed at the ignition unit in the vehicle which will capture the image of the unauthorized person. The system will alert and notify the owner if there is any theft of the vehicle and will also send live location of the vehicle to the owner.

2. Literature Survey

In [1], the proposed system uses GPS and GSM Technology to track vehicles. The main idea is to recognize the face and detecting it using python OpenCV modules. The device stores the user face image and verifies it every time when the user tries to start the vehicle. If it's not the authorized user the engine does not start and sends the user location of the vehicle. The drawback of the system is the accuracy with which the authorized user face is recognized each time. Cost of the device is expensive and hard to manufacture.

In [2], GSM along with the micro controller is used to control the engine of the vehicle. The private message that has been already stored in the device needs to be sorted out for the engine to ignite. When the private message is correct the engine of the vehicle will be ignited. Each time the secret message fails to match up to maximum of three trials, then the device will starts to siren and start sending the warning message to the vehicle owner with the help of GSM system. The time limit taken to arrange the secret key is a question mark as user may take different timing each time to enter the key.

In [3], the objective of the paper is monitoring theft and effective management. The main components in the security unit are GSM, GPS, relay unit, current sensor and micro controller.

Analog signal will be transmitted by the current sensor to the controller when the car is in movement and the owner of the car gets notification of the vehicle.

In [4], the proposed device is used to verify the authenticated user using fingerprint and using GPS and GSM to locate the vehicle location in real time. The effectiveness of the sensor to identify the driver is not guaranteed. Also, it's impossible for other drivers to use the vehicle when the authorized driver is not nearby during emergency situations. Adding all the possible drivers finger print to the database is not feasible.

[5] This paper proposes a museum anti-theft method based on the IOT technology, which identifies whether the museum things and items are within the safe range through the RFID readers/writers. When stolen, the cultural artifacts will leave the effective RFID identification range, which causes the alarm system to run immediately, and then the system starts the anti-theft plan. The method has multiple advantages when compared to traditional infrared anti-theft, door magnetic detection. Real time tracking of the artifacts is also possible in this system.

3. Existing System

In existing system, the implementation of security system is done based on the car mechanical key. In case if the key input entered is incorrect, the vehicle will get immobilized. Mostly the security systems for anti-theft are based on RFID tags which are used to control entry of person inside the vehicle. An alert will be sent to owner in case of any intrusion. Even though there are many devices for theft detection now a days, each device has its own drawbacks. In this system, there is a radio transmitter, that sends a coded radio wave signal to the receiver to the receiver unit which is present inside the car, which is used for locking or unlocking the vehicle's door. The vehicle tracking is done with the help of GPS. There are only sensors for alarming purposes that are available in the existing system. There is no facility for capturing the intruder's or thief's image and also to authenticate the driver.

4. Proposed System

The vehicle monitoring and detection system is used for monitoring using the vehicle with the help of GPS. The facial recognition sensor enables the acquisition of images by using a web-based IP camera, and it can easily hide in a place into the vehicle. GSM and GPS are based on Tele-surveillance. The system was set up. The solution for vehicle theft detection is identifying and

capturing the face of the intruder who is trying to steal the vehicle. When the actual driver is driving the car, the device will be in user mode. Once the owner parks the car, he can activate the device to theft mode. Once the device is in theft mode and the intruder tries to start the engine, the device will send an OTP to the owner's mobile number. The driver has to enter the OTP within 30 seconds. If the driver does not enter the correct OTP the device will send a live GPS location to the owner and also he can capture the face of the intruder. The locking and detecting device of the vehicle is installed at the truck. If a person attempts to damage this apparatus, the siren will be activated and immediately send alert message to the owner. The primary purpose of this project is to prevent person-level vehicle theft system in addition with allowing users to see intruder details. The vehicle theft tracking device can be installed in the vehicle anywhere. The proposed work aims at capturing face images of the intruder in real time in case of theft.

Fig. 1 - Proposed System Architecture
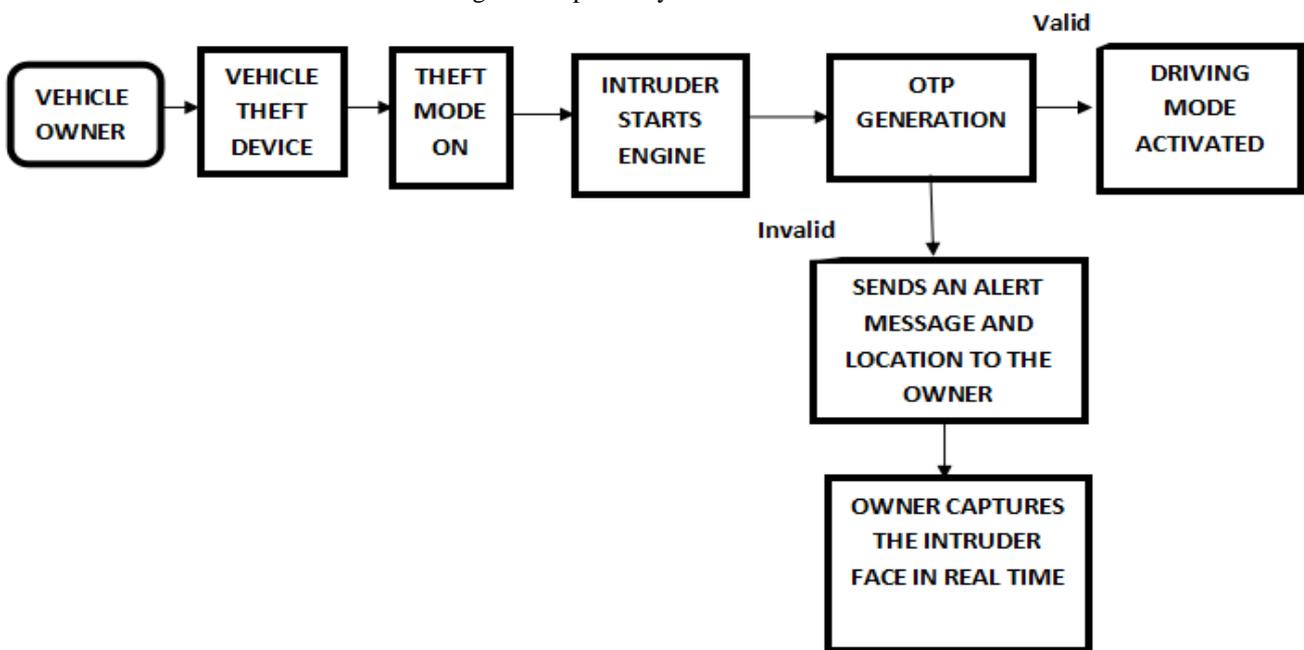
PIC Microcontroller

The PIC micro controller used here is 16F877A. This performs the key role of processing the received data from the sensors and transmitting them to the Li-Fi module. The advantage of micro controller such as low power consumption and flexibility to connect other devices makes it as the best choice among other processors.

Fig. 2 - PIC Micro Controller

LCD

LCD stands for liquid crystal display. This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply. The 16 x 2 intelligent alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols.

Fig. 3 - LCD Display

Keypad

4x4 keypad modules are available in different sizes and shapes. 4x4 keypad will have eight terminals. In them four are rows of matrix and four are columns of matrix. These 8 pins are driven out from 16 buttons present in the module. Those 16 alphanumeric digits on the module surface are the 16 buttons arranged in matrix formation. As 16 keys are connected in matrix formation the module is a little complex to use. The module gives only 8 pins as a way for interacting with 16 buttons.
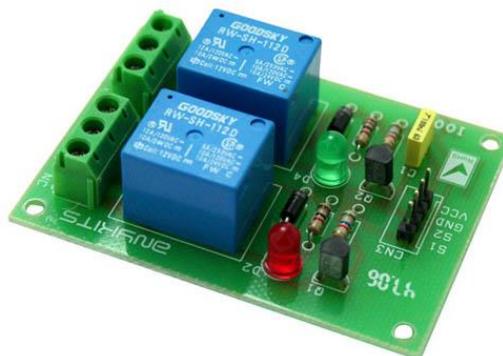
Fig. 4 - Keyboard Module
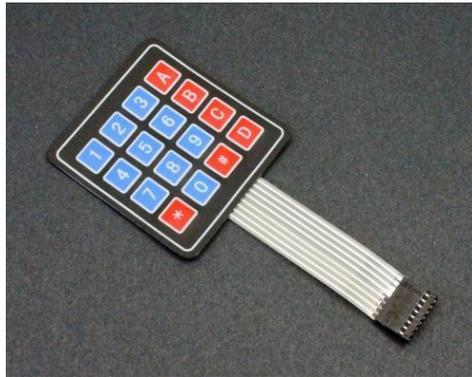
Relay Board

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. A relay is an electro mechanical switch which is activated by an electric current.

Fig. 5 - Relay Board

DC Motor

A DC motor converts direct current electrical power into mechanical power. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it experiences a torque and has a tendency to move. This is known as motoring action. When magnetic field and electric field interact they produce a mechanical force. Thus, a DC motor can be used at a voltage lower than the rated voltage. But, below 1000 rpm, the speed becomes unstable, and the motor will not run smoothly. However, using the motor outside this range will result in high temperature rises and deterioration of motor parts.

Fig. 6 - DC Motor
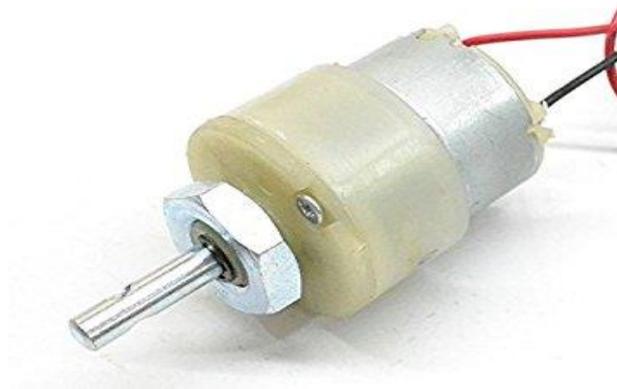
ESP32 Camera

Wireless cameras are proving very popular among modern security consumers due to their low installation costs and flexible mounting options. Some wireless security cameras are battery-powered, making the cameras truly wireless from top to bottom. Wireless cameras can be mounted/ installed in locations previously unavailable to standard wired cameras.
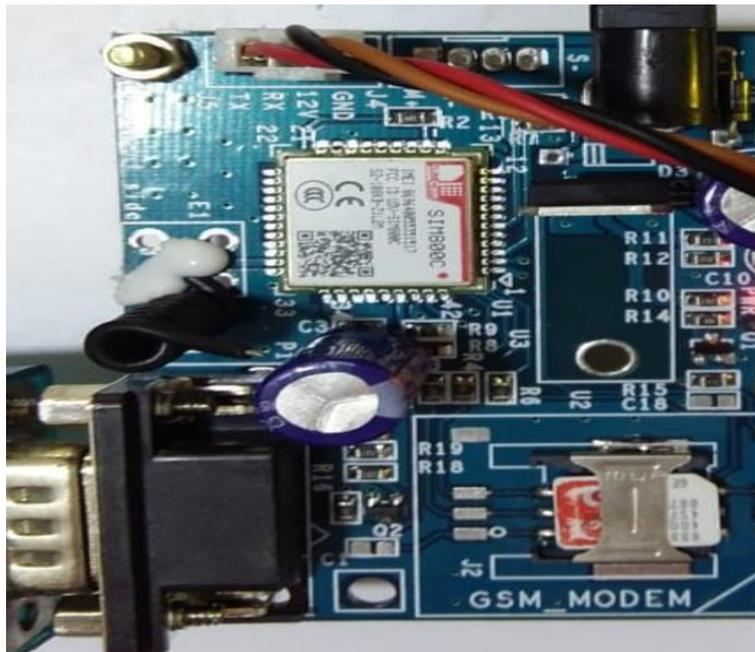
Fig. 7 - ESP32 Camera

GSM

This GSM Modem can accept any GSM network act as SIM card and just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications.

Fig. 8 - GSM Modem

GPS

The Global Positioning System (GPS) is a global navigation satellite system that provides location and time information in all weather conditions. The GPS concept is based on time and the known position of specialized satellites. GPS satellites continuously transmit their current time and position. A GPS receiver monitors multiple satellites and solves equations to determine the precise position of the receiver and its deviation from true time.

Fig. 9 - GPS

MP Lab

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC micro controllers, and is developed by Microchip Technology. MPLAB and MPLAB X support project management, code editing, debugging.

Embedded C

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. It includes a number of features not available in normal C, such as fixed-point arithmetic, named address spaces and basic I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C.

5. Results

The device is built and is set up. It is installed in the vehicle. There are two modes. One is user mode and another one is theft mode. When the authorized owner is driving the car, the device is in user mode. When the driver parks the car, the device is put into theft mode. When an intruder or thief tries to steal the vehicle (i.e.) when the thief tries to start the engine, vehicle theft monitoring device will send OTP to the authorized owner and if the correct OTP is not entered, the device will send an alert message to the owner along with the coordinates of the vehicle [Fig (ix)]. The user can also see the thief in real time using the camera installed along with the device.

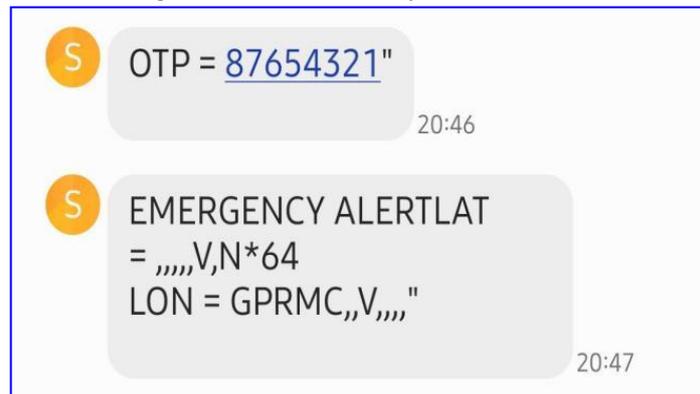Fig. 10 - OTP Received by Vehicle Owner

Fig. 11 - Working of Device in Theft Mode

6. Conclusion

In this proposed work, we have efficiently designed a system for detection of vehicle theft with the use of GSM and GPS. When theft is attempted, it is sensed by device and OTP is sent to the owner. If the person doesn't enter the correct OTP, then the person is thief and an alert is sent via GSM network to authorized mobile (SMS) with location. This device is fixed in vehicle where the thief finds it difficult to identify and remove. This device is verified to be highly successful in preventing vehicle theft.

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