

## SAFETY AND SECURITY SYSTEM OF CAR USING FINGERPRINT BIOMETRIC SCANNER AND DEVELOPING MOBILE APPLICATION WITH IOT.

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<b>Aamir Arzbegi</b> Student, NCRD's Sterling Institute of Management Studies, Nerul, Navi Mumbai <b>aamir.arzbegi1702@gmail.com</b>	<b>Mayuri Dhanve</b> Student, NCRD's Sterling Institute of Management Studies, Nerul, Navi Mumbai <b>mayuridhanve96@gmail.com</b>	<b>Dr. Pragati Goel</b> Associate Professor, M.C.A. Dept. SIMS, Navi Mumbai <b>goelpragati78@gmail.com</b>
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### ABSTRACT:

*We all are living in modern world, where the current IT market it trying hard to reach out to their customer with their best products. Their trying to build products that might give high security using various protocols, usability environment for the customers. To build such a product internet of things (IOT) play an important role. The concept of IOT started gaining its popularity in 2010. IOT does not only provide usability but also give a pleasure to work faster and stay updated. The Internet of things (IoT) is a system of where number of computing devices are interlinked with each other. They contain unique identifiers which are also called as UIDs. These UIDs have an ability to transfer messages across the network without requiring human-to-human or human-to-computer interaction.*

*The paper explains a mobile application to track the car thefts. If an unregistered person tries to steal the vehicle, a notification will be sent to user and police using the IoT based system called the GPS tracking system. The functionality also includes collection of data of fingerprints that are stored in the storage of the system. If the stored fingerprint of the user and the RFID matches then the microcontroller sends a signal to the circuit of the enterprise content management which is known as ECM. If the burglar tries to steal the car using any other means a notification and location of the vehicle will be sent to the owner's mobile app. All this process of sending notification and location of the car using GPS is done using cloud technology.*

*This system is developed with the idea of using Intel Galileo gen2 board. The following technology such as GPS, GSM, Wi-Fi module and a SD card is also connected to the board. The idea behind using this system is that it will not let the ECM generate power on the engine. There are also some sensors used to set an alarm when a burglar tries to steal the vehicle. If the burglar attempts to turn on the engine using some other means,*

*such as paper clips or needles the owner will be notified about the event and the location of vehicle.*

*Developing security systems for users, storage, location tracking systems, devices for health records are done by internet of things. The biometric car security system can be demonstrated with min cost utilization.*

**Keywords:** *GSM, GPS, RFID, Arduino, IoT.*

## **1. INTRODUCTION:**

There are many people who ask why even the modern day cars are not being developed with biometric entry system, because these days even mobile phones are equipped with it. Since then some companies started working on implementing on this and finally some managed to build, and perform test on some cars. The attempt to install such a system on cars is unreachable yet in the market.

In the modern world of technology with rapid industrialization, people have not only started securing their homes but also their phones. It has become a need for the people to live in this modern world with their safety. Where securing phones have become a need to secure data of the phone, car security has also become a major concern. The concerns have arisen due to car thefts on large number these days. The RFID based networks are used to detect the stolen cars. The RFID has a security system and a fully optimized warning system. A small system is made available in the car. The module is placed near the RFID reader. The module now gets activated by coming in contact of radio waves from the reader and makes a unique identification code which is also called as UIDs. These UIDs are tracked at toll plaza when burglar passes by it. If the code matches with the data that is sent, it starts alarming and the burglar is caught. Now it being observed that the cars with less security measures have keyless entry system

Due to the lack of the system planning, there almost no alarm system in cars. This helps the burglars to enter the car. This results in stealing of car which then becomes difficult to track. By implementing the idea of finger print based entry system in cars will avoid the cars to be stolen.

When a user's fingerprint matches, only then the engine of the vehicle will start using the push start button. The paper also explains if the fingerprint does not match the start button will

not function and a notification alarm will be sent on the user's phone. The location of the car will be sent to the police station using GPS system. The location will be running till the user finds its car or have some control over it. Then the user can reset the app. The notifications will be sent continuously to the user's mobile phone, in order to track its current location. There are many ways to steal a car these days. Burglars use paper clips, iron scale to insert them in the fuse in order to start the engine of the car. Here there are two circuits connected that will start the car- first is the normal circuit connected to RFID3 and the push start button. The second one is connected to the battery and starter. The sensor of every circuit used in this system will send an alarm saying whether the circuit is connected or not, and if the circuit attached to the battery and the engine are connected, a burglary notification is sent to the owner's phone. This might speed up the process to find your vehicle and track down the burglar.

The idea of basic biometric entry system can be demonstrated using an Arduino IoT kit. This kit can be programmed to recognise the user.

## **2. LITERATURE REVIEW:**

Sayantam Sadhukhan, Aritra Acharyya and Rajendra Prasad (2017) in their article, 'Car Security System using Fingerprint Scanner and IOT' published in Indian Journal of Science and Technology explains the importance of IoT with mobile application. They further also explain that how important it is to keep our cars secure as we keep our phones. The team explains the use of biometric car entry system that keeps the cars secure. It allows multiple users to use the car only when the user is authorized. The use of mobile phone application is an added advantage here. It notifies the owner when the car is stolen.

Rajeev Velikkal(2019) in his project, published in Indian Journal of Science and Technology explains the demonstration of keyless car entry system. He has developed this module using an Arduino kit in which the sketched it and executed. The sketched is developed using simple programming languages.

### **3. RESEARCH METHODOLOGY:**

The main aim of this paper is to build a biometric car entry system for security. For this, a basic demonstration can be made, where a CAN Bus Shield is attached to Arduino UNO board to which fingerprint sensor is installed.

What is CAN Bus Shield?

A Controller Area Network (CAN bus) is a kind of a transport bus standard which is developed in such a way that microcontrollers and devices can communicate with each other using such technology. No host computer required.

For the development of the biometric system, fingerprint sensors are available and used. The entire system also requires a door handle which is purchased and a hole is made with the help of the shape and size of the fingerprint sensor. The sensor is glued to the door handle and conveniently placed exactly where it's required. The sensor is also protected using rubber based material to prevent it from getting wet. This results it making it waterproof.

Wire from the fingerprint sensor module is stretched up to the controller. This controller is attached to the Arduino board (Iot board). A USB cable is used to connect the Arduino board to your PC. Arduino IDE software is used to develop a sketch for the system and this sketch is uploaded on the board. The fingerprint whether matching or not will result a relay to high that means success, the input to pin 3. Pin 3 is of the Arduino board. The sketch running in the Arduino board will determine whether the door is open or close. The status of the pin will say whether the door is closed or not.

The objective of building a biometric car entry system is to make the car keyless. The following points will explain the objective behind in building this system.

1. To avoid the use of keys.
2. Providing more security.
3. To stay updated with the status of your car.
4. Multifunctional biometric system.
5. Embedded system for authentication purpose.

The use of keys in cars is being used since ages. The technological development over the years has helped many companies to develop a better system for cars, one of which is less use

of keys. In these recent years, modern cars have come up with the idea of push start button in cars, which has become the replacement for keys used to start the engine. These push start buttons is used to avoid keys used for ignition purpose in cars.

The biometric system in cars allows the user to lock/unlock the doors with its fingerprint recognition technique. Thus, avoids the use of keys and doubles the security system in cars.

The biometric car system increases the security for the owner's vehicle. As fingerprints are unique and cannot be duplicated easily, the biometric car entry provides high security to the user. The concept of biometric car lock/unlock system is similar to the fingerprint scanners in mobile phones.

The paper further also explains the concept of embedded touch screen display, which is also called as infotainment systems in the cars. The infotainment systems in cars are very popular because of its multifunctional capabilities. Authentication feature is a feature that can be added in the infotainment system.

This infotainment system can be used to register the user for the car. The registered user will only have the access to the vehicle and not others. The infotainment system's screen will contain a button saying Scan the QR code. The QR code will contain the registration form for the user. The user will scan the code and fill the following details;

1. Name
2. Mobile number
3. Email id.

After pressing on the submit button, the user will receive a notification and the infotainment system will display "Registered successfully welcome". The paper also explains to develop a mobile application for the owner. The owner can also monitor his/her vehicle. He/she will also be able to know the status of the car.

#### **4. THE PROPOSED SYSTEM:**

The system in made up of various components such as components Intel Galileo gen 2 kit, RFID3 sensor, fingerprint sensor, a 7408 IC, a 7404 IC, SD card, GPS and GSM module and an Intel Centrino 7260 Wi-Fi module. The two main components are the sensor and FOB circuit which is manufactured by the car manufacturer. These are the important part of the

main circuit. The FOB and RFID3 which is a sensor are both programmed with radio frequency range. When this RF matches between the two that is the sensor and the FOB, then the user needs to scan their fingerprints. The fingerprints are matched using the fingerprint sensor, and hence it validates the fingerprint only when the stored fingerprint matches with the one being scanned. The proposed system being developed for the cars contains one owner and 4 other users also called as guest users. These guest users are ones who will be allowed to drive the car or enter the car only if they registered. The users except the owner will be allowed to register themselves using the mobile app. The registration process will be simple as follows; the infotainment system of the car will display a button saying scan the QR code. The QR code will display a registration form on the smartphone which will have 3 credentials of the user. After filling those three credentials the user is registered and the infotainment system of the car will display successfully registered welcome. A notification of the registration will also be sent to the owner's phone. The FOB sends a radio frequency to RFID3. After the radio frequency is received by the RFID3 the fingerprint input is detected by the sensor. Now the output from the two sensors is then sending to 7408 IC. These outputs acts as inputs which perform logical AND operation. The AND gate truth table explains when both the inputs are 1 the output received is also seen as 1. Here two sensors are playing their role, the RFID3 and fingerprint sensor. When the correct values are passed to the 7408 IC, the output received is high. This high output is given to receiving end of the pin no 0. The processor sends these outputs to the respective pins.

The ECM5 circuit's pin no 1 receives high values from the processor. The proposed system being developed for the security of the cars also include a mobile app. It is developed for the owner's mobile phone. The mobile app is designed in such a way that it can be customized to run the system, which includes storage of prints of the registered user. It can also alter the registered data of the system that was already been stored. The alteration of the data happens on requirement basis.

The mobile app can also let you know the status of your car, such as who is driving, how much fuel is consumed, how many users are registered etc. The person trying to steal the vehicle can be stopped using some digital sensors such as LED module. The burglar tries to put the paperclips into the fuses and tries to start the car using battery starter connection. The digital sensors can be used which blinks when current is applied. The output can be given to integrated circuit 7404 which is a NOT gate. The NOT gate inverts the values at the time of the process and is sent to the pin no 2 of Galileo. The pin no 2 of Galileo is placed at the

receiving end. During the entire process the pin no 3 sends the required data to GPS1 and the second most important GSM2 module.

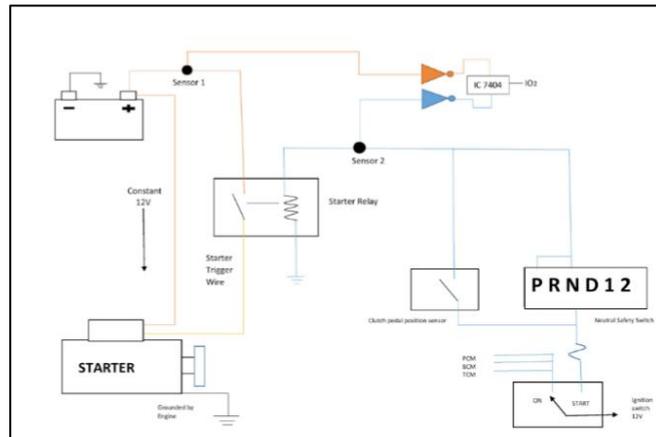


Fig. 1: Power break Circuit diagram

(Reference: <http://www.indjst.org/index.php/indjst/article/download/109854/82717>)

## 5. SYSTEM SPECIFICATIONS:

### The Intel Galileo Board:

The board is built for students to develop programs using simple programming language. Professional developers also find it easy and simple to use. Intel Galileo Board is based on the concept of Intel Quark 32-bit SOC which is compatible with Arduino Software Development Environment (SDE).

### Intel Quark:

Intel Quark consumes less power designed by Intel. It is single core 32mm \* 1000 SOC microcontroller. It has a frequency of 400 MHZ. There are multiple interfaces in Intel Quark which are as follows;

1. Peripheral Component Interconnect Express which is also called as PCI express.
2. Serial universal asynchronous receiver-transmitter (UART)
3. FC
4. Fast Ethernet support
5. USB 2.0,
6. Secure digital input output.
7. power management controller,
8. A general-purpose input/output (GPIO)

**Communication:** The Galileo Board can communicate with other devices using various protocols, they are as follows;

1. UART
2. USB Client Ports which are used for serial communication.
3. Mini PCI Express (mPCIe): It provides a mini PCI Express slot.
4. Ethernet RJ45: Ethernet RJ45 is used to access the network which is most of the time wired
5. Micro SD card reader.

The Galileo board can be sketched using the Arduino SDE software. Arduino SDE is used to program the board. The program sketched runs on the board and interacts with the Linux kernel in the board. This communication takes place using the I/O adapter of Arduino when the board boots up, two scenarios are possible: The program present in the boards states two major events first it quickly executes or else it waits for the execution.

**Fingerprint Scanning System:** The purpose behind using a fingerprint scanning system is to get an image of the finger of the authorized user and match with the print from the stored data of prints. It validates the pattern, scans it puts it in the algorithm. The scanned image is now stored in the SD which is a storage device. Now the process further explains that whenever the user places his/her finger on the scanner, the image is captured. The scanner validates whether the patter of the fingerprint matches or not with the stored fingerprint. These fingerprints are stored using some encrypted biometric key or some binary codes. These binary codes are series of numbers that are used for validating the fingerprint. These series of binary numbers cannot be altered and thus remains unique.

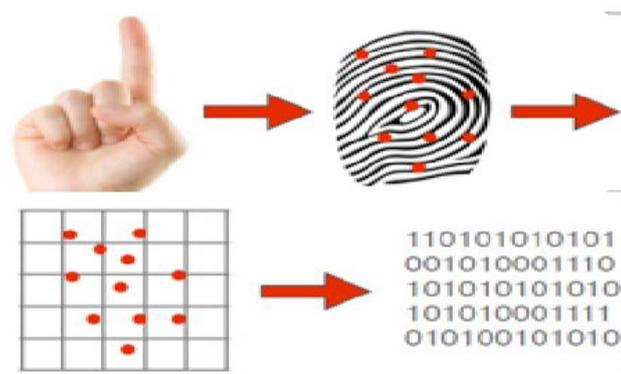


Fig.2. Finger scanning system

Reference: <http://www.indjst.org/index.php/indjst/article/download/109854/82717>

## **6. HARDWARE ARCHITECTURE:**

The hardware includes RFID3 device, the fingerprint sensor, ICs such as 7404 and 7408, modules used such as GSM2 and GPS1. For its functionality the system used LED module.

### **RFID:**

This device is uses electromagnetic waves to identify the developed system to track .The developed mechanism contains digital information that is stored. The mechanism designed are embedded in the track object.

For this RFID3 is used for Automatic Identification and Data Capture (AIDC).

**GSM Module:** GSM module is nothing but a modem which is mobile in nature. This modem is also known as communication modem. Nowadays GSM2 is preferred for communication. It was developed at Bell Laboratories in 1970. This communication modem has a range between 850MHz and 1900MHz frequency bands. GSM2 is used for both voice and data services. It is an open cellular technology.

**GPS Module:** GPS also called as Global Positioning System used for locating the position of the devices holding this technology. It was developed by the DOD of USA. GPS uses microwave signals. GPS tracks the velocity and movement and time of the object on ground . GPS is useually used by the people to find their way out, which is aso called as navigation in GPS. On the surface of the earth, there are microcomputers on each and every GPS receiver. The information is gathered from minimum of three satellites. The data collected is of logitude and latitude having an accuracy of 10m to 100m. The collected data which is then used by various softwares that are used during navigation. The satellites orbits minimum 2 times per day. The distace from the earth's surface is about 20,000km There are so well designed that atleast 6 satellites are always in view.

## **7. CONCEPTUAL FRAMEWORK:**

The system explains the security of the car using biometric car entry system where, the finger prints are used to enter the car. Here snesor on the door handle tries to match with fingerprints stored in the storage. The car gets unlocked only when the two prints of the finger match. The finger prints are stored in the micro SD card using algorithems. The prints are stored in the form of dome binary numbers. These binary numbers are unique and difficult decode. This makes the biometerc car entry system secure and makes the car keyless.

The connectivity with the mobile application makes the car more secure by notifying the user and the police. This helps to catch the burglar by tracking its location.

## **8. RESULTS:**

The developed system has been designed using Intel Galileo gen2. The modules that were selected to work with Galileo board was tested. This system explains that, if the owner or the user loses his/her key or copies some radio frequencies of the key fob, the car will not start. The alarm will ring on multiple attempts. These attempts are detected by the finger print sensor in the biometric system. The mobile receives a notification with the car's location. The location spot of the vehicle is tracked using GPS technology.

## **9. CONCLUSION:**

The paper explains the biometric entry system that uses RFID which provides high security to the owner of the car. The biometric system is fingerprint system where only the authorized users are allowed to drive the car. If any mishandling happens with the biometric system it will trigger an alarm using sensors and will notify on the mobile phone of the owner. The notification will also include the GPS location of the vehicle. The user can also reset the burglary option in the mobile application.

The entire system consumes less power therefore, even if the main power or battery is removed the other source of power can keep on sending the car's location. The substitute for the source of power is Li-ion battery.

## **10. FUTURE ENHANCEMENT:**

The Biometric entry can be further developed using various technologies such as Iot. The scope of this system can be explained by building a system in which the person who is actually driving the car can be known. This can be done by using sensors that are placed on the steering wheel of the car. The finger prints detected by the steering wheel can be authorized by the fingerprints stored in the SD card. By doing this we will be able to know whether the authorized user was driving the car or not. It will be easy to find the unknown driver during car accidents. The scope of the paper further explains that instead of having a registration form for the user we can have an inbuilt fingerprint scanner in the infotainment system itself.

By doing this it will make all the tasks easy. User's both the fingerprints will be scanned, one on the door handle and the other on the infotainment system. If both the fingerprints match the user is automatically registered and will be notified to the owner. The inbuilt fingerprint scanner will be using a 3D ultrasonic scanner in its system which is similar to ones in the mobile phones.

#### **REFERENCES:**

1. [researchgate.net](https://www.researchgate.net)
2. [www.androidauthority.com](https://www.androidauthority.com)
3. <https://www.wikipedia.org/>
4. <https://www.clickz.com/everything-you-need-to-know-about-building-apps-for-connected-cars/95810/>
5. <https://www.csselectronics.com/screen/page/simple-intro-to-can-bus/language/en>
6. <https://create.arduino.cc/projecthub/rajeevvelikkal/biometric-car-entry-true-keyless-car-298928>
7. <http://www.indjst.org/index.php/indjst/article/download/109854/82717>