Sound Detection Security System with Email and Live Streaming using Raspberry Pi

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Abstract:
Even when needed, having a security camera system may sometimes be impossible due to the expensive costs for installation. In this project used a raspberry pi, 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. That is extremely user-friendly and cost-effective. It contains sound detection and this project used a raspberry pi, raspberry pi is a credit card sized computer that has the capability to become a camera security system “Raspberry Pi” where USB camera used to capture the image when detected the noise using sound sensors. This system is suitable for small personal area surveillance offices/homes, bank, locker room, parking entrance. Whenever the sound is detected through the sound sensor the image is captured through the camera and stored in the raspberry pi module and then send to the email server. The internet of things (IOT) based application used to get notifications.

Keywords: Raspberry Pi Zero W, Camera, Email, Notification, Internet, Sound Sensor, Power Supply.

I. INTRODUCTION

In the present day scenario, the security forms the most important part of our life. Let it be in any form of life. The house is a residential building, asset, as well as a place to store wealth. Therefore, security becomes one of the mandatory considerations in keeping the house from undesirable event or accident. The traditional solution for house security is a closed-circuit television (CCTV). CCTV is a device to monitor the situation around the office area, house, and building. CCTV is also a very useful device to monitor the circumstances around the house, either when the residents are at home or not at home. There are some problems with CCTV implementation. Firstly, it does not produce any notification and warning whenever it captures any suspicious object. Secondly, CCTV is streaming continuously to capture the events that occur in the home environment even when there is no any suspicious object or activity. Therefore it results in huge consumption of bandwidth and storage media due to the continuous video streaming and storing. Internet of Things (IoT) is a network of interconnected electronic devices that are capable of sending data without interference or with minimal human intervention. Raspberry pi is a credit-card sized computer. It functions almost as a computer. A Raspberry Pi Zero with smaller size and reduced input/output (I/O) and general-purpose input/output (GPIO) capabilities was released in November 2015. By 2017, it became the newest mainline Raspberry Pi. On 28 February 2017, the Raspberry Pi Zero W was launched, a version of the Zero with Wi-Fi and Bluetooth capabilities. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support.

II. PROBLEM & SOLUTION

The traditional solution for house security is a closed-circuit television (CCTV). CCTV is a device to monitor the situation around the office area, house, and building. CCTV is also a very useful device to monitor the circumstances around the house, either when the residents are at home or not at home. There are some problems with CCTV implementation. CCTV camera is costly because of the use of computers. It reserves too much space for continue recording and also require manpower to detect the unauthorized Activity. But compared to the existing system, Raspberry pi system is much cheaper with better resolution and low power consumption feature. This system is suitable for small personal area surveillance. i.e. personal office cabin, bank locker room, parking entrance. The small form factor, integrated Wi-Fi and low price, make the Pi Zero W the perfect computer for running low-power jobs, particularly where space is an issue. This concept can be used to sound detection camera security system with email and live streaming based on Raspberry Pi zero w, that is cost effective. This system connect to power supply and connect to the internet. Sound sensor detects the sound then activate the Raspberry Pi and camera to take pictures and keep a record by sending an attachment through a Email and you can see live video. With the help of this system evidence of the visitor can be kept as email if any emergency case or situation occurs. To Implement this system we required OpenCv Module, an open source library of programming functions mainly aimed at real-time computer vision. Python code which interact with the Raspberry Pi and camera module using OpenCv.

Let’s break the whole setup into 3 major parts:-
1. Functional Description
2. Connection of camera with raspberry pi
3. Python Code for image detection and Live video

III. FUNCTIONAL DESCRIPTION

In this we will talk about the core component required for this setup. Following are the core component:-

1. Raspberry pi
2. Camera
IV. RASPBERRY PI

The Pi Zero W has been designed to be as flexible and compact as possible with mini connectors and an unpopulated 40-pin GPIO, allowing you to use only what your project requires. At the heart of the Raspberry Pi Zero W is a 1GHz BCM2835 single-core processor, the same as the B+ and A+, with 512MB RAM. Raspberry Pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems, military applications, etc. Raspberry Pi is a popular Single Board Computer (SBC) in that it is a full computer packed into a single board. Many may already be familiar with the Raspberry Pi 3 and its predecessors, which comes in a form factor that has become as highly recognizable. The Raspberry Pi comes in an even smaller form factor.

Raspberry Pi Camera
- Dimensions: 25mm x 20mm x 9mm
- 5MP resolution
- 2592 x 1944 pixel static images
- 1080p30 video
- This module is only capable of taking pictures and video, not sound.

Sensor (Sound Sensor):

The Sound Sensor is a microphone that allows your GrovePi or GoPiGo robot car to listen to sound strength, so you can control it to take a picture or move around based on changes in noise! The Sound sensor module is a simple microphone. Based on the power amplifier LM386 and the electret microphone, it can be used to detect the sound strength of the environment. The value of output can be adjusted by the potentiometer.

Features:
- Grove compatible interface
- Wide supply voltage range: 4V-12V
- Low quiescent current drain: 4mA
- 2.0cm x 2.0cm twig module
- Minimum external parts

Connection of camera with raspberry pi-
Now we need to assemble the camera and raspberry pi like below image. Like the below image we need memory card to boot the raspberry pi.

We need to give the power supply to run the normal raspberry pi. HDMI port is also available to give the monitor purpose.

Sound Sensor with Raspberry Pi-

The Grove Base Hat for Raspberry Pi Zero provides Digital/Analog/I2C/PWM/UART port to meet all your needs. With the help of build in MCU, a 12-bit 6 channel ADC is also available for Raspberry Pi. Compared with Grove Pi+, the Grove Base Hat for Raspberry Pi Zero does not use the ATMEGA chip for data conversion, so it runs faster. We provide the Raspberry Pi driver for Grove Base Hat for Raspberry Pi Zero.
Python Code for Sensor and Live video-
Final and the most important part is to run the python code for cctv purposes. We required the OpenCv for this. We are using Python2.7 for this project. OpenCV is a library of programming functions mainly aimed at real-time computer vision. We need to program for the Sensor which detects the sound. After detect the sound of a certain range, we trigger the email. Which Indicate the live streaming for the user. And User can watch the live video.

V. CONCLUSION

Security is one of the most important factors of human life. Humans want to secure everything as possible as he. The security system has been aimed to design in such a way that it can fulfil the needs of the user for surveillance area. This concept can be used to sound detection camera security system with email and live streaming based on Raspberry Pi zero w, that is cost effective. This system connect to power supply and connect to the internet. Sound sensor detects the sound then activate the Raspberry Pi and camera to take pictures and keep a record by sending an attachment through a Email and you can see live video. With the help of this system evidence of the visitor can be kept as email if any emergency case or situation occurs.

Future Work
One application should be developed the controlling power of raspberry pi from the window. User can also view captured image remotely on this application. Live video streaming can be added as per the user requirement. Power management should also be there and system went on sleep mode when it is no longer in active mode. The small form factor, integrated Wi-Fi and low price, make the Pi Zero W the perfect computer for running low-power jobs, particularly where space is an issue.

VI. REFERENCES


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