LIVE STREAMING MOTION DETECTION CAMERA SECURITY SYSTEM WITH EMAIL NOTIFICATION USING RASPBERRY PI

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Abstract
Even when needed, having a security camera system may sometimes be impossible due to the extensive costs for installation. The Raspberry Pi is a credit card sized computer that has the capability to become a camera security system when its own camera board is used. It contains the software motion which enables the Pi's camera to detect motion and save the image as well as view live streaming from the camera. A python script, then directs the Pi to send email notifications every time motion is detected. With these components, a cost effective and efficient security camera system is made and reported here.

Keywords: Raspberry Pi, Motion Detecting, Email, Notifications, Python, Live Streaming.

I. INTRODUCTION

New innovative technology revolves around how much a product is capable of implementing along with its price. The Raspberry Pi crosses off both criteria because it is a cheap effective computer which is capable of much more. What makes it so convenient is that so much can be done with it from a security system to a VPN server. The possibilities are endless! Like any other computer it can accept several programming languages including Python.

Most importantly, security can be a necessity today and the Pi has the ability to become a camera security system with a cost under 80dollars.Regular security systems lead up to prices within the range of thousands. Who would want to buy a single camera for over 100 dollars just to setup on their front door, when they can buy a 29 dollar camera which even notifies them via email? You would never have to worry about looking back through recordings because the Pi Security System would send you an email whenever someone comes by your home. Most of all the Pi Security Camera system is very user friendly. Anyone who has the required materials can do it with a few additional installations of files and save themselves a great amount of money. Not to mention, they would gain an efficient security system.

II. PROPOSED SYSTEM

The proposed system is designed to overcome the drawbacks of previous system and to improve security, flexibility, efficiency Even when needed, having a security camera system may sometimes be impossible due to the extensive costs for installation. The Raspberry Pi is a credit card sized computer that has the capability to become a camera security system when its own camera board is used. It contains the software motion which enables the Pi's camera to detect motion and save the image as well as view live streaming from the camera. A python script, then directs the Pi to send email notifications every time motion is detected. With these components, a cost effective and efficient security camera system is made and reported here. The proposed system block diagram is shown below.

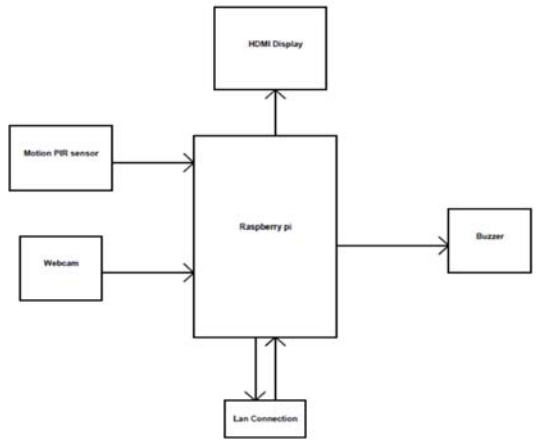

Fig.1. Block diagram of Proposed system

A. Component Description:

The proposed system consists of following major components.

[i] Raspberry Pi
[ii] LAN Cable
[iii] HDMI Display
[iv] PIR sensor
[v} Buzzer
[vii] Keyboard and mouse
[viii] Webcam

[i] Raspberry Pi:

The Raspberry Pi is a credit card sized, single board computer developed in the UK by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2835 System on a Chip (SoC), which includes an ARM1176JZF-S 700 MHz processor. It has an internal storage of 512 MB, external storage supported up to 32 GB, 1 Ethernet port, 4-2.0 USB ports, 1 micro SD card slot, DSI display connector, 1 HDMI out port, 1 CSI Camera connector, 5V USB power, RCA video and audio jack as shown in the below figure.

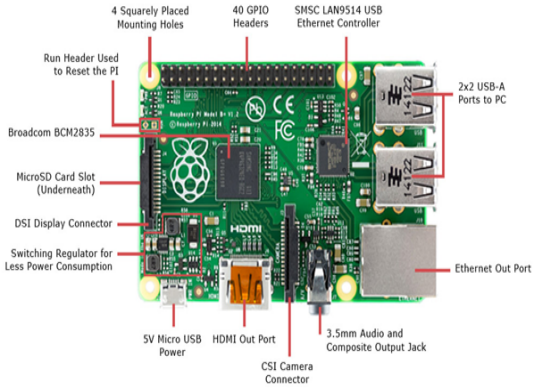

Fig.2. Raspberry Pi B+ Model

The Raspberry Pi B+ model CPU is of ARM 11 family, operates at 700MHz. The GPU having Broadcom Video core-IV, open GLES 2.0, 1080p30, H.264/MPEG-4, AVC high profile decoder and capable of 1Gpixel/s, 1.5 G Texel/s (or) 24 GFLOPs of general-purpose (GPIO) compute. It operates 1mA at 5V power supply. With the help of GPIO pins we can control the devices sitting at home. The GPIO pin configuration is shown in below figure.

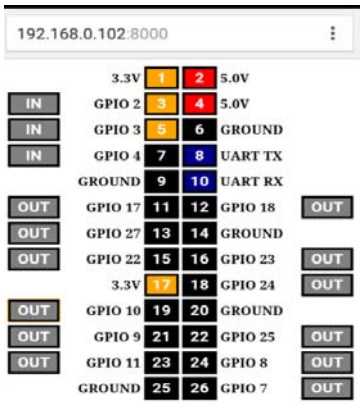

Fig.3. GPIO Header file of Raspberry Pi

The IN and OUT pins of the GPIO are mentioned, shows the current status of the appliances.8 GPIO pins for external peripheral connections supported by Raspberry Pi. 2- 3.3V, 2-5V pins for power supply connected to the external devices. With the Python is a default programming language for the Raspberry Pi with support of C, C++, Java, Perl and Ruby.

[ii] LAN Cable (Local Area Network):

To access the internet in Raspberry Pi we need LAN connection, with the help of which we can access the incoming and outgoing E- mail services. The LAN speed is much faster than the wireless connection.

[iii] HDMI Display:

To see the current status of the home appliances as well as the sensors (LPG gas, PIR, temperature) and also we will able to check the updates regarding Raspberry Pi.

[iv] PIR sensor:

Passive Infrared sensor is to detect the motion of human being, as a human passes through this sensor, the temperature in the background will rise from room temperature to the body

temperature and thus the motion or human will be detected.

[iv] Buzzer:

It has two wires. Namely red black. Polarity matters: black=ground Apply an oscillating voltage to make a noise. Oscillating voltage alternately squeezes and releases the piezo element. Must apply flucuating voltage, a steady HIGH or LOW won't work. The buzzer case supports the piezo element and has resonant cavity for sound

[vii] Keyboard and mouse:

Key board and mouse are used to operate the Raspberry Pi, so we can easily do the programming and make changes easily.

[viii] Webcam:

A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

B. Interfacing:

- First of all need to install the Rasbian Operating system in the micro SD card, after that need to insert the SD card in Raspberry Pi kit and give the 5V power supply to the same.

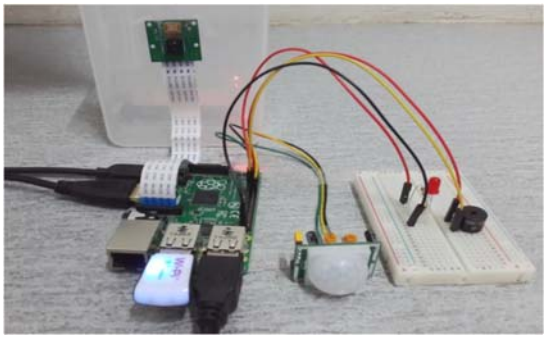

Fig.4. Motion detecting camera security system experimental setup

- Connect the HDMI port to the LED TV and thus the display will be observed on LED screen.
- Now connect the keyboard and mouse to the Raspberry Pi USB ports, so will be able to write the code with the help of keyboard and mouse.
- Connect the LAN cable to Ethernet port and so we can access the Raspberry Pi and make the system interactive by sending and receiving E-mails.
- Need to write the code for the proposed system in Python language and store the results in the form of E-mail.
- LEDs are used to check the hardware setup before the interfacing and it will show either the device is in ON state or OFF state.

III. RESULTS

Case I:

When the email has been successfully sent, the LED and buzzer will 'OFF' and stop producing alarm sound respectively.

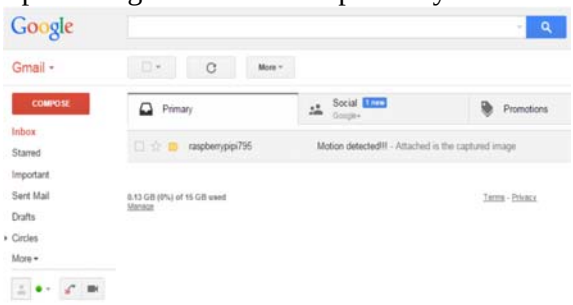

Fig.5. Email notification

Case II:

Figure 6 show the notification and content of the email received by the user respectively.

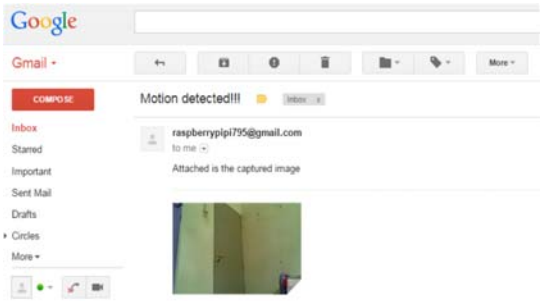

Fig.6. Content of the received email

Case III:

The main purpose of this android application was to enable the user to remotely control the activation of the system. 'Taken image' button is used to view the captured image once a motion is detected. Therefore the user can further confirm the reliability of the received image from the email.

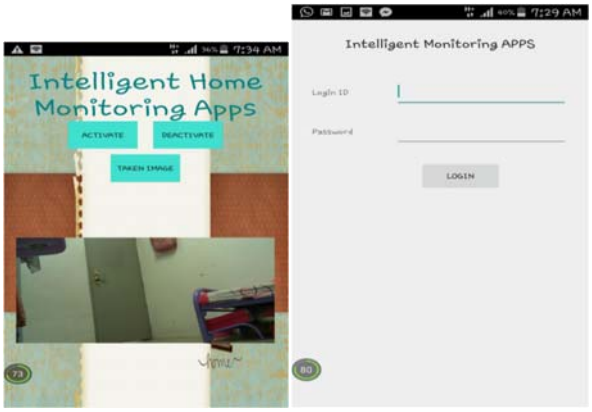

Fig.7. Android application interface

Case IV:

The home surveillance system is then integrated with the Android application to develop an intelligent motion detecting camera security system for home/offices. The complete Python program for the motion detecting camera security system. The system will only be activated when the user touches the 'Activate' button. Once the 'Activate' button is touched, the motion detecting camera security will performed their complete function. Otherwise, the user can deactivate the system by touching the 'Deactivate' button. Figure 6.7 shows the result obtained from the system integration.

```
pi@raspberrypi ~ $ sudo python system.py      Python program file
Activate  --> 'Activate' button is touched
GPIO pin 24 is HIGH
Image
Send Mail
GPIO pin 24 is LOW
Deactivate  --> 'Deactivate' button is touched
Activate    --> The system is activated again
GPIO pin 24 is HIGH
Image
Send Mail
GPIO pin 24 is LOW
```

Fig.8. Result of the system integration

IV. CONCLUSION

We developed a comprehensive solution that provides a user friendly home automation and security application for homes/offices. We accomplished this through the integration of cheap, off-the-shelf, widely available devices, interfaces and software coupled with a user friendly interface. This work provides users with an easy to use mobile application for which they can remotely access and control their home appliances and security. In future we intend to provide a wireless relay connection and wireless sensors which can be movable and can be operated and which can be used in company and instates for Security to the whole building with one single system. This provides a full security support for homes.

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