

# Home Security Control Sytem Using Raspberry Pi

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**Abstract**—Home-based Security System is a mobile web-based application that allows the user to monitor and control their home using their mobile device. Through this project we could achieve a 24/7 controlled and monitored surveillance with minimal human interference and connection that surveillance with the internet world to accesses it from any point of the world. The projected security issues centers on our integration of cameras into web application. Raspberry Pi works and controls motion detectors and video cameras for remote sensing and surveillance, streams live video and records it for future playback.

**Keywords**—Raspberrypi,Monitoring,webcamera,Motion detector

## I. LITERATURE SURVEY

Security for Smart Home based on Raspberry pi controller was discussed by Govinda. (2014) that provides two methods to implement home security using IoT. One is using web or pi cameras such that whenever there is any motion detected by the camera, it sounds an alarm and sends a mail or the whats app message to the owner. This method of detecting intrusion is quite good, but somewhat expensive due to the cost of the cameras involved in the process. Jayashri and Arvind (2013) have implemented a fingerprint-based authentication system to unlock a door [3]. This system helps users by only allowing the users whose fingerprint are authorized by the owner of the house. This system can also be used to monitor who all have used the sensor to enter the house. Laser rays and LDR sensor are used to to detect intrusion using their movement was proposed in 2016.

## II. WORKING OF THE SURVEILLANCE SYSTEM

### A. Raspberry Pi Based Surveillance System

A raspberrypi can be used to implement a security system with motion detection, image processing and alert mechanism.

It consists of four modules

- 1) Raspberry Pi Zero
- 2) Pi camera/USB Ceamear
- 3) PIR sensor
- 4) Laptop

### B. Image Processing

There are many Image processing techniques which were used to get the perfect output which are

- 1) Image Blurring-Gaussian blur (also known as Gaussian smoothing) is the result of altering an image by a Gaussian

Function. It is a widely used to decrease noise and detail. The visual effect of this blurring technique is a smooth blur approaching that of watching the image through a luminous screen, distinctly dissimilar from the bokeh effect shaped by an out-of-focus lens or the shadow of an object under usual illumination.

- 2) Gray Scaling-Grayscale is a range of shades of gray without seeming color. The darkest possible shade is black, which is the total anti-presence of transmitted or reflected light. The lightest likely shade is white, the total transmission or reflection of light at all visible wavelengths. Midway shades of gray are represented by equal brightness levels of the three primary colors (red, green and blue) for transmitted light, or equal quantities of the three primary pigments (cyan, magenta and yellow) for reflected light

- 3) Thresholding- Thresholding is a process of changing a grayscale input image to a bi-level image by using an best threshold. The purpose of thresholding is to extract those pixels from some double which signify an object (either text or other line image data such as graphs, maps). Though the info is binary the pixels characterize a range of intensities. Thus, the objective of binarization is to mark pixels that belong to true forefront regions with a single intensity and background regions with unlike intensities.

### C. The Raspberry Pi

The Raspberry Pi is a Linux based microcomputer based on ARM architecture. It was built mainly to aid in developing open source game. An operating system makes Raspberry Pi run. Since Raspberry Pi is a credit sized computer that is grounded on Linux, optimum performance of RPI can be achieved if it is therefore operated in this environment. Important to note is that the Raspberry Pi does not operate in a Windows environment. To get access to Pi from windows we require Putty Software. Putty is an SSH and TelNet client. The Camera Board on the Raspberry Pi is a small printed circuit board with a camera on it. The PCB is connected to a ribbon cable which connects to the Pi itself on its own port. The ribbon can be extendable. The camera on the board is very small (5MP camera).

### D. Email Notification

To allow for email notifications to send, the OS needs a program that allows for emails to be sent. Simple Mail Transfer Protocol (SMTP) is a package that allows a system to deliver an email from a local computer to a mail host. It does not receive mail but can send out mail. SMTP is ideal for

situations where alerts are needed to be sent, therefore it is useful when sending notifications.

A python script can be used to achieve this. It may just send a notification without image or can be modified to send an attachment along with the alarm message. For SMTP to support transmission of an attached file, Multipurpose Internet Mail Extension (MIME) is required

### III. HARDWARE ARCHITECTURE

Below figure shows the entire system module

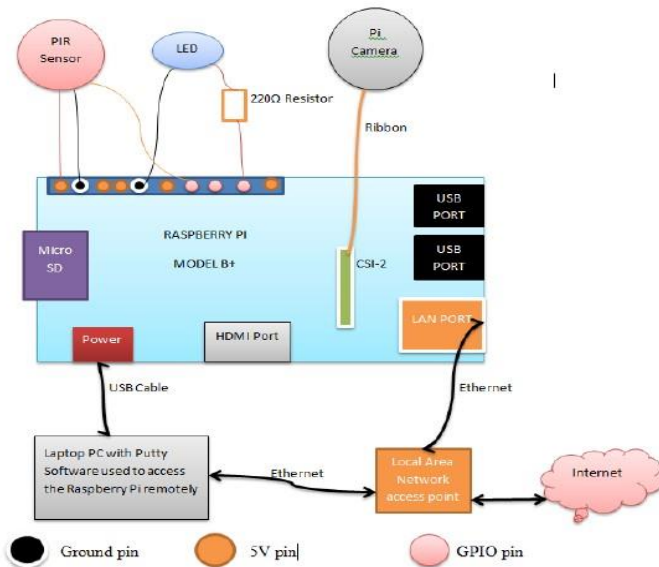


Fig1: System Module

### IV. SOFTWARE DESIGNING

Here we have used python programming whose pseudo code is as follows

- i. Start the camera and set to capture video stream
- ii. Grab a frame from the video stream. If frame is grabbed, continue with the process. Else stop. Initialize the frame as the current frame
- iii. Convert the captured frame to grayscale. Then do Gaussian blurring to remove noise in the gray image
- iv. Capture another frame and repeat step two above.
- v. Check for pixel threshold if enough to call motion detected
- vi. Draw a rectangle around the region where motion was detected

### V. RESULTS

Tweaking the sensitivity of the PIR sensor among different levels, the following were the results

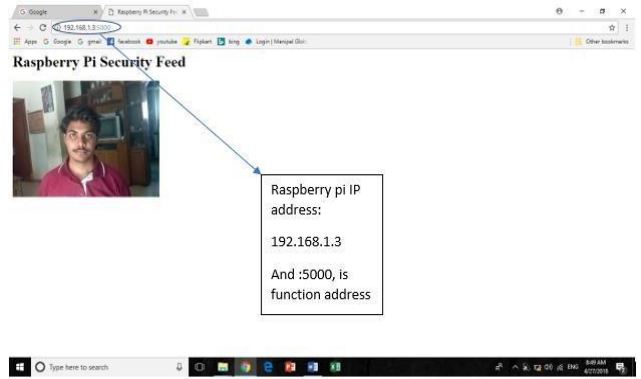


Fig2- Security feed

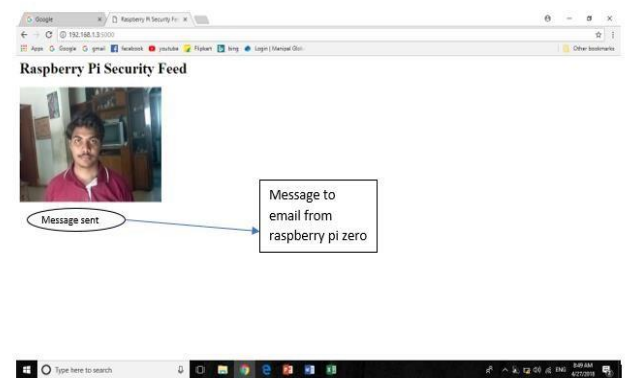


Fig3-Message to email

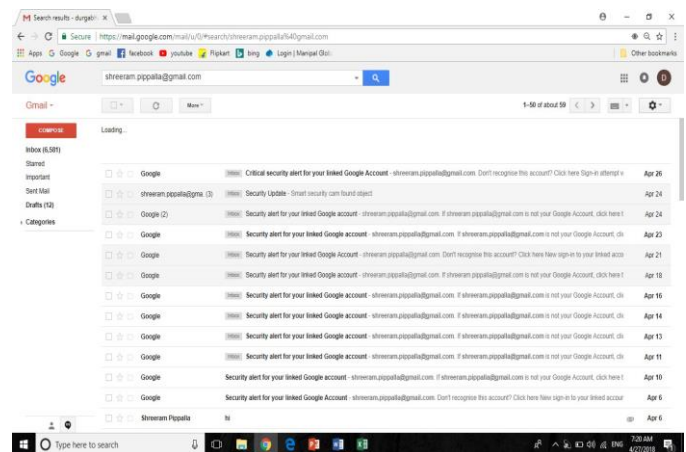


Fig4- Caption real time video link on email with image

## VI. CONCLUSION

The project designed and implemented a security system based on the Raspberry Pi. The aspects of the system are: motion detection using a PIR sensor, video capturing using a Pi Camera and sending out an alert through e-mail. It did not however achieve the option of image processing in the Raspberry Pi because of system constraints i.e. processor speed

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