

Smart Door Lock System Using Rasbarry PI

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Abstract— An internet connected, automatic, servo driven deadbolt actuator that can be operated remotely using any device. In this project the actuator powered by a Raspberry Pi which will be added onto your existing door lock without any modifications to the door. The door lock can be controlled by multiple wireless devices, and even notify the user whenever someone locks/unlocks the door. And also the door is unlocked automatically when the known person comes in front of it. This is done by using Raspberry Pi Security Camera, which will be running on Open CV for object detection. The camera will send a pop-up to the connected device with an image of any object it detects, and then it will process the received image and match with the database. For an extra impressive door lock, a simple LED light to indicate if the door is locked, and a push-button to operate the lock manually.

Keywords— Raspberry Pi, Raspberry Pi Security Camera.

INTRODUCTION.

In this project, the System designed reduces human efforts and provide security. System provides Security locks for door, comfort, convenience security and energy efficiency for user. Raspberry Pi-3 Model B which sends the images to the user. It has in built capabilities of connecting to external devices.

Raspberry Pi proves to be smart economic and efficient platform for implementing the home

security system and for automation. Along with this image processing is also applied so that for the authorized person the door will open automatically. It will be simply done by matching the image captured at the door and the image which is stored in the memory of Raspberry-Pi. Two advantages provided by the system is that, necessary deed can be taken in short period of time. An internet connected, automatic servo-driven deadbolt actuator that can be operated remotely using any device. And along with that it can be opened automatically when it satisfies certain conditions.

Problem Defination

The security aspect is the major concern of IoT connected entities. The data can be personal, enterprise or consumer. For an acceptable implementation of the **Digital Door Shield (DDS)**, security should be taken as a major challenge. We can summarize the problems into different questions.

1) How we will set-up high and strong authentication between the user point entity (e.g smartphone) and the API and will this property provide strong privacy guarantees?

2) How we can generate an access token for the user that has privilege to unlock the door and how we can secure the token from being exposed?

3) Which connection protocols can be used in the product and having an ability to authenticate,

and access control does the local WiFi network full fill the security aspect?

4) What kind of microcontroller would satisfy the aims of the product by connecting a secure IoTsystem?

Hardware Components.

In the previous chapter we saw a brief introduction about the project and also the components required for it. In this chapter we'll see the detailed information of the components used in this project.

Raspberry Pi 3 Model B.

RaspberryPi-3Model is the third generation Raspberry Pi. It replaced with Raspberry Pi2 Model Bin February 2016. As of January2017, Raspberry Pi-3Model B is that the newest version of Raspberry Pi. It is as small as credit card size. Also it is open source therefore changes can be made to it as and when required.Compared to the Raspberry Pi 2, it has 802.11n Wireless LAN as well as Bluetooth 4.1 and Bluetooth Low Energy(BLE). For the Raspberry Pi-3 Model B, CPU speed ranges from 700Mhz to 1.2 GHz and on board memory range from 256 MB to



1GBRAM.

- Figure of Raspberry Pi-3 Model B

Raspberry Pi-3 Model B which uses system on chip (Soc) BCM2835.It does not have storage drive but one can use SD card for storing operating system as well as for booting and long term process. The Raspberry Pi-3 ModelB runs on

Raspbian OS and it is programmed using python 2.7.6.Also one can install various different type of software's for different purposes .Four USB ports for external storage, 40 GPIO pins for interfacing with hardware and full HDMI port are available on Raspberry Pi- 3 Model B board. It can be also connected to an USB camera which is used as a spy camera. In our System, Raspberry pi which act as a main controller of our system. Camera is configured with Raspberry pi to capture and store the image. Also sensors are connected directly to raspberriy pi configured with motion of door.

Raspberry Pi 3 PinDaigram

Raspberry Pi 3 GPIO Header

Pin#	NAME		NAME	Pin#
01	3.3v DC Power		DC Power 5v	02
03	GPIO02 (SDA1 , I2C)		DC Power 5v	04
05	GPIO03 (SCL1 , I2C)		Ground	06
07	GPIO04 (GPIO_GCLK)		(TXD0) GPIO14	08
09	Ground		(RXD0) GPIO15	10
11	GPIO17 (GPIO_GEN0)		(GPIO_GEN1) GPIO18	12
13	GPIO27 (GPIO_GEN2)		Ground	14
15	GPIO22 (GPIO_GEN3)		(GPIO_GEN4) GPIO23	16
17	3.3v DC Power		(GPIO_GEN5) GPIO24	18
19	GPIO10 (SPI_MOSI)		Ground	20
21	GPIO09 (SPI_MISO)		(GPIO_GEN6) GPIO25	22
23	GPIO11 (SPI_CLK)		(SPI_CE0_N) GPIO08	24
25	Ground		(SPI_CE1_N) GPIO07	26
27	ID_SD (I2C ID EEPROM)		(I2C ID EEPROM) ID_SC	28
29	GPIO05		Ground	30
31	GPIO06		GPIO12	32
33	GPIO13		Ground	34
35	GPIO19		GPIO16	36
37	GPIO26		GPIO20	38
39	Ground		GPIO21	40

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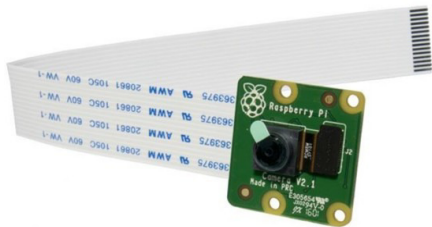
Raspberry Pi 3 Technical Specifications

- Quad Core 1.2GHz Broadcom BCM2837 64bitCPU
- 1GBRAM
- BCM43437 wireless LAN and Bluetooth Low Energy (BLE) onboard

- 100 BaseEthernet
- 40-pin extendedGPIO
- 4 USB 2ports
- 4 Pole audioproductivity and composite videoport
- Full sizeHDMI
- DSI presentation port for connecting a Raspberry Pi touchscreenpresentation
- Micro SD docks for loading your functional system and storingdata .Upgraded switched Micro USB power.

Raspberry Pi CameraModule

According to user convince, user can use web camera or pi-camera. Web camera have minimum 16 MP interpolated resolution also plug and play USB interface which can be configured with raspberry pi which is already connected with door. The Camera Module is a great accessory for the Raspberry Pi, allowing users to take still pictures and record video in full HD.



• Figure : Raspberry Pi-3 Camera Module

Starting with Raspberry-pi camera, one need to go to settings and configure it accordingly. Raspberry Pi-3 Model B has in-built Camera interface (CSI). To capture the picture, we need to save file as camera.py and need proper and correct python coding. Run the code and camera preview open for 5 seconds before capturing a picture and adjust to a different resolution momentarily as the picture is taken. As it is connected with sensors and door, it senses the person in front of door and capture the image and store it. Then captured image is send to users Android App.

We can seizure images using Python. Here, we'll mark a Python program to seizure images via Pi Camera on Raspberry Pi. Here we'll have used pi camera package (library) which offers different classes for Raspberry Pi. Out of which we are mainly involved in PiCamera class which is for camera module.

• Figure: Interfacing of Raspberry Pi Camera with Raspberry Pi



Servo Driven Motor:-

This great-torque stock servo now comes during a metal-gear flavour, for extra-high torque (10kg*cm!) and reliability! It can rotate a minimum of 120 degrees (60 in each direction) with a classic 1.5-2.5ms pulse, but if you'll can extend your pulses it can go up to about 170 degrees - it varies a touch servo-to-servo..



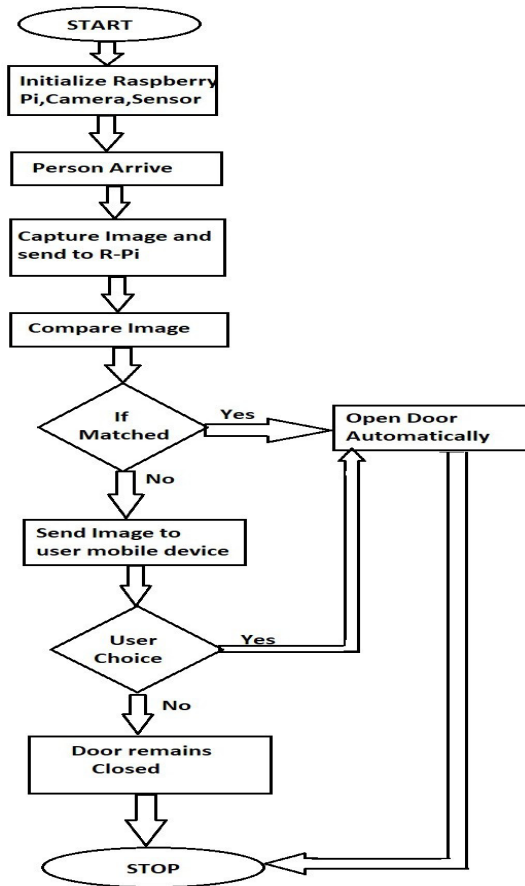
Good for beginners who want to make stuff move without building a motor controller with feedback and gear box. Comes with a lot of plastic horns, as shown. We currently convey the Turret-Pro MG-995, they're very nice, great quality servos, excellent to behave in robotics.

- Figure of Tower-Pro MG-995

- Torque: At 4.8V: 8.5 kg-cm / 120 oz-in, and at 6V: 10 kg-cm / 140oz-in.
- Bulk mm: (L x W x H) 40.7 x 19.7 x42.9
- Spline Count:25

Software Implementation

FlowChart -:



Servomotor works on the PWM (Pulse Width Modulation) principle, which suggests its angle of rotation is controlled by the duration of pulse applied to its control PIN. Basically servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears.

Details:

- Power: 4.8V - 9V DC max (5V works well)
- Normal Speed: 60 degrees in 0.30 sec (@ 4.8V), 60 degrees in 0.16 sec (@ 6.0V)
- Weight: 62.42g

Working Algorithm -:

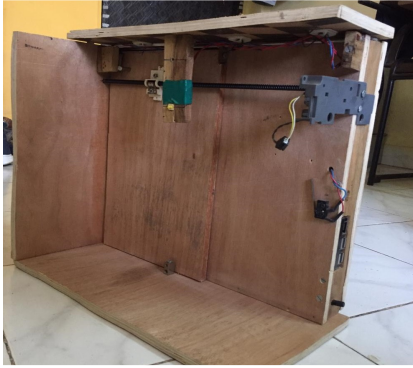
Flow of working of the system and flow of the programme are shown in these following steps:

Steps Included:

- STEP 1: Start.
- STEP 2: Initialization of Raspberry pi, Camera, Sensors.
- STEP 3: If any person comes, camera captures the picture/image and sends to the Raspberry Pi
- STEP 4: Raspberry Pi matches the received image with images stored in its memory.
- STEP 5: If image gets matched then door gets opened automatically.
- STEP 6: If image does not get match then the notification is sent to the user device.
- STEP 7: User gets notification and opens/closes door according to his/her convenience.
- STEP 8: If system crashes go to step (7).
- STEP 9: Backup plan (Keys)
- STEP 10: End.

Model





Software Application

- **OS: Raspbian-:**

Raspbian is Debian based 32 bit computer operating system for Raspberry Pi. There are several version of Raspbian including Raspbian buster and Raspbian stretch. Raspbian uses PIXEL, Pi improved X-Window Environment, Lightweight as its main desktop environment of the latest update. It is composed of a modified LXDE desktop environment and the open box stacking window manager with a new theme and a few other changes.

- **Python-:**

Python is an interpreted, high level, general purpose programming language. **Language constructs and object oriented approach aim to assist programmers write clear, logical code for minor and large-scale projects Python interpreters are available for several operating systems.** A global community of programmers develops and maintains CPython, open source reference implementation. A nonprofit organization, the Python Software Foundation, succeeds and points resources for python and CPython development. Python can serve as a scripting language for web applications, a standard API has evolved to facilitate these applications. Python is more productive than conventional languages, such as C and Java, for programming problems involving string

manipulation and search during a dictionary.

- **Visual Studio-:**

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft.

It is used to develop computer programs, as well as web sites, web application, web services and mobile application. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store. It can yield natural and managed code. Visual Studio also contains a code editor backing code refactoring and code completion. Constructed in gears include a code profiler, designer for building GUI applications, web designer, class designer, and database schema designer. Visual Studio supports 36 different programming language and allows the code editor and debugger to support any programming language. Built in language includes C++, XML, HTML, JavaScript, CSharp.

Risks -:

There is an extensive risk involved with developing an electronic door lock. **Locks are a product of safety and believe an excessive trust between product and user. The owner of the lock must feel completely confident that the lock is secure.** This trust is hard to acquire and very easy to lose.

Conclusion-:

We deliberate the System which reduce human efforts and provide security. Proposed system is cheap, consistent and works are easily available. It is also portable and easily upgradable. System provides Security locks for door, comfort, convenience security and energy efficiency for user. Raspberry Pi- 3 Model B which sends the images to the user. It has in built capabilities of connecting to external devices. Raspberry Pi shows to be a clever financial and efficient platform for applying the home security system and for automation. Two advantages provided by the system is that, necessary action can be taken in short period of interval.

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