

Secure Door Automation System Using Iot

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Abstract

Nowadays technology is being found in each and every part of our life. By using these emerging technologies we can overcome the problems with conventional lock systems. So we are proposing a keyless system, in which the password is being sent from Bluetooth to microcontroller to access the door. For the security of password AES(Advanced Encryption Standard)algorithm is being implemented. In this system multilevel protection is also being provided through password reconfiguration option. In case of emergency the door can be accessed through fingerprint module. This form of locks will provide an inexpensive solution for the security of door locks by integrating Android and Microcontroller module.

Keywords: *Bluetooth, Bluetooth Terminal HC-05, Microcontroller, Fingerprint module.*

1. INTRODUCTION

There are many problems related to conventional locks such as duplication of keys, so we have developed a secure door automation system. In this system we can access the door through password or fingerprint to provide security to the password, AES algorithm has been implemented. This system also provides password reconfiguration option. This door lock system may be used for domestic, companies, educational, health, military and other zones where we need more security. It minimizes robbery and illegal access to our premises. In this system, password is made up of alphanumeric with special characters and this password is being encrypted by AES algorithm with a key length of 128 bits, so the attackers cannot easily guess the password. This system is cost effective, user friendly and also provides greater security to the password.

2. Literature Survey

- The idea of using Handwriting Recognition Technology is to manage and control the access of door only to users with proper credentials[1].But if user uses a different handwritten pattern other than the stored samples then system does not recognize the user.
- For the benefits of disable people to access the door by using Android phone [2].The application developed in the system is user friendly to disable people but it is not secure as door can be accessed by unauthorized users.
- Face recognition system based on graphical user interface is a less intrusive compared to other systems [3].But if any unauthorized person uses mask of authorized person then system recognizes and opens the door which is insecure.

- Both voice and face recognition is included in this system to provide security[4].But if one of it fails then authorized user cannot access,even when the voice of a person get mimicked then unauthorized person can access the door which is insecure.
- But in this system there is no security to the stored password and we cannot access the door without the mobile phone.

3. Components

Raspberry Pi:

Raspberry Pi Is Cost Effective Microprocessor Which Is Plugged Into A Computer Or Tv.It Is 40 Pin Header With Ram Of 1gb(900mhz) And Cpu Of 3.3v.It Operates In The Open Source Ecosystem That Is Linux Operating System.

Bluetooth Module:

Bluetooth is a wireless technology that uses short wavelength radio waves. It's main function is to send and receive information between devices. This will be connected with the Raspberry pi and other microcontrollers with a voltage of 4V to 6V.This device ranges up to <100 m and can be operated in Master/Slave mode.

Relay:

Relay is a switch that used to access the circuits electromechanically or electronically. This switch may contain voltage between 12V to 24V. Relay controls one electrical circuit by opening and closing circuits in another circuits. It acts like connector between the processor and the motor (actuator).

Buzzer:

Buzzer is a device that provides sound, that can be mechanical, electromechanical or piezoelectric. The size of the buzzer is 22(mm)V or 12(mm)V that can be control with single chip microcontroller IO directly.

Fingerprint Module:

This is an optional biometric. Fingerprint sensor module with TTL (Transistor- Transistor Logic) USB/UART interface that connected to microcontroller UART directly. The data will be stored in the fingerprint module and can configure bit in 1:1 or 1: N mode for identifying the person. The verification and scanning of the finger will be done within seconds. This requires the voltage of 4.2V to 6.0V and operating environment temperature will be -20 to 40 °C.

Gear Motor:

Gear motor is a specific kind of electrical motor that transforms electrical energy to the mechanical energy.AC (Alternating Current) or DC (Direct Current) power can be used to run the motor. It delivers high torque at low horse power or low speed.

Twilio:

Twilio acts as a communicator that allows the programmers to perform communication function like making and receiving phone calls, messages and so on by using it's web service API(Application Program Interface).

Bluetooth Terminal HC-05:

This Apk uses Bluetooth for sending and receiving commands.

4. Implementation

Block diagram depicted below describes the architecture of keyless door lock system. In this system the door can be accessed either by passing password or by through fingerprint module.

Firstly the user has to register with his credentials. Then user has to wait for admin approval to access the system. Admin will login by his admin-id and password. After login, admin gives permission to accept the user request sent by the user module. Once the admin approves user can login to the system by using User-id and password. If he is a authorized user and got admin's approval then the user can do the following:

- He can view profile details.
- He can configure the password by resetting into new password.
- He can view the configured information which is generated by encrypted password.
- He can access the fingerprint module by entering his Mail-id.

Next download the in-built Apk Bluetooth Terminal HC-05 to the Android Phone, then pair the Android phone with the Bluetooth HC-05 module. Now check the current status of Bluetooth on your phone if it is off then turn it on.

Once the HC-05 module is paired with the Android device, then we will be able to connect the device with Bluetooth device HC-05 Application which is downloaded in android device. Once it is connected then we can send password and login id to access the door. Then the password will be encrypted using AES algorithm. When compared to DES AES is better as it is faster, stronger and has adjustable key length In this algorithm, number of rounds depends upon key length. Here the key length is 128bits, so number of rounds will be 10.Each and every round will make use of a unique 128 bit round key which is obtained from actual AES key. The process of encryption of the password takes place as follows

SUBSTITUTION OF BYTES (SUB BYTES):

A fixed table (S box) is used for substitution of 16 input bytes .the result of this step will be a new 4x4 matrix.

Shift Rows:

Left Shift is performed on every row of the matrix except first row.Then second,third and fourth rows are shifted left by one,two and three positions respectively.The result of this operation is a new 4x4 matrix which consists of same elements But in different positions.

MixColumns:

This step makes use of a mathematical technique which transform the four bytes of data in a column to completely new bytes of data as a result a new matrix will be generated which consists of new 16 bytes.

Addroundkey:

The final 4x4 matrix obtained by performing above three rounds is XOR'ed with 128 bit round key. If it is the last round then obtained output will be cipher text or else the resulting 4x4 matrix should be interpreted as 16 bytes and repeat the above process. The encrypted password will be stored as shown belo The password obtained from encryption process is checked with the stored encrypted password, if it matches then 1(one) will be sent to the microcontroller as the indication that password is correct or else 0(zero) will be sent to the microcontroller as the indication that password is incorrect. Based on this the door will open or close.

Suppose if the password is incorrect then buzzer will be on and admin will get a message that "someone is trying to access the door" through Twilio application. should login by his user-id and password then he can change the password.

As an option for emergency access we have fingerprint module to access the door.For accessing this fingerprint module user has to enter the credentials.

4. Results

The below diagrams depicts the functioning of the model designed



Figure 1: Raspberry pi.



Figure 2: Bluetooth Module.

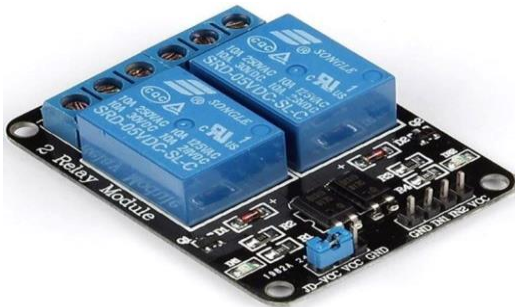


Figure 3: Relay.



Figure 4: Buzzer.



Figure 5: Fingerprint Module.



Figure 6: Gear Motor.



Figure 7: Bluetooth Terminal HC-05 Apk

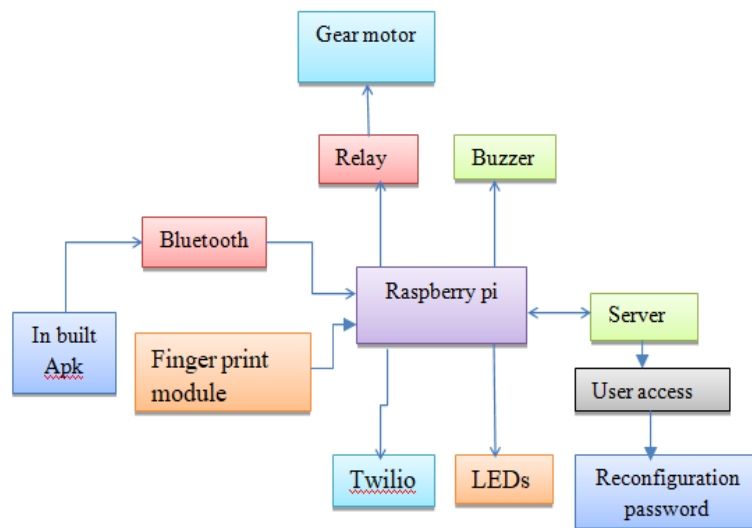


Figure 8: Block diagram

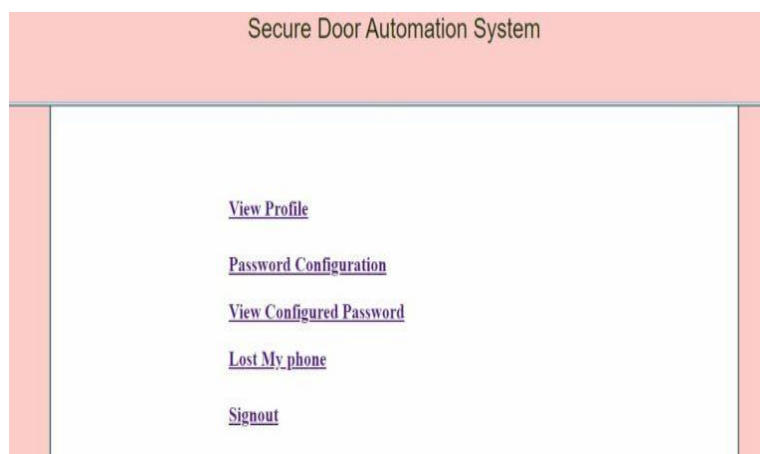


Figure 9: User page.



Figure 10: Bluetooth device paring with Android

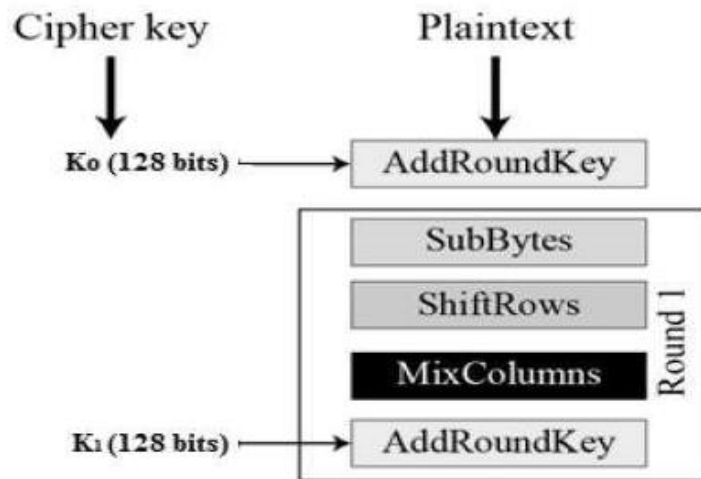


Figure 11: Encryption Process.

User Reconfiguration Information

User Id	password
2222	UzFAYQ==

BACK

Figure 12: Password obtained after encryption.

Customer ID:

Enter your Email ID:

Figure 13: Login page to access the door using fingerprint.

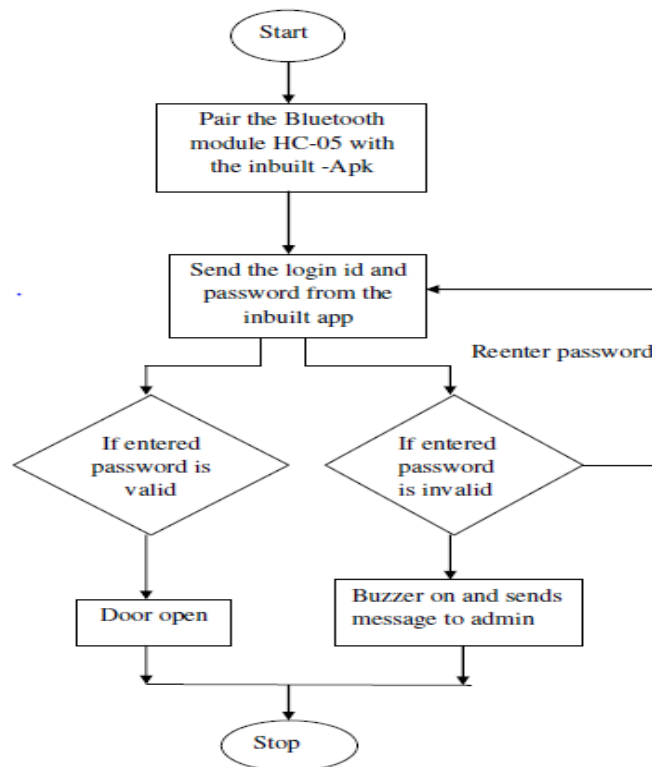


Figure 14: Workflow of accessing door using password.

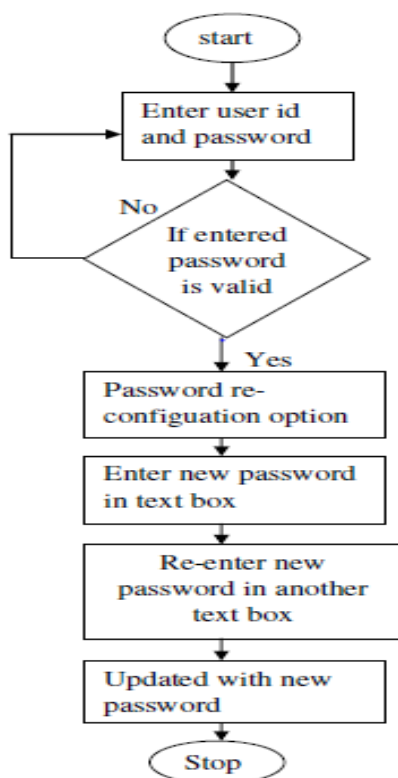


Figure 15: Workflow diagram for password reconfiguration.

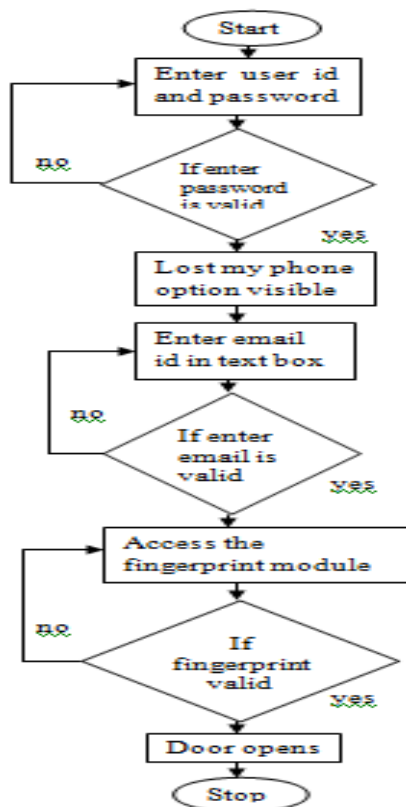


Figure 16: Workflow of accessing door using fingerprint

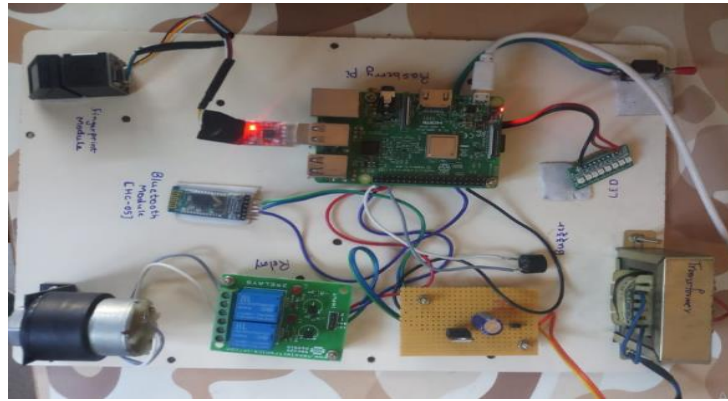


Figure 17: Model of secure door automation system.

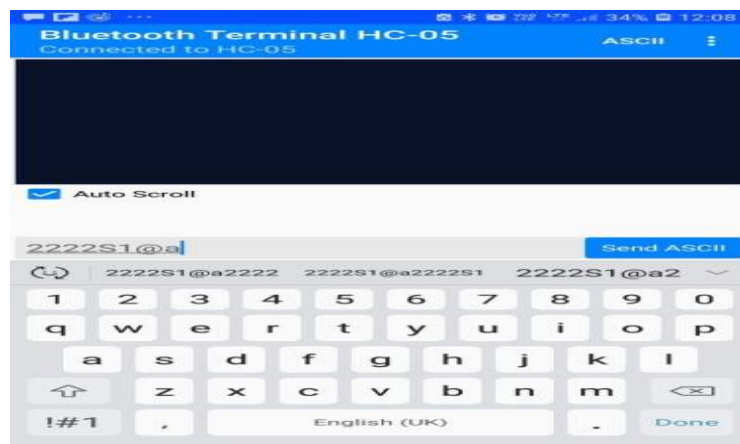


Figure 18: GUI integrating security lock using smart android phone.

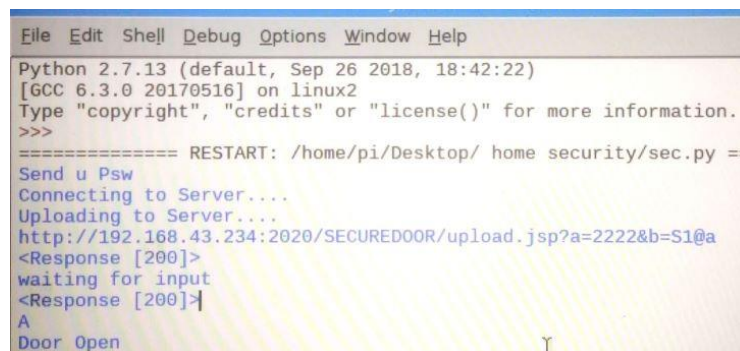
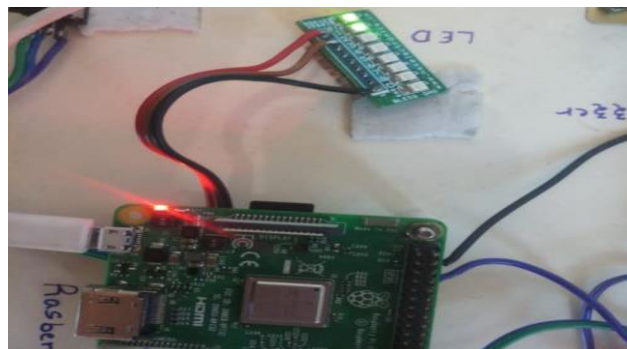


Figure 19: Door opens if password is valid.

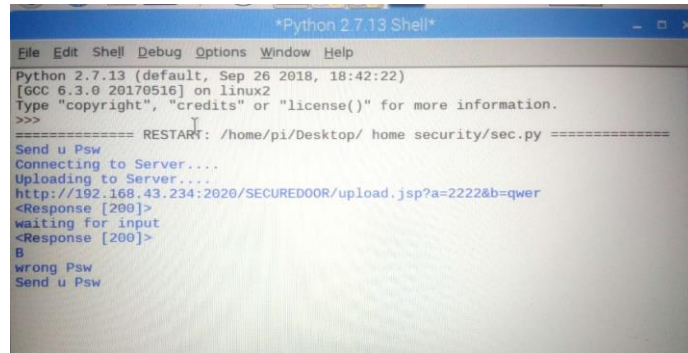
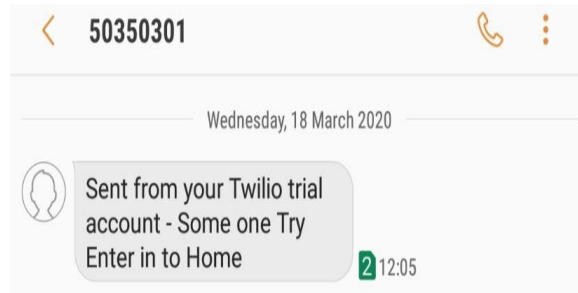


Figure 20: Buzzer will turn on for certain time if unauthorized person access the door.

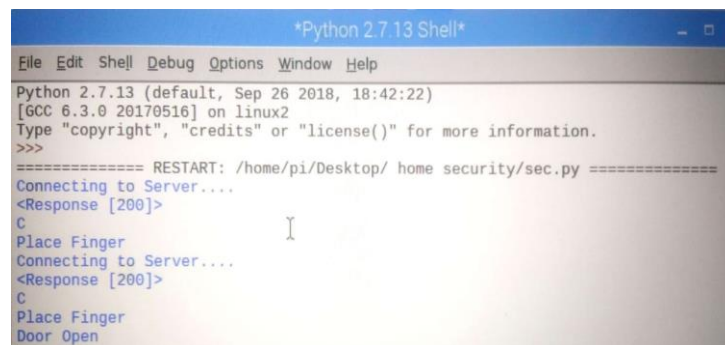
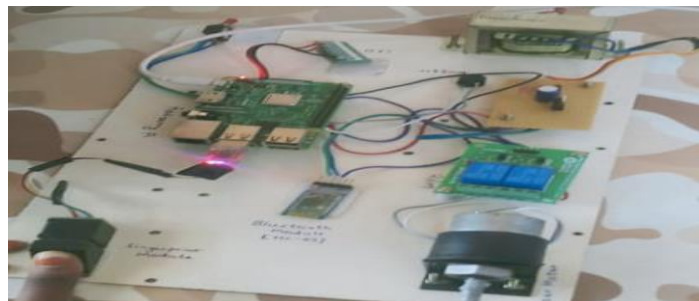


Figure 21: Using Fingerprint module to access the door during emergency.

5. CONCLUSION.

Secured door automation system is used in places where we require more security. This paper provides basic idea to access the door without key. In this system, we are making use of Android (provides Graphical User Interface) and AES algorithm (provides security to the password), in-built Apk (password can be entered to access the door). We have also provided fingerprint access for the door during emergency. We have prepared a simple design in this paper such that it can be used to develop a secured door lock system. For this still better

improvement in terms of security we can make use of large key length such as 192 bit,256 bit and so on.

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