

Fingerprint Based Ignition System and Tracking of Vehicle

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Abstract— The Vehicle Tracking System is world-famed technology in this modern era, which is used by vehicle owners, ambulance services, Trains etc. all over the world. In Pakistan many companies such as V-Tracking, TPL, Falcon-i etc. offers tracking system but they tracks the vehicle with difficult process and provide no direct access to the vehicle's owner, in addition to that their cost is high starting from Rs.10000 to onwards. We have designed our project on vehicle tracking and fingerprint starts of vehicle, through which we have given direct access to the user with low price. In today's modern world the use of smartphone is general and the popularity of GPS based application is increasing, it has become more viable or feasible for any user to track the vehicle through smartphone. We have designed a device which is used for the Vehicle Tracking System by using Global Positioning System (GPS) and Global System for Mobile Communication (GSM). We focus on the vehicle tracking system by which we able to know the location of vehicle through Google map, which will ensure safety as travelling. In addition to vehicle tracking system, we have added a new feature through which we can start the vehicle ignition system through fingerprint to avoid the vehicle from robbery, snatching or theft when the vehicle are stand outside the house, hotels, parking etc. This biometric system in vehicle takes the image of owner's finger, then convert it into the binary and stores it on the database. When the vehicle owner place its finger on fingerprint module R305 the system matches its image to that image stored in database if it matches then vehicle's ignition system will start. Our main purpose to develop the project is to provide direct access to the user by which one can easily start and track the vehicle from its current position to destination. Also to provide both features of tracking and fingerprint start of vehicle low prices and with very easy process by which every people can fully understand the system.

Keywords: Ignition System, Tracking of Vehicle

I. INTRODUCTION

With an advancements in technology, there has been an increase in the usage of vehicle tracking systems. The design of vehicle tracking systems enable the display of a vehicle's position on Google Maps. The GPS, GSM/GPRS modules controlled by Arduino MEGA are placed inside the vehicle. This hardware is placed onto the vehicle in such a manner that persons who are in or outside of the vehicle cannot see it. Thus, it is used as a covert unit which continuously track the location, or as a result of interruptions to the system, the tracking device sends location data to the authorized person through SMS. When a vehicle is stolen, the location data from the tracking system can be used to find the location and so inform the police for further action [1]. When users make a request, the GPS coordinates of the vehicle SMS are sent to specified mobile. The user will be provided with the position of the

vehicle in terms of latitude and longitude which can be viewed using Google Maps. To increase the security of the system a biometric based start of vehicle is designed with the help of microcontroller. Biometrics define as the automatic identification of a living person based on physiological or behavioral characteristics for authentication purpose. The existing biometric technologies are the face recognition, finger-geometry, fingerprint recognition, iris recognition, vein recognition, voice recognition and signature recognition, hand geometry. All humans have unique, immutable fingerprints. A fingerprint is made of a series of ridges and furrows/valleys that are present on the surface of the fingers. The inimitability of a fingerprint can be determined by the pattern of ridges and valleys as well as the minutiae points [2].

The cost of fingerprint based recognition/identification systems as compare to other biometric systems are very low and it's acceptance is very high. Quality of fingerprint based identification is that it can work in a varied range of environments. It has strong core technology and, the ability of enrolling multiple fingers can be increased by the system accuracy and the flexibility dramatically[3]. The current demand for robust and secure security systems in vehicles are very high. Therefore, the importance of designing and implementing a fingerprint based security system helps us to prevent from unauthorized person to start vehicle ignition without permission [4].

II. IMPLEMENTATION METHODOLOGY

In this section the design the real time tracking and locking system of vehicle including hardware and software implementation. This section also will cover about designing the fingerprint based starter circuit, LCD, interfacing of Microcontroller with the relay, programming and with GSM modem. Fig. 1 shows the schematic diagram of biometric based start of vehicle. We designed this circuit in Proteus 8.4 Cad Connected. Before going to hardware this circuit is designed in software to get the desired output. The control unit is microcontroller Atmega328P which sends the signal to the relay to open or close contact when an authorized person place his/her fingerprint is matched with the fingerprint stored in database [5]. We can also enroll the new person fingerprint with the help one of the push button. That image will be stored on database and registered as the authentic user.

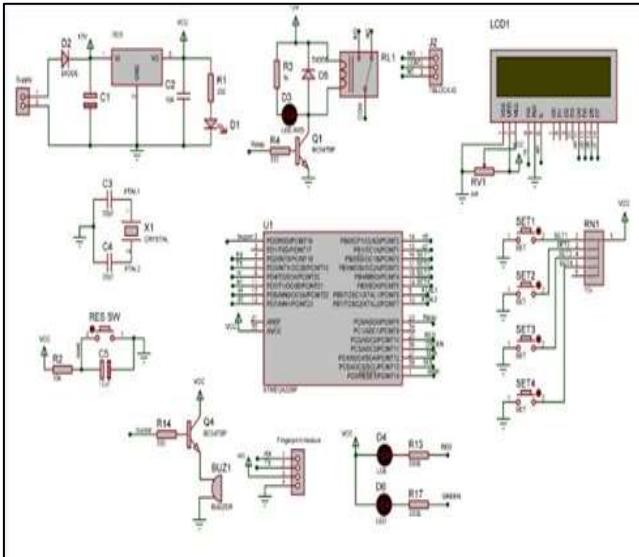


Fig. 1: Schematic Diagram of Biometric Based Start of Vehicle

Fig. 2 shows the circuit diagram of real time tracking of the vehicle. The GSM Module sim808 receive the message from the authority and sends back SMS to the authority with the help of Arduino Mega. In the SMS sim808 module send the longitude and latitude as well as Google map link by clicking that link it shows the exact location of vehicle [6].



Fig. 2: Circuit Diagram of Real Time Tracking

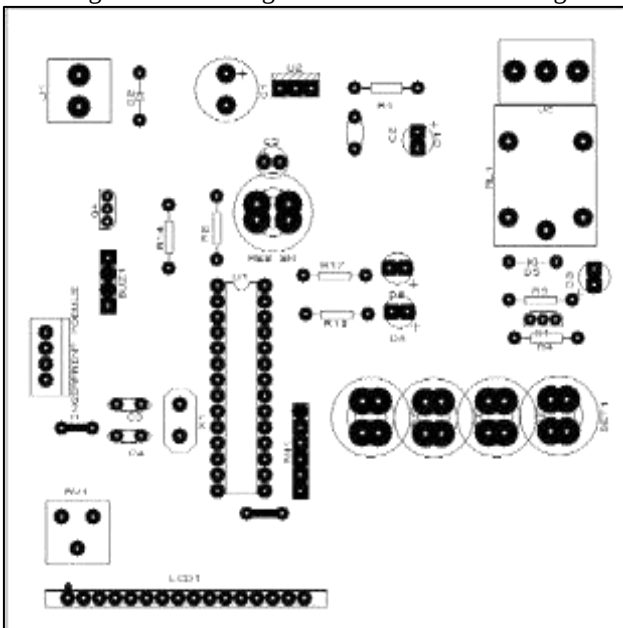


Fig. 3: Top View of PCB of Fingerprint Based Start of Vehicle

Fig. 3 shows the top view of PCB designed in Proteus. The design shows the names of different components to be connected on the copper clad board top. This design also shows how to place components on PCB like positive and negative terminal of capacitors, diode and LED.

Fig. 4 shows the bottom view of PCB of fingerprint based start of vehicle designed in Proteus. In this diagram it shows the actual connection of wires with the components used in the project. The PCB design reduce the wire connection due to which size of project is reduced and makes it beautiful.

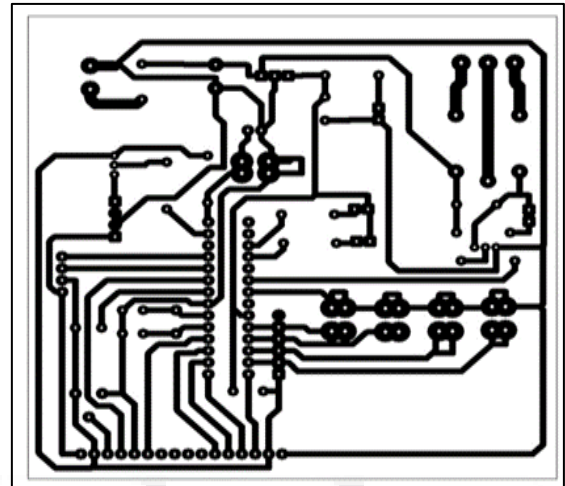


Fig. 1: Bottom View of PCB

III. RESULTS ANALYSIS

In order to verify the performance of the proposed “Real time tracking and locking system of vehicle”, a hardware prototype was implemented with an Arduino Mega and microcontroller ATMEGA328P. A LCD used which shows the results of Fingerprint based start of vehicle. First of all microcontroller with the help of fingerprint module enrolls the fingerprint of vehicle owner after that it scan the finger if it is matched the vehicle switch on. The Arduino Mega and SIM808 Module is used to find the exact location of vehicle through SMS. The validity of this project prototype is verified through this test system as follow.

A. Mechanism for starting of a proposed vehicle based on fingerprint

The result which we expect from our project is that the vehicle will be ignited only when the authorized person scans his/her finger on the fingerprint module. The fingerprints of the authorized person(s) are stored in the fingerprint module. When any person put his/her finger on the fingerprint module then the data of the placed finger is matched with the stored data in the module. If the fingerprint data is found in the module then match condition occurs and the microcontroller ignites the bike otherwise bike will not start.

B. Initialization

Initially the LCD shows the “Fingerprint Start of the vehicle”. We have used five push button. Their purpose are given bellow.

Push Button 1: Used for to enroll a new finger print Push

Button 2: Used for scan the fingerprint as well as to go System mode where a new finger print is stored to the Data base.

Push Button 3: Used to clear the stored image that are in Data Base when it goes to the System Mode.

Push Button 4: Used to Stop the Engine

Push Button 5: Used to on the device or reset the device. As initially we have not registered any fingerprint therefore it shows "Fingerprints Did not Matched" in Fig. 5. When the fingerprint not matched then it will shows that unauthorized person want to start vehicle but it will not start until unless registered



Fig. 2: Initialization Results

C. Enrolling a Fingerprint

To start the vehicle the first you have to go through a process called enrollment, where the system learns about all the person fingerprint which it will have to recognize each day. During enrollment, each person's fingerprints are scanned, analyzed, and then stored in a coded form on a secure database. Typically it takes less than a half minute to store a person's prints. Below are the steps to enroll any fingerprint that will be stored on data base. Step1: The step one is to go to system mode and where there are two options "Enroll" and "Normal operation". To go to the system mode by pressing push button 2 for 5 seconds. In the System Mode we register any fingerprint. Step2: The second step is to place your finger on module that will take image and convert image. After pressing push button one it goes enrolling mode where it ask user to place its finger. When user place its Figure in finger print module R305 it take image of finger. That image then converted to binary Step3: The final step to verify the image to be enrolled and after verifying store that image to data base We have to verify the image before we store the fingerprint to data base. "Place Same Finger again" to verify the image. After verifying the image it will store that image to data base and register the image as authentic user.

D. Start the Vehicle with the Authentic User

As we have enrolled and stored the fingerprint in data base. Now to start vehicle with that fingerprint. To start the vehicle with fingerprint we have to press the push button 2 after pressing the push button it ask the user to place their finger on fingerprint module R305. The module will take the image and convert it into binary number. Now the microcontroller match that binary number to the stored image binary code if it is matched with that number the relay will normally close if not than normally open. The results are attached below.



Fig. 6: Matching of Fingerprint

User placed the finger in fingerprint module R305 after that the image is converted and microcontroller match the image with the stored image. If there is an authentic user then image is matched and LCD shows as "Valid User" the results are shown in Fig. 7. When the image is verified as authentic user the microcontroller close the contact to start vehicle through relay.

E. Tracking of Vehicle

The tracking system is used to track the exact location of vehicle. This system is an integration of several modern embedded and communication technologies. To provide location and time information anywhere on earth, Global Positioning System (GPS) is commonly used as a space-based global navigation satellite system. The block diagram is shown below [7].

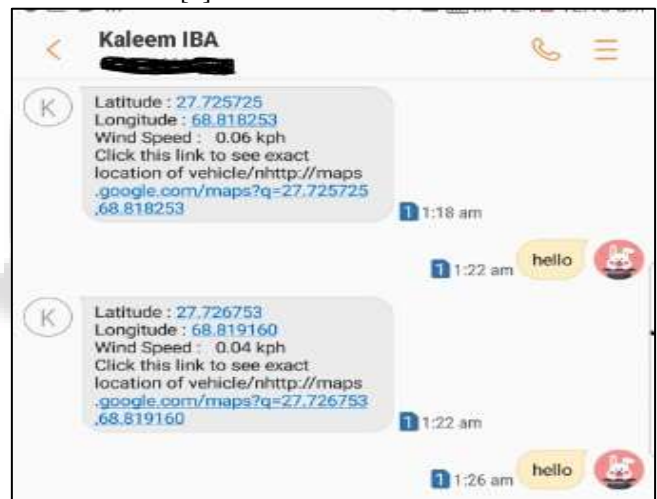


Fig. 7: Block Diagram of Tracking System



Fig. 8: Received Message from SIM808 Module



Fig. 9: Vehicle Location

The received message from tracking device and location of vehicle in real time are shown below. Fig. 8 shows the message received from the sim808 module in message there is Google map link. By clicking the link it will shows the location in map through Google map. We have taken result when vehicle moves in different locations as shown in Fig. 9.

IV. CONCLUSION

In our research paper we have developed a “vehicle tracking system as well as fingerprint based start of vehicle” which is flexible, customizable and accurate. The GSM modem was configured and we tested and implemented the tracking system to monitor the vehicles location via SMS and online on Google map. The Arduino Mega is the brain for the tracking device and the GSM modem is controlled by AT commands that enable data transmission over GSM network while the GPS provide the location data. We thought of designing a vehicle tracking system in our thesis keeping the scenario of Pakistan in mind where vehicle theft is rapidly increasing. The vehicle are also stolen while they are stand in front of house and in parking area due to weak security. The Key based start of vehicle ignition can be easily start by joining the wires than there no need of key. We have improved the security of vehicle by starting the vehicle ignition using fingerprint. As fingerprint system are secure and reliable it accepts only authentic user finger image to start the vehicle. The fingerprint take the image, convert it into binary and match with the stored image in database if it is matched then vehicle ignition start otherwise not. This thesis has widely increased our knowledge of GPS, Biometric identification specially fingerprint system and also improved our programming skills. We have also ensured the reliability of

our system through various field tests that we have done during our thesis and the initial results that we obtained through our prototype are very promising. This makes our thesis complete, robust and we can even think of commercialization of this system in future.

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