Biometric Security System Using Arduino for Vehicles

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Abstract -

Objectives: This paper advance a noble system to prevent vehicle from thefts. This system provides a fingerprint security to unlock the vehicle. If an unauthorized person tries to steal the vehicle, user will be notified in its registered mobile number. Along with that if the vehicle moves from its position, an alert message will be sends to the authorized user.

Methods: Fingerprints of the authorized user is first stored in the memory of the system. If the fingerprint matches with the stored ones then the controller triggers the powering circuit and the engine starts else if the burglar tries to start the car it will sends the alert message to the owner and if the vehicle moves from its location it will send an alert message along with the GPS location of that vehicle.

Findings: The system is implemented using Arduino Uno. The GPS, GSM, Wi-fi module and a SD card is additionally associated with the board. Along with that the system incorporates certain other sensors to stop the car burglary.

Application: The system works well with low-price range vehicle employed with keyless entry and is unique because it uses IOT to protect the vehicles.

Index Terms - Arduino, Fingerprint Scanner, GPS, GSM, IOT.

1. INTRODUCTION

With the advancing arrangement of world advancements, a great deal of research is being held on each field. There had been a lot of research in biometrics. This study was focused on biometric application for vehicles. There are lot of incidents we come across every day as car burglary, towing car, harming vehicles and much more. In order to short this problem many initiatives had been taken but it is not so effectively implemented. This project is about providing more advanced security to the vehicle and avoiding the unauthorized use of the vehicles.

After the invention of the wheel, vehicles have been used in one or the other form. With the development of stream engine, vehicle is turned into the form which we see today. Earlier crank shaft mechanisms were used to ignite the vehicles. After that the ignition is done by using the keys. And now, the keys are being replaced by push down button. This project was started with the sole purpose of replacing keys with some conventional method and enhancing the security of vehicles. With the presentation of Biometrics in the eighteenth century, security progression in innovation has gone up to different levels [1].

In the 21st century, the use of biometric based systems has an exponential growth. Biometric is becoming a new state of art method of security systems. Nowadays biometrics are used to prevent unauthorized access to cellular phones, ATM, laptops and many other securities concerned things. They have changed the security system from something to remember (such as password) or what you always bring (such as keys) to biometrics (retinal patters, fingerprints, voice recognition).

2. RELATED WORK

Fingerprints have been deductively examined for a long time in our general public. The qualities of fingerprints were contemplated as ahead of schedule as 1600s. But using the fingerprint for identification first occur in mid - 1800s.

In this project the hardware and the software both play a vital role [2]. Instead of using the conventional methods to start the vehicle, fingerprint of the owner is used to ignite as fingers can't be duplicated. There is a 16-bit AVR microcontroller is used which is the center of the User Authentication and the Vehicle Ignition [3]. The fingerprint sensor scans the fingerprint which sends the signals to the microcontroller. Since the microcontroller has a little bit of flash memory available, the fingerprints can be stored in it for verification.

Three buttons are present which the GSM module also used to send an alert message to the owner if an unauthorized person tries to access the vehicle [4]. In this system the vehicle can't be started without the fingerprint of all the authentic users.

In [5] and [6] the components include an intel Galileo gen 2 kit, RFID sensor and 7408, 7404 IC chips. Here FOB and RFID sensor are electrically coded with the radio frequency range. When the correct radio frequency matches between the sensor and FOB as programmed, then the user need to scan their fingerprint using the fingerprint sensor. Once the RFID receives a radio frequency from the FOB and a fingerprint input

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is detected, then the output of the two sensors is given to 7408 IC as input to perform a logical AND operation i.e. if both the inputs are correct (1) then the output is also correct (1) and if anyone is wrong then output will not come. In this way this system recognizes the fingerprints.

But what if you want to give the keys to valet boy to park the car... as he doesn't have the registered fingerprint???

3. PORPOSED MODELLING

Thinking about the downsides of the current ones we proposed this framework. This system utilizes an Arduino to program the diverse sensors. In this project two distinct kinds of sensors are being utilized, fingerprint sensor to uniquely identify the owner and the motion sensor for getting the data about the vehicle in the event that it disengages from its standing position without the owner's acknowledgement.

3.1 Working

The system that we are proposing and trying to implements has its roots in IOT. In this paper the user needs to enroll his/her fingers with the help of push button/keys.

To do this client need to press ENROLL key and after that the LCD requests for entering location/ID where finger will be a store. So now client needs to enter ID (Location) by using UP/DOWN keys. After choosing the Location/ID client needs to press an OK key (DEL key). Presently the LCD will request for placing finger over the finger print module. Now the client needs to put his finger over finger print module. At that point LCD will request to expel the finger from finger print module and again request for placing the finger.

Now client needs to put his finger again over fingerprint module. Then fingerprint module takes an image and converts it into templates and stores it by selected ID in to the fingerprint module's memory.



Fig 3.2 - Working Model

Now client can start the vehicle by placing the same finger that he/she have added or enrolled into the system and then press MATCH key (UP/Down key). By the same way, the client can add one or more fingerprints. If the finger does not match with the enrolled one then an alert message will be sent to the authorized person which is all performed by GSM module.

Now this all about securing the vehicle from starting the engine. But what if the vehicle is stolen i.e. TOW!!!



Fig 3.1 – Flow Chart of system operations

For that this system is using a motion sensor that will generate an alert message if the vehicle will move from one place to another. The message will be sent to the authorized person by the GSM Module along with the location of that vehicle which will be send via the GPS module. This system uses Arduino to program the two different sensors. The program is written by using Arduino Uno software as per the system requirements.

- 3.2 Components Used
- 3.2.1 Arduino

Arduino is an open-source platform used for building electronic gadgets. Arduino consists of both a physical programmable circuit board (microcontroller) and a bit of programming, or IDE that keeps running on your PC, used to compose and transfer PC code to the physical board.

The Arduino stage has turned out to be very prevalent with individuals simply beginning with gadgets, and all things considered. Dissimilar to most past programmable circuit sheets, the Arduino does not require a different bit of equipment keeping in mind the end goal to stack new code onto the board – you can just utilize a USB link. Moreover, the Arduino IDE utilizes a streamlined adaptation of C++, making it less demanding to figure out how to program. At last, Arduino gives a standard form factor that breaks out the functions of the micro-controller into a more accessible package.



Fig 3.3 - Arduino

3.2.2 LCD display

An LCD is used to display the results of the entire project. The presentation is a dot matrix display used to show characters, alphanumeric characters, symbols and so forth. The LCD unit receives the character codes from the microcontroller, latches the codes to its display data RAM, transform each character code into dot matrix pattern and displays the character on the LCD screen.

3.2.3 GSM module

It is a versatile correspondence modem. The possibility of GSM, these days essential decision for versatile correspondences, was created at Bell Laboratories in 1970. GSM, which works somewhere in the range of 850MHz and 1900MHz recurrence groups, is an open source cell innovation utilized for granting portable administrations, both voice and information included. We insert the sim card which sends the alert message to the registered phone number when burglar tries to access the vehicle.

3.2.4 GPS module

It was developed by the DOD of the USA. Something between 24 to 32 MEO satellites are used that transmit spot-on microwave signals. From these signals the GPS tracks the movement and velocity and time of the object.

The outcome is given as longitude and latitude bearing a precision of 10 to 100 meters, which in turn are utilized by different programming applications to provide directions while exploring amid a drive or a walk.

3.2.5 Fingerprint sensor

It is a 4 pins gadget which is an optical biometric fingerprint reader which can be utilized for different applications, for example, get to control, wellbeing store locks, banks, and auto locks and so on. The model utilized in this undertaking is the R305 unique finger impression scanner module. The reason being it is one of the least expensive unique finger impression reader accessible in the market. One of the primary highlights is that it expends less power, and it gives the comparable execution with regards to the costly ones. The fingerprint sensor is utilized to peruse the unique finger impression of the effectively enrolled client/clients. It can likewise be utilized to include/erase new/existing fingerprints.

Its 4 pins are Tx-In, Rx-out, GND and +5V. Tx-In and Rx-out pins are utilized for information and yield reason. The GND and +5V are used for power supply and grounding purpose. It is very easy to implement, being a simple connector.

At the point when the client puts his finger on the sensor for the first time, a 3-Dimensional picture of the unique mark is captured. It is then put into the memory of the controller by using different calculations. Internally, it just converts the pieces of code which the microcontroller stores it in its memory and verifies it. Alongside the fingerprint sensor three buttons are additionally utilized among which one of them is utilized for detecting the fingerprints. The other two are utilized at whatever point a unique finger impression is excessively included or erased. It examines the edges of the fingers and stores it in the memory of the controller. If there should arise an occurrence of erasing the unique mark, we need to initially put the finger impression that should be erased, and on squeezing the erase catch we need to examine that same unique mark once more. This erases the unique mark from the memory of controller. There are fundamentally two modes in a unique mark scanner, first is filtering and the second is composing.

When the user places his/her finger it will scan and saves it in its flash memory. The scanner uses AND gate for verifying the user. If the input by the person matches with the stored one, then output is correct and if anyone input is false the output will not be generated and it will send an alert signal to the registered device through GSM module as programmed by Arduino.



Fig 3.4 - Fingerprint Sensor

3.2.6 Motion sensor

Motion sensor are being used to detect the vehicle is in stationary state or not. In this system we are using the PIR motion sensor as it is ideal to detect movements. The PIR sensor measures infrared light in the environment.



Fig 3.5 - Motion Sensor

This sensor has two built-in potentiometers to adjust the delay time and the sensitivity. The Arduino is used programmed such that if the vehicles dislocates from its standing position it will send an alert message to the registered device. Wiring the PIR motion sensor to an Arduino is truly clear – the sensor has just 3 pins –

GND - connect to ground

OUT – connect to an Arduino digital pin

5V – connect to 5V

4. RESULTS AND DISCUSSIONS

This paper mainly focuses on the security of vehicles by igniting it with sensors. The fingerprint scanner is programmed by Arduino which is used to scan the fingers of authorized owner to start the vehicle and if any burglars tries to start the engine it will send an alert message to the owner register devices through GSM module. Through Arduino the motion sensor is modified to such an extent that if the vehicle moves from its standing position by somebody then it will send an alarm message alongside that the GPS area will be followed by the GPS module and it will send to the enrolled gadgets.

Our proposed architecture and system have been successfully simulated and implemented in real situation. The results show that our algorithm significantly reduces a lots of car burglaries and enhance the security of vehicle. The efforts made in this paper are intended to improve the safety of vehicles in every aspect and accordingly meaning to improve the quality existence of individuals.

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