

# The Development of Intelligent Home Security System Using Raspberry pi3

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**Abstract :** Nowadays, providing a security system for houses has become a vital research in which the latest technologies are being adopted to serve this purpose. Wireless network is one of the technologies that have been used to provide remote monitor and control for the home appliances. This paper aims to propose a surveillance camera based on Raspberry pi technology where cameras, Buzzer and GSM modules are being utilized to provide an alarming system that has the ability to notify the owner. The system works by taking snaps for the person through a code and USB camera positioned in somewhere then, such snaps will be compared with library files. If there are any unauthorized persons entered the snap will be sent to the owner. The proposed system can be extended to be used for different properties and facilities such as banks and office.

**IndexTerms – Security, Robot, Raspberry pi3.**

## I. INTRODUCTION

In recent years, many people pay a lot of attention on the security of home, office, laboratory, factory and public situation. Many experts of the academic community and commercial companies start to cooperate together and make efforts in different security systems, because the issue of the safe living environment for human being becomes more and more important. Therefore, we suggest the robotic technology combine with the security. System as the state-of-the-art robotic application, (i.e.) security robot. The security robot is able to identify potential hazards to warn human beings in advance. We can monitor that particular area through the Internet anytime, anywhere. A typical security system consists of intruders, Buzzer alarm to be installed. Real-time image is used to monitor home condition. When any abnormality is found, robot will use.

## II. Literature survey

In the past literatures, many experts research in the security and service robot. [2] Jatin Chatrath. Developed Real time human face detection and tracking here they used Viola Jones algorithm to detect the faces. [3] Anagha S. Dhavalikar. Developed Face detection and facial expression recognition system. The proposed method has three stages: (a) face detection, (b) feature extraction and (c) facial expression recognition. [4] Virginia Menezes. Developed Surveillance and monitoring system using Raspberry Pi and SimpleCV. This paper proposes the motion detection and tracking system for surveillance. [5] Bahaa Eldin Gamal. Developed embedded target detection system based on Raspberry Pi system. This paper describes implementation of target detecting and tracking system, which can extract required information from images without need for an external processing unit and track the target, based on embedded system.

## III. Proposed System

### 3.1 System Architecture

System Architecture as shown in the below figure, the whole architecture of the system is composed of five modules namely:

- Ethernet cable/ Wi-Fi
- Raspberry Pi model B
- Buzzer (optional)
- USB Camera
- Monitor/Mobile

The role of each module shall be discussed in detail later in this chapter. Here we use open cv tool for face Detection and face recognition.

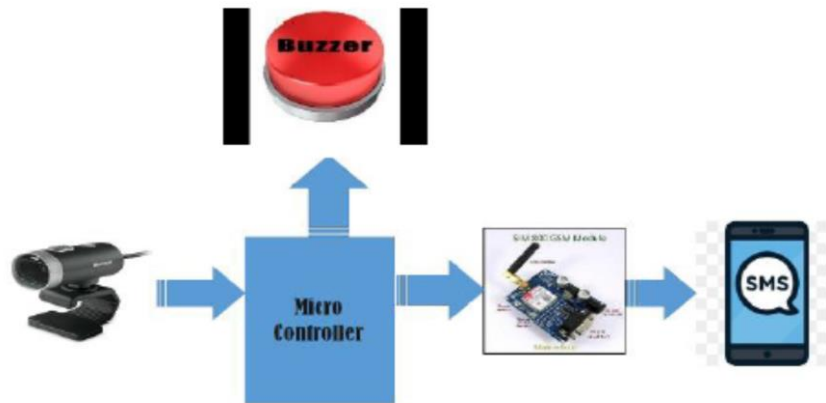


Figure.1 System Architecture

### 3.2 Why Raspberry Pi based Security Systems for Homes?

Several criteria have been used to select a security system required to safeguard a facility. The chief among all these has been the cost of implementation of such a system. The Raspberry Pi is also a very versatile device whose functionality is not limited. The following reasons explain the need to have your home security system based on Raspberry Pi:

Arduino microcontroller based security system can be relatively cheaper to implement as compared to Raspberry Pi based system but its memory capacity renders it more ineffective especially when trying to interface with other modules e.g. camera, monitors, motion sensors, mouse and keyboard. Raspberry Pi has an extendable SD card storage and can be expanded to suit the needs of an individual. Moreover, Arduino microcontroller requires a GSM modem to enable it transfer information through the internet. The Raspberry Pi has a port to connect it to the internet.

### 3.3 Object Detection and Sending Alert message

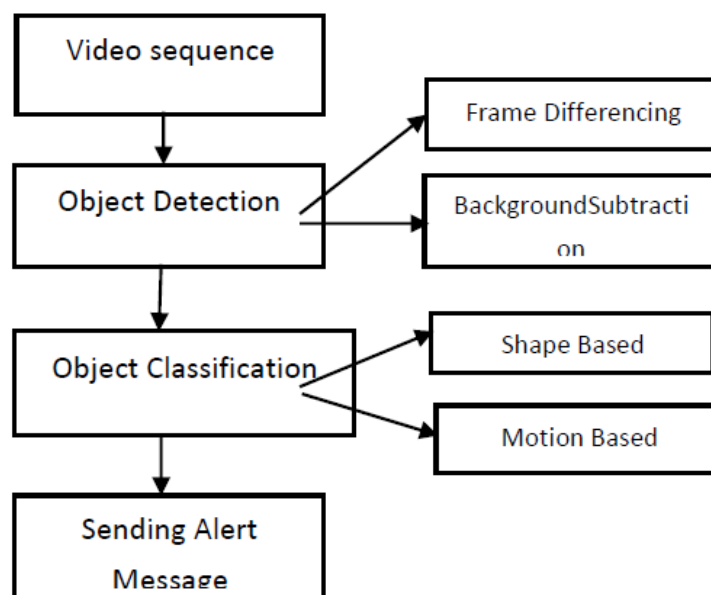
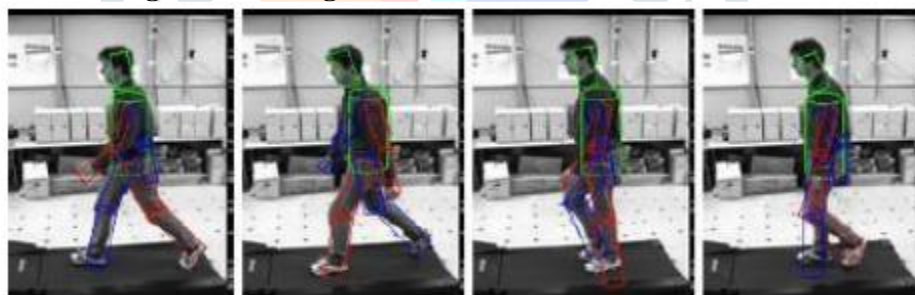


Figure 2. Object Detection and Flow Chart

## IV. Methods of Detection

### 4.1 Background Subtraction Method :

A very widely used method which is simple to implement by just subtracting the current frame from previous frame and obtaining threshold value of difference between given pixel value and obtained pixel value [6,7,8,9,10]. If threshold value is greater than the given the pixel it is considered as foreground. This method is not as appropriate as it is highly inaccurate and gives false rate detection.

### 4.2 Real Time Background Subtraction and Shadow Detection Technique Theory:

It describes two type of distortion namely brightness distortion and chromaticity distortion based on RGB values of pixels in given image. This method is accurate up to some extends as it also detect the shadow part of object.

### 4.3. Shape Based:

Shape based method is used to detect objects in real-world images. The shape features are more striking as compared to local features like SIFT because most object categories are better described by their shape then texture, such as cows, horses and cups and also for wiry objects like bikes, chair or ladders, local features contain large amount of background noise. Thus shape features are often used as a replacement to local features.

### 4.4 Programming the Raspberry Pi:

To enable communication with the outside world, the Raspberry Pi has to be programmed with a suitable programming language. Here we use python code as a programming language. RPI can be programmed using any of the languages but for purposes of this project, Python will be of great importance to study. It is provided by default through and thus optimum operation of the Pi can be achieved.

### 4.5 Raspberry Pi Operating Systems:

An operating system makes Raspberry Pi run. Since Raspberry Pi is a credit sized computer that is based on Linux, optimum performance of RPI can be achieved if it is therefore operated in this environment. Raspbian provides more than a pure OS: it comes with over 35,000 packages; precompiled software bundled in a nice format for easy installation on RPI. 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.

### 4.6 The USB camera module:

USB Cameras are imaging cameras that use USB1.1 or USB 2.0 technology to transfer image data. USB Cameras are designed to easily interface with dedicated computer systems by using the same USB technology that is found on most computers. The accessibility of USB technology in computer systems as well as the 480 Mb/s transfer rate of USB 2.0 makes USB Cameras ideal for many imaging applications.



**Figure 3. USB Camera**

To initialize the camera plus a Python script to enable it take pictures Specific configuration settings are required to Enabling the USB Camera

- Sudo apt-get update
- Sudo apt-get upgrade
- Sudo apt-get install fswebcam
- Sudo raspi-config

**Python code**

After enabling camera run the face detection code. In output face was detected from the video and it will show with green color square box around the face and eye. After classifying the object, If it is unauthorized means immediately alert message is sent to the given mobile number (USER).

**SMS Alert**

The user mobile number is given in the program and then using a GSM module the alert message is sent to the user if any unauthorized person is detected in the camera.

**RECOMMENDATIONS**

The following are recommended:

- The designed security system can be used in homes to monitor the facility at any given time.
- The system requires to be remotely controlled. Hence, future explorations should focus much more on the same

**V. CONCLUSION**

The project designed and implemented a security system based on the Raspberry Pi. The aspects of the system are: video capturing using a USB Camera analyzing the captured images using Haar cascade algorithm, If the image is unauthorized means sends an alert message to the Mobile phone.

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