

# SMART DOOR SECURITY AND SURVEILLANCE USING RASPBERRY PI

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**Abstract**— Home security is a top concern for everyone who owns or rents a home/store. In this present living conditions, safe and secure residential space is the necessity of everyone as most of the family members are working. The home is left alone for most of the day-time and home trespassing crimes are high as constantly monitoring of the home/store is much difficult. Another reason for the need of home safety is specifically when the old aged are alone or the kids are with baby-sitter and maid. Home security and surveillance system is thus required and desirable for resident's safeness and assistance. The aim of this paper is to develop a smart home security and surveillance System which can be controlled over the globe by the owner. Though there are many security systems developed this is based on the low cost Raspberry Pi interfaced with a PIR sensor and webcam. This system will detect the presence of intruder and quickly alert the user by sending him an alert message in the form of e-mail. This message will also contain the picture of the intruder, captured by the camera. The system can be installed at the main door of the home or office and monitor from anywhere in the world using your smart phone or personal computer(PC).

**Keywords:** Internet of Things (IoT), Raspberry Pi, Webcam, Smart phone, Intruder Alert System(IAS), Personal Computer(PC)

## I. INTRODUCTION

Security has become the most important aspect in this current world, so nothing can be compromised when it comes to the safety and security of our homes, offices and shops. If the same comes in a very effective way, then it would not be negotiated with the people of our world and the technology is even growing rapidly. So keeping that in mind this paper is to maintain the level of technology even in an affordable price. The security system is implemented at the door and if there is any person trying to approach towards the door, the camera captures and sends to the owner through an e-mail alert and through which the owner finally sends the information whether to open the door or not.

The IoT is the network of devices that contains electronics, software, sensors, and which allows these things to connect, interact and exchange data. In this paper IoT has come across in the purpose of sending the captured image to the owner and waiting for his/her decision.

The proposed system has added features like view video stream through mobile phone [3]. Additionally, voice

alert or siren activated to alert neighbours when intruder is detected.

## II. DESIGN AND IMPLEMENTATION

The system architecture of the Smart home security system is shown in the below figure which comprises of the Raspberry Pi, camera module, biometric system, PIR sensor, smartphone and power supply. The PIR sensor is connected to the GPIO pins of the Raspberry Pi. The image captured is stored at the SD card or USB pen drive which are inserted in the respective slots of the Raspberry Pi.

### a. Raspberry Pi

The Raspberry-Pi is a mini computer without any peripheral devices like mouse, keyboard, etc. The main purpose of this Raspberry Pi is to store the data from the different devices and it has the ability to run multiple programs at a time. It has a lot of interfacing slots like USB ports, an Ethernet port, an SD card slot, Wi-Fi ports, and more. The Raspberry-Pi 3 is a tiny credit card size computer. It's a Broadcom BCM2837, ARM cortex A53, 1.2GHZ 64bit processor with Storage capability using micro SD card of capacity 1GB. GPU of 400 MHz Dual Core Video Core IV with 1080p30 H.264 high-profile decodes. Several ports such as HDMI for audio, four USB 2.0 ports, 3.5mm 4-pole Composite Video and Audio jack, DSI Display Port, CSI Camera port and 40pin GPIO [5].

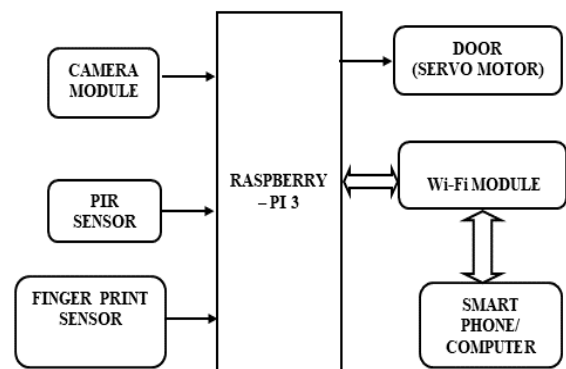


Fig 1. Block diagram

Wireless communication can be done using 802.11n Wi-Fi wireless Networking; IEEE 802.11a/g/b/n compatible. Bluetooth 4.1 wireless technology 10/100BASE-T Ethernet (RJ-45 connector) [6].



Fig 2. Raspberry Pi

Operating voltage of 5V DC and operating current is 2.5Amps operating systems are NOOBS, Raspbian several third party operating systems are XBian, RISC OS, pinet, Librelec, etc [1].

#### b. PIR Sensor

This is the only sensor used in this project as it can detect the infrared rays which varies depending on the temperature and surface characteristics of the objects in front of the sensor within the range of 5-12 meters. So it is used so as when any person tries to enter inside the home it detects the rays from it and sends to the Raspberry Pi for the further process to be done [4]. It is connected at the pin no's 21 and 22 of the GPIO pins.



Fig 3. PIR sensor

#### c. Web Camera

The Web camera captures the image of the intruder and sends to the owner's mail. The model used here is QHM585 web camera. It is nothing but just a digital camera of 25 mega pixels. Web Camera not only captures the images but it can also record up to 1080p30fps. The Web Camera comes into active state when PIR sensor triggers, when it detects the intruder.



Fig 4. Web Camera

#### d. Servo Motor

Servo motor is nothing but a normal DC motor used in the place of door locking system. It is operated using the technique, Pulse width modulation which is sent to the motor from the Raspberry Pi which helps the motor to turn around various angles and allowing the door to open according to it. It is usually along the lines of a 1ms pulse for the 0-degree position, a 1.5 ms pulse for 90 degrees, and a 2 ms pulse for 180 degrees [2]. For a continuous servo motor, which can turn 360 degrees, the pulse usually controls the rpm and directions. It is connected to the pin no.s 27,28.



Fig 5. Servo Motor

#### e. Buzzer

A buzzer or beeper is an audio signalling device, the buzzer used here is of electromagnetic type which is configured Raspberry Pi. It is used for the alarming the household when there is any error in the process. and when anyone tries to open the door forcefully.



Fig 6. Buzzer

#### f. Biometric system:

If there is no internet connection in the particular time where the owner can operate the door by the biometric system placed at the outside of the door. The model used here is AS608 optical finger print reader module sensor. The biometric system consists of a finger print sensor module which is interfaced to the Raspberry Pi. The finger print databases of the members living in the home are stored in the memory card which is inserted in the Raspberry Pi board and if the user's id matches with the database then automatically the door opens. If the data base is not stored then the door does not open.



Fig 7. Biometric module

### III. SYSTEM IMPLEMENTATION

#### A. Installing OS and Configuring Raspberry Pi:

First we need to install Raspbian on micro SD card that will be used in Raspberry Pi. We can download the latest image of Raspbian OS from Raspberry Pi website at [7]:

After successfully installing Raspbian OS on Raspberry Pi, we need to update software. To do this we need to run following Linux commands [7]:

```
$ sudo apt-get update
$ sudo apt-get upgrade
```

#### B. Web camera Configuring as IP camera:

After successfully installing Raspbian OS on Raspberry Pi, we need to convert our web camera into IP (Internet Protocol) camera for streaming the video on the smartphone. So for that web camera is configured through Putty terminal with the IP address of Raspberry Pi.

#### C. Installing Software for sending Email alert:

Now after setting up the web camera, we will install software for sending the Email. Here we are using SMTP, which is an easy and good solution for sending Email using command line or using Python Script. We need to install two Libraries for sending mails using SMTP:

```
$ sudo apt-get install ssmtp
$ sudo apt-get install mailutils
```

After installing libraries, user needs to open ssmtp.conf file and edit this configuration file.

#### D. Graphical User Interface:

For the user interface the web page is designed using hypertext markup language with necessary commands for opening and locking the door. The webpage can be accessed by the user from any location using the IP address defined to it. A web server is installed on the Raspberry Pi. In our case, we don't need a MySQL(My Sequel) database, only a HTTP(Hyper Text Transfer Protocol) server and its PHP (Hypertext Pre-processor) extension.

#### E. Python Program for IAS:

The Python Program of this project plays a very crucial role to perform all the tasks. First of all, we include required libraries for email, initialize variables and define pins for PIR se, servo motor and other components. For sending simple email, Simple Mail Transfer Protocol(SMTP) Library is enough to send mail with attachment etc.

### IV. METHODOLOGY

When the intruder alert system is powered on the PIR sensor senses any obstacle comes in between and it activates the web camera to capture the image. The web camera sends the captured image to the Raspberry Pi for storage. Then through internet it sends the image to the owner through an email which alerts the owner about the intruder. If the owner wants to give access in to the home, then by pressing the "YES" command in

the webpage, the door gets opened else it remains closed.

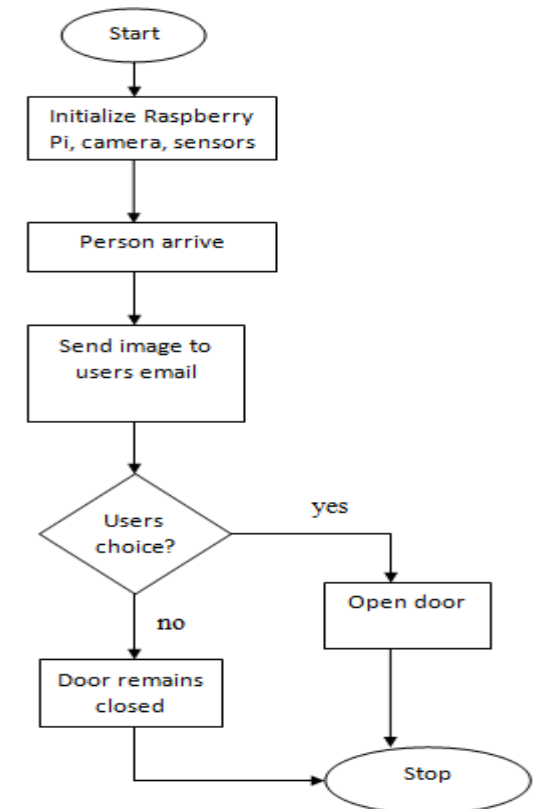


Fig 8. Flow Chart

### V. EXPERIMENTAL RESULTS

The biometric system which is placed at the door gives access to the authorized people to get into the home/office.

In the below figure shows the picture of the intruder captured by the web camera received to the owner's email address.

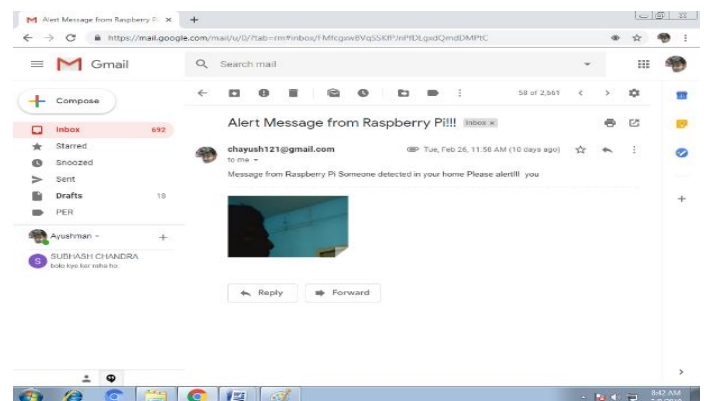


Fig 9. E-mail Alert message

If the owner wants to open/close the door, then he can control this operation with the help of webpage. The below figure shows the webpage which is provided with user commands to operate the locking/opening of the door.

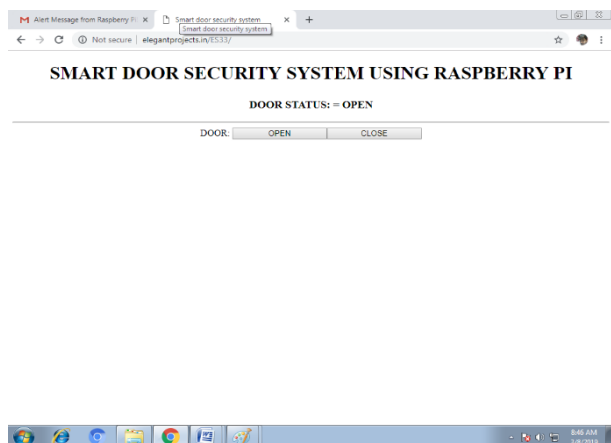


Fig 10. User interface

## VI. CONCLUSION

This paper presents the design and the implementation of an interactive Smart home security and surveillance system with Email alert, biometric system for door accessing using Smart Phone. The smart door security and surveillance system which is designed provides us the safety from suspicious people. It helps in monitoring of the homes/stores remotely from anywhere by the user. This system is easily portable and upgradable. Thereby, this system can find its application in many fields such as home automation, office security system and so on. In Future, this Raspberry Pi project is further enhanced with GPRS for performing Locking and Unlocking of door from any locations. In addition to this we can upgrade finger print module with Iris scanner.

## VI. REFERENCES

- [1]. Akash v Bhatkule - Home Based Security Control System using Raspberry Pi and GSM, International Journal of Innovative Research in Computer and Communication. Vol. 4, Issue 9, September 2016
- [2]. Anuradha.R.S, Bharathi.R - Optimized Door Locking and Unlocking Using IoT for Physically Challenged People, International Journal of Innovative Research in Computer and Communication Engineering, vol. 4, pp. 3397-3401,2016.
- [3]. S. Nazeem Basha, Dr. S.A.K. Jilani - An Intelligent Door System using Raspberry Pi and Amazon Web Services IoT, International Journal of Engineering Trends and Technology (IJETT), vol. 33, pp. 84-89,2016
- [4]. Nisarg Shroff, Pradeep Kauthale- IOT Based Home Automation system using Raspberry Pi-3, International Research Journal of Engineering and Technology (IRJET), vol. 4, pp. 2824-2826,2017.
- [5]. Rajendra Nayak, Neema Shetty - Secured Smart Home Monitoring System Using Raspberry-PI, International Journal Innovative Research and Development (IJIRD), vol. 5, pp. 339-342,2016.
- [6]. Lia Kamelia, Alfin Noorhassan S.R, Mada Sanjaya.W.S, and Edi Mulyana, "Door-Automation System using Bluetooth-based Android for Mobile phone," vol. 9, no. 10, October 2014.

- [7]. <http://www.raspberrypi.org/downloads/>
- [8]. Mrutyunjaya Sahani, Chiranjiv Nanda, Abhijeet Kumar Sahu and Biswajeet Pattnaik, "Web-Based Online Embedded Door Access Control and Home Security System Based on Face Recognition" 2015 International Conference on Circuit, Power and Computing Technologies [ICCPCT]
- [9] Rhythm Haji, Arjun Trivedi, Hitarth Mehta , Prof. A.B.Upadhyay "Implementation of Web-Surveillance using Raspberry Pi" International Journal of Engineering Research & Technology (IJERT) Vol. 3 Issue 10, October- 2014, IJERT