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Biometric Keyless Car Unlocking System

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Abstract—Security is one of the major concerns of people and this project helps you deal with the security of your car. It places emphasis on central locking system of car which is replaced by biometric locking system (Fingerprint Scanner). The current remote key fob is replaced by an android application installed in the smartphone. The android application has biometric interface for fingerprint authentication which is compared with already stored fingerprint. Once successfully authenticated, the Bluetooth of smartphone turns on and user can select the option to lock or unlock according to the preference. Raspberry pi is used for the purpose of pairing between smartphone and car.

Keywords— Android Smartphone, Biometrics, Bluetooth, Fingerprint scanner, Raspberry pi.

I. INTRODUCTION

Presently every industry is looking forward for advancement in their technology. Great strides have been made towards satisfying customer demands. Considering automobile industries, there has been a significant elevation in the technologies used in a car. As investing in a car is a big decision, a propensity for people to look of their comfort is of no doubt. Therefor automobile companies have showed great interest in automating vehicle to provide user friendliness. Automating the vehicle implies keyless entry in the car which helps the user to open the door of the car without using the mechanical key. Keyless entry primarily means a lock present at the driver's door which requires pressing of self-programmed code to enter inside the car.

There are technologies adopted for security of vehicle. Technology like biometric holds a reliable source. Biometric is a method automatic identification of the person based on their behavioral characteristics. It is said to be a dependable informant because biometric data are different and distinct from personal information. There are possibilities of losing the car key which may create problem for the owner. Thus to avoid this problem, this project includes biometrics and raspberry pi for locking and unlocking. Firstly, the android application will authenticate the user by scanning the fingerprint of the user. If the user proves to be genuine, it will trigger the Bluetooth of smartphone and provide two options either to lock or unlock the car. The smartphone will connect to the raspberry pi through Bluetooth.

The signals that are received from the smartphone will be transmitted to the GPIO pins that are programmed to lock and unlock the door. Once the connection is established, raspberry pi will do the locking and unlocking of doors. Raspberry pi will be connected in the same manner as RF receiver is connected in the car. The raspberry pi will receive the power supply from the car's battery so that it always remains on even when the car is not in ignition.

Thus this system allows us to lock and unlock the car by sending a Bluetooth signal from biometric based android application installed in the smartphone to the raspberry pi connected to the car.

II. LITRATURE SURVEY

The traditional system has a key or a key fob for locking and unlocking of car which does not emphasis more on providing security to the car. The automation companies took lot of efforts in automating the system and making the system user friendly but it hampers the security system.[1] There is always a threat of losing the key fob or getting misplaced. Once the key fob is misplaced, any unknown person can get access to the car and the owner will have to bear the loss. Thus there is always a threat of theft or getting the key misplaced.[3]
As referred by the papers there are measures taken to automate the technology of car like remote locking via Bluetooth using android but again there are no measures taken for authentication of the owner and that becomes a drawback and there are also some feasibility issues. This paper shows the functionality of controlling car doors using Bluetooth

technology and android application. This function helps the user to access the car within a range of 10m from the vehicles through the help of smartphone.[1]

III. SYSTEM ARCHITECTURE

The system architecture is the step by step representation of working of the system. It shows the proper flow of signals. This architecture bears two modules, first module explains about the libraries and fingerprint packages used and second module explains the actual flow of signals.

Module 1:

The android application consists of the package java.lang.Object which consist the fingerprint manager class extended to Object. It also consists of the class KeyGenerator extended to Object. These classes use different encryption algorithms like AES, ARC4, Blowfish, DES etc. Firstly a request for the fingerprint authentication is taken from project manifest file. Before requesting verify that the smartphone is protected by a PIN, password or pattern because fingerprints can only be registered on devices which are secured by PIN or password. A FingerprintManager class instance is created. The android keystore container stores the fingerprint of the owner. A Keystore instance is created to access the Android Keystore container. An encryption key is generated using the keyGenerator class and stored in Keystore container.[6] An instance of cipher class is initialized using the key generated. A cryptoObject is created and assigned to the fingerprint manager instance using the cipher instance. Authenticate method of FingerprintManger instance is called.

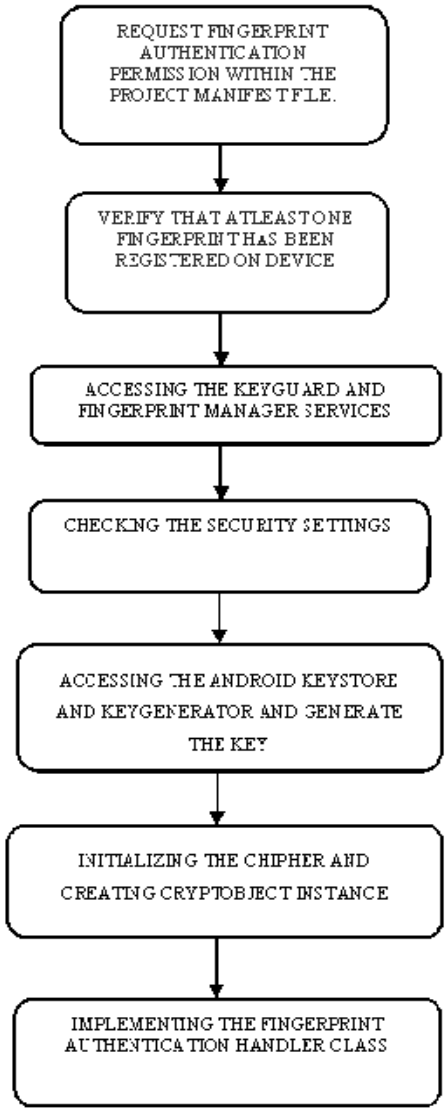

Figure 1: User and Application Interaction

Module 2:
The module 2 shows the communication between the smartphone and raspberry pi. Once the owner is successfully authenticated then the Bluetooth of the smartphone is turned on. The smartphone then sends the Bluetooth signal to the raspberry pi and requests for connection. The Bluetooth receiver of the raspberry pi at the other end accepts the request based on authenticated user. Once done with the pairing, the user can then press the lock or unlock button of door or trunk. The signal is received in byte format which is then converted in string format with the help of python code. This string is then compared with the string received through the Bluetooth signal and the GPIO pins are activated according to the button pressed and the related GPIO pin allocated to it. A message is displayed on the application.

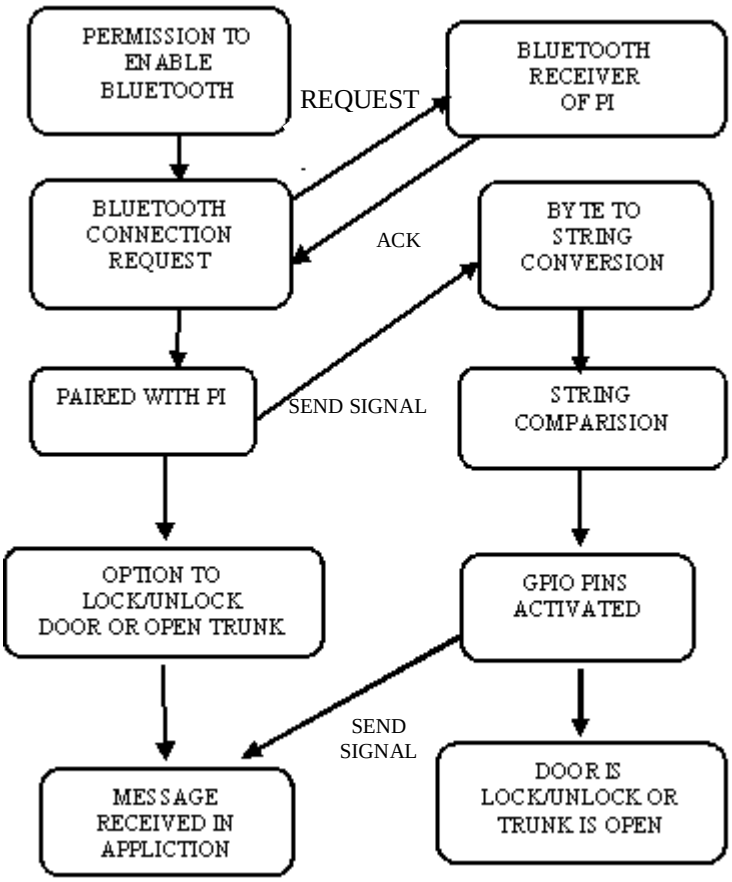

Figure 2: Application and Raspberry pi Interaction

A. HARDWARE SPECIFICATION

Raspberry pi 3 model B: A small single board computer used for connection between android application and car's door. It has inbuilt Bluetooth model which we use for connection.

Android Smartphone: The smartphone should contain Marshmallow 6.0 and above versions of android. The smartphone should also have a fingerprint sensor. It consist of android application for the locking and unlocking of car door. It works as the medium of communication between the user and raspberry pi.

B. SOFTWARE SPECIFICATION

Android studio: This software is used for the development of android application with two activities.

Fingerprint Manager Api: This Api is used get access of the fingerprint sensor driver of the smartphone. It compares the fingerprint placed for authentication with the one already stored in the Key container.

Jessie Raspbian OS: This operating system is used for the interaction between the raspberry pi and the smartphone.

Idle For Python: This is an integrated development environment used for python programming in raspberry pi.

Pybluez For Python: This is a Bluetooth package for raspbian OS .

IV. RESULT

This paper proposes locking and unlocking of car using biometric based android application. As the biometric data is distinct, it cannot be duplicated. Car locking system based on Bluetooth and accessed by android application is implemented. The performance is measured by experimenting existing systems with different dimensions. Based on the reports, the keyless entry system provides secure entry to the car. The scope of this system can be extended by adding GPS module to the system which will help to enroute the destination . This module can be implemented for Garage doors and in all the mid-range cars.

The figure below is the android application interface which enables the circuit flow from raspberry pi to the actuator which when given 12 volts and 5 volts of supply from the battery helps the actuator of car to lock and unlock the door.

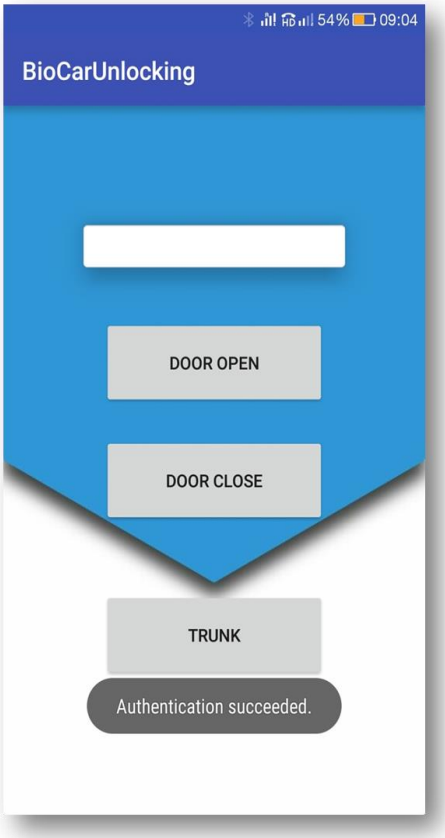

Figure 3: Successful user Authentication

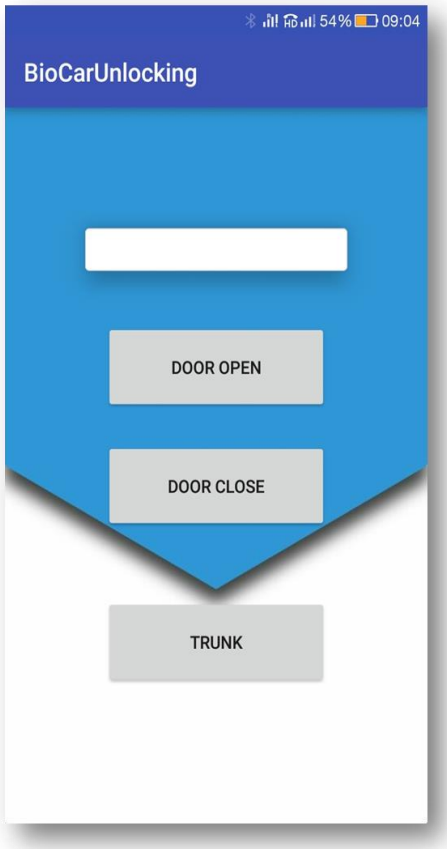

Figure 4: Options to Lock/Unlock Door and Trunk

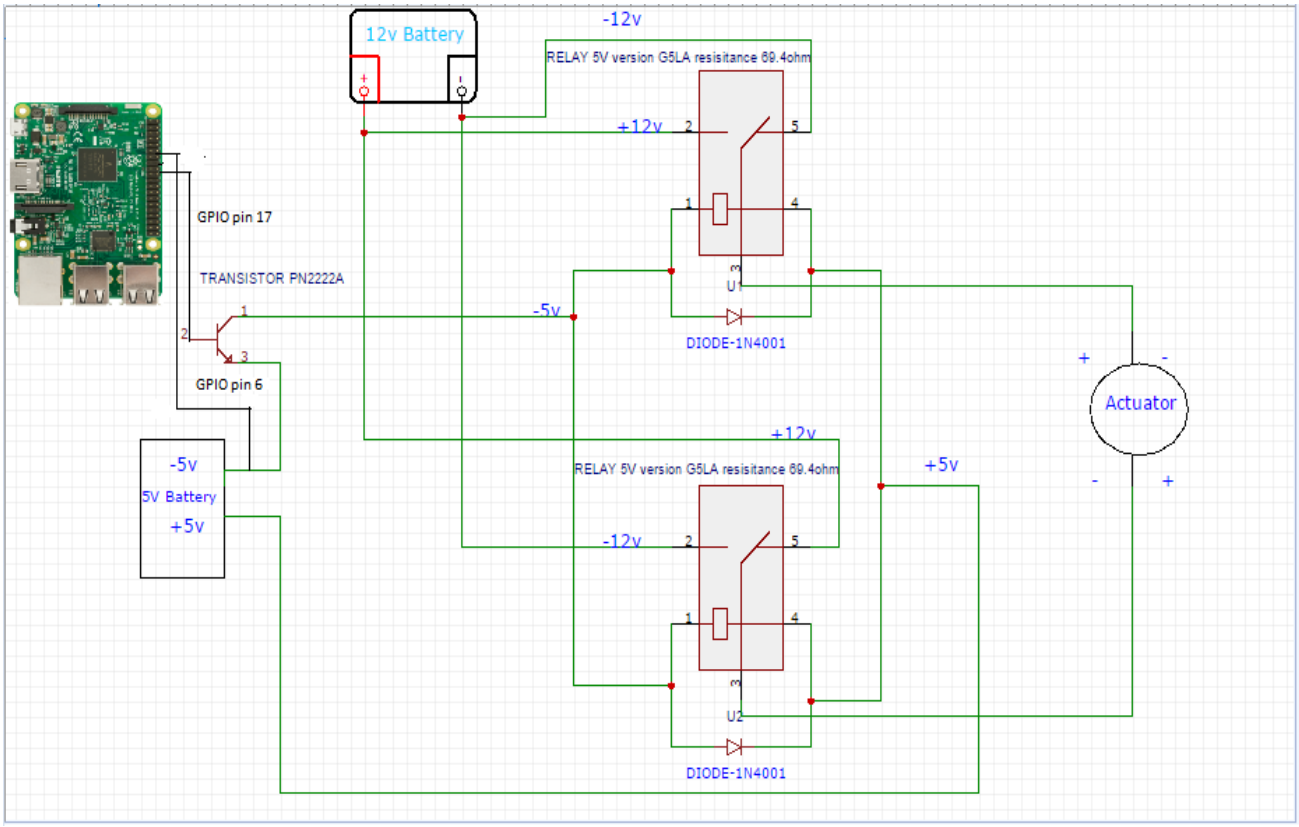

Figure 5: Circuit Diagram

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