

An Agile Security System for Automobiles using IoT

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Abstract: *Thieves are becoming smarter day-by-day which results in increase of looting of automobiles like scooters, cars and many other. To overcome this problem there is a crucial need for an effective system that diagnoses the vehicle theft. In this paper, an IoT based agile security system by using Raspberry Pi as the central processing unit of the entire system, a lightweight, cheap and efficient system is researched, built and explored. The Linux Embedded System gathers the data from Passive Infra-Red (PIR) motion sensors, pressure sensors, gas sensors, Global Positioning System (GPS), Pi camera, buzzer, and Liquid Crystal Display (LCD). The system has generally 2 modes. They are: Owner mode and Theft mode. If the system detects any intrusion in the vehicle it gives an alarm on detection, capture the image of the person by using image processing technique and identifies who is trying to unlock the vehicle and send coordinates of the vehicle when the intruder opens the vehicle door and starts moving the car, along with images of intruder to the owner by using a GSM module. By using GPS module, we can be to get the latitude and longitude of the vehicle remotely when the intruder has theft the vehicle.*

Keywords: *Image Processing, Intruder, Vehicle Theft, Smart Device, IoT.*

I. INTRODUCTION

The crime rate associated with vehicle theft is increasing aggressively with the increase in the number of automobiles. More than 10 million vehicles are stolen worldwide each year and only few vehicles are traced by the trackers. Day-by-day criminals are becoming more sophisticated and have reached to the stage of consummation against the current vehicle safety systems.

Vehicles like cars and bikes that are theft are often used for major crimes that are happening which results in property damage, physical injuries and loss of life when an accident occurs. This requires an efficient theft detection system to identify who has stolen the vehicle. The device for vehicle tracking is attached to the vehicle in such a way that the intruder doesn't know that such a smart device is existing in the vehicle.

In present generation Internet of Things (IoT) will help us to connect most of the devices. All devices can be grouped together to exchange data with users who are in remote locations to make thing easier and simpler. Securing those devices which are connected to the internet is very difficult task.

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The security designs that are made is very expensive which can't be tolerable by middle class people. An agile security device is a IoT based hardware device used to protect someone's vehicle from being theft and unauthorised entry.

In this paper, an agile security system which alerts and notifies the owner in case of unauthorised access to the vehicle intrusion has been identified by the system. And, also the device sends latitude and longitude of the vehicle along with the intruder images which are captured by using camera. The owner will be notified about unauthorized access to the vehicle attempt and the vehicle coordinates will be sent via an e-mail and SMS using the GPS module. To detect vibrations from the vehicle a piezo electric sensor is used. If there is any fire in the vehicle it can be detected by using a gas sensor and if there is any person inside the vehicle during fire it can be identified by using PIR sensor.

The device is connected to internet by using a Wi-Fi Dongle. We will be using python programming language to issue commands for the board how it needs to work. What it should do when any event occurs. When the vehicle is parked at any location after switching off the engine the device gets activated automatically. When intruder tries to access the vehicle, the system gives an alarm and sends intimation to the owner.

II. LITERATURE SURVEY

The main disadvantage of the hardware devices is it can be easily damaged by same hardware instruments. We reviewed recent alternative theft detection system which uses image processing technology to captures the driver's image and compares it with the owner's image which is already stored in database to detect an intrusion in the vehicles. But there are certain drawbacks and weaknesses and fingerprint detection which on two-wheelers seems cumbersome and very costly which is the major constraints for two wheelers. Thieves and offenders have developed methods of counteracting existing systems.

The requirement is to design a system which takes size, cost and power as constraints. In [1] the paper shows the purpose of controlling and maintaining the fleet. The system has two units: the primary one is the GSM, GPS, relay, current sensor, and microcontroller protection panel. When the car is moving, the current sensor will relay an analog signal to the controller and confirmation is achieved by sending SMS to the driver. To broadcast the messages, we use CAN bus by which we can connect to the entire vehicle network.[2]

In very short span of time the exact location of the vehicle will be sent to the recipient. The GSM modem interfaced with the microcontroller receives the message, the yield of which enacts a feature that cripples the vehicle's ignition by using a flow sensor that causes the vehicle to stop. In [4], the author described a mechanism for alerting the user if the unauthorized person attempts to remove the vehicle and stop

the ignition and disable the gadget.

In [5], author proposed a car safety system that included a GPS and a GSM module. Through this substructure, the user interacts with vehicles and determines their present areas and status using Google Earth, and customer can follow the location of the notified vehicles.

In [3], the motors in the vehicle are operated by using microcontroller and GSM. The declared secret word has to be figured out for the vehicle to get going. To start the vehicle there is a secret word which has to be sorted by the intruder. Any time secret key neglects matching up to the three trials then framework will start the siren and send the message via GSM network to the owner.

III. PROPOSED ARCHITECTURE

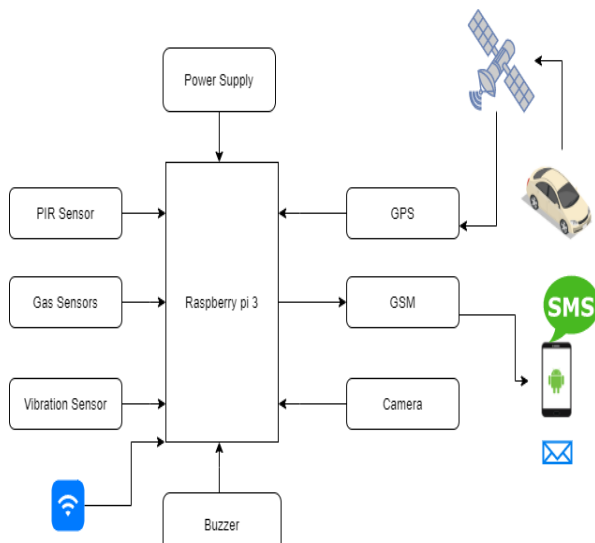


Fig 1: Architecture of Agile Security System

IV. IMPLEMENTATION

A) Working

The Raspberry Pi is a single-board computer with a 32-bit credit card size using the Broadcom BCM 2837 System on Chip (SoC), featuring a 1.2GHz quad core ARM cortex-A53 and a videocore4 GPU. The system will not come with a real-time clock (RTC) so an operating system has to use a network time server. A battery-powered RTC can be added to the device by using the I2C interface. The power supply is from the USB hub which delivers 5v, 2A dc output.

To provide the host server the Ethernet cable is attached to the Pi and to the Laptop. Raspbian Squeeze is used as operating system and python IDE to write the functionalities that the device has to be performed. To store the data on the pi board a 16GB bootable SD card with Linux is attached with the device. The internet for the external applications in the board can be integrated by using an external USB Wi-Fi dongle. The v2 camera module attaches to the CSI-2 camera port and uses a short ribbon cable to absorb 250mA of power from the frame.

The data from the camera is processed and converted into image which can be stored into the SD card. To reduce the amount of storage we use 5 megapixels camera which takes 720p resolution images and also it consumes less power. The images are stored in.jpeg format. To get the position and time in all weathers we use a Neo-6m navigation system that contains GPS module already fixed in it.

NMEA (-157dBm) format is the output of the GPS receiver. When the intruder has stolen the vehicle the agile system inside the device will send an alert along with notification to the owner of the vehicle through SMS and email.

B) Algorithm

- 1) The program must initially operate on user mode.
- 2) Theft mode can be switched on using a switch after the car has been stopped.
- 3) PIR, pressure and gas sensors track all burglaries continuously
- 4) If the output is HIGH on those pins, the camera module instantly captures the image.
- 5) Latitude and longitude, date and time of the vehicle can be tracked by using a GPS module.
- 6) If the vehicle is relocated by 120 metres, then the updated device coordinates are also saved by the GPS module.
- 7) The camera image is sent to the user by using GSM through registered E-mail and SMS along with a connection to the respective location.
- 8) a link will be shared in the SMS and e-mail which gives the live location of the vehicle that has to be tracked.
- 9) User mode can be turned on again, once the user enters the car.

V. RESULTS

By using Ethernet cable and USB cable all the sensors are interfaced with the Raspberry pi 3 module. Whenever the intruder tries to access the vehicle or if there is any fire inside the vehicle or fire in the surroundings of the vehicle the alarm will start giving beep sound continuously and the live location of the vehicle will be shared with the owner of the vehicle. In Addition to that an email along with SMS will be sent to the owner which contains captured images of the intruder and a link to the Google maps.

VI. CONCLUSION

We've learned a lot about system design, board interfacing components and efficient, compact programming. Vehicle theft detection system is the need for the hour, and Raspberry pi can be used to make a lightweight, powerful, and cheap device. Eventually a strong product can be made from this framework. By increasing the cost of the components, we can increase the accuracy. We can add contact numbers for ambulance and contact number for police station so they can reach that location very quickly. The application can allow the user to generate the voice-based alert. Additionally, the features that can be added to block the ignition unit by sending any instructions to the microcontroller make it impossible for the vehicle to start for better safety. The whole system can be combined with an Android app and the data can be stored in a database to make it easier for the user to access it.

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