Motion Detection

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***Abstract* -- Motion detection is one of the key techniques for automatic video analysis to extract crucial information from scenes in video surveillance systems. This paper presents an algorithm for Motion Detection which is independent of illumination variations, bootstrapping, dynamic variations and noise problems.**

***CCS CONCEPTS* -- Hardware → Electronic design automation**

***KEYWORDS* -- Raspberry pi, Bluetooth, Motion Detection, Smart Home, Anti-theft, Safety, Security for home.**

I. INTRODUCTION

The project we have been working on helps in any security threat or anything that concerns safety at our home, in our absence, and notifies us if there is any motion detected at home. This IOT project is pixel based non-parametric method which requires only one frame to construct the model. The foreground/background detection starts from second frame onwards. It employs new object tracking method which detects the motion and triggers notification to the client by uploading the motion detected picture to their dropbox account instantly. We have tested this project using various locations and lightning factors and this project has proved to compete with other state-of-art motion detection techniques with even less use of hardware.

II. SYSTEM DESIGN

The circuit for this project consists of a Raspberry pi 3 model B, raspberry camera module and an ultrasonic sensor.

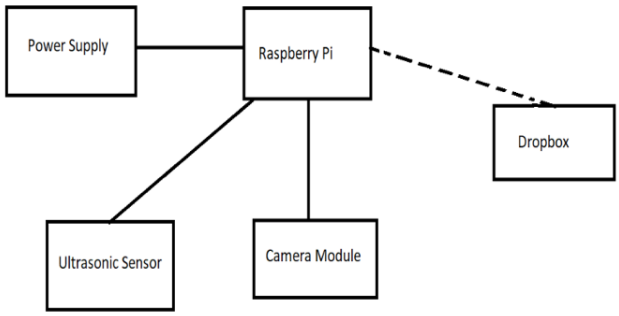
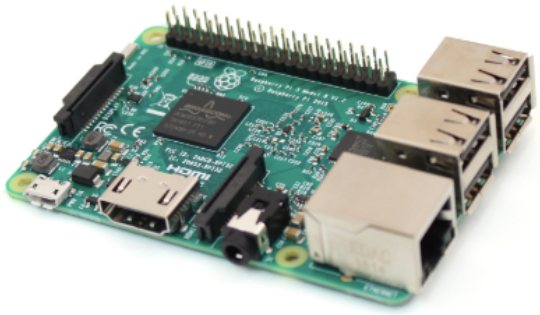


Figure 1: System Design

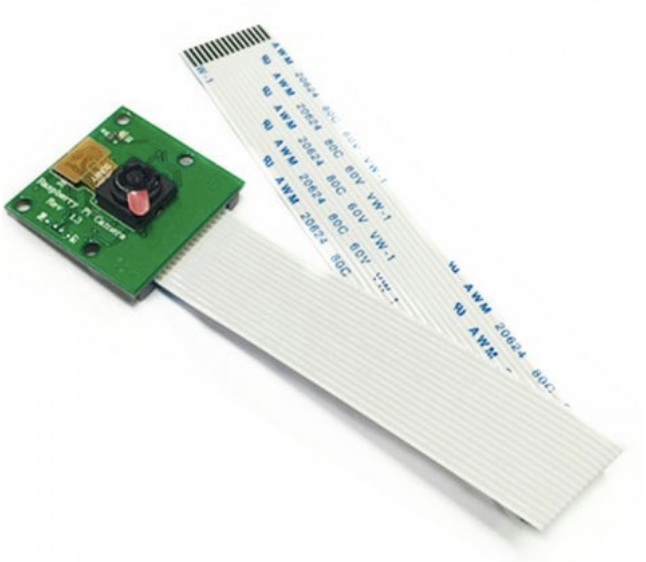
III. HARDWARE

A. Raspberry pi 3 model B



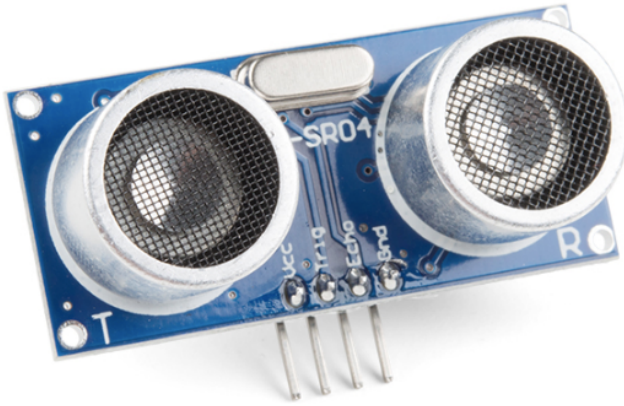
The Raspberry Pi small single-board computers developed to promote teaching of basic computer science in schools. Raspberry Pi 3 Model B was released in February 2016 with a 1.2 GHz 64-bit quad core processor, on-board 802.11n Wi-Fi, Bluetooth and USB boot capabilities.

B. Raspberry pi camera module



Raspberry Pi Camera is a high quality image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens.

C. Ultrasonic Sensor



This sensor measure range to an object by sending a sound signal and measuring the time for the signal to return. It is typically used in small electronic robots where a small control computer requires the range of a nearby object.

IV. SOFTWARES USED

A. Raspbian Buster:

We have installed Raspbian Buster in the Raspberry pi 3 model B. Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Buster and Raspbian Stretch. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian uses PIXEL, Pi Improved X Window Environment, Lightweight as its main desktop environment as of the latest update.

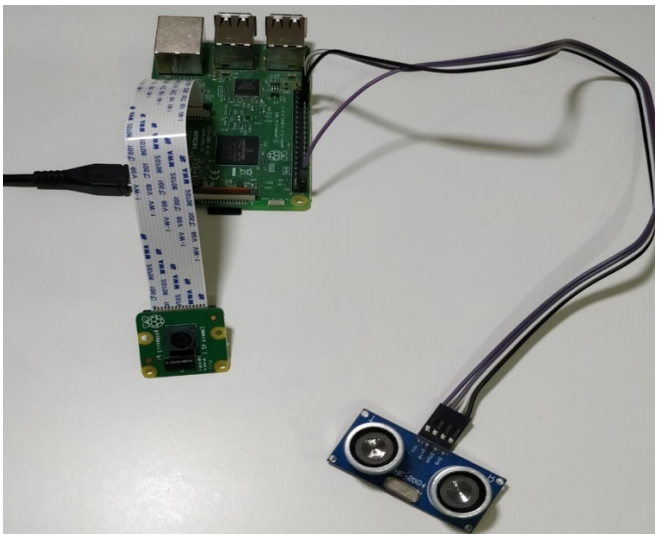
B. OpenCV

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

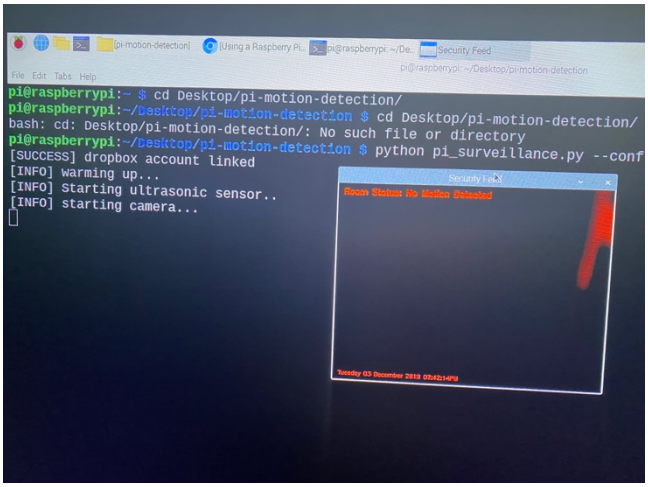
C. Dropbox

We have used Dropbox for storing images that are captured while motion detection. Dropbox also notifies user if a file has been added to any account. So, this notification helps user getting notified for any motion detected at a particular place. As this service is free for limited use, we have used dropbox. Instead of an android app, which can be only accessed by android users, dropbox can be used by any user.

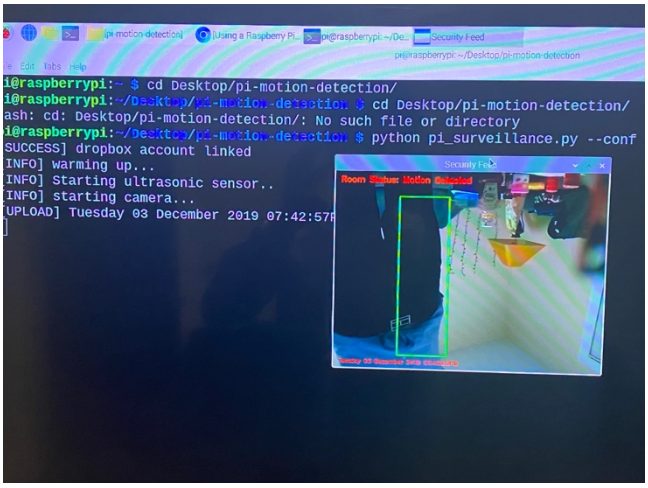
V. WORKING



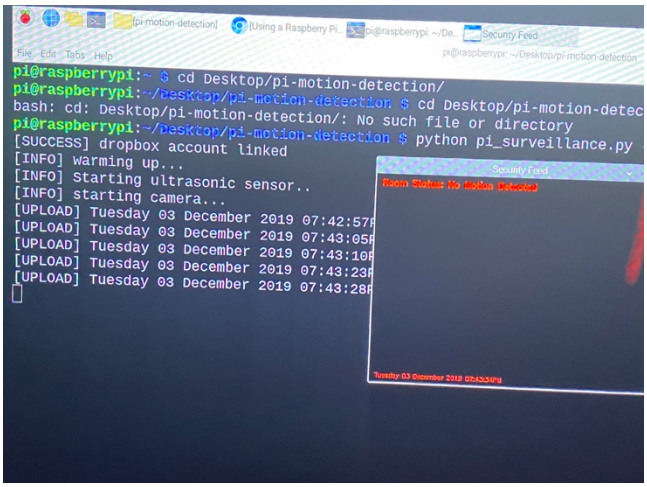
The python code will be run to activate the ultrasonic sensor and start the camera. As the sensor detects any motion, it triggers the camera module as shown in picture 1. The program uses computer vision algorithm as well as distance calculation algorithm used by ultrasonic sensor. So, when the ultrasonic sensor experiences a motion, it triggers notification to the program, and it then calculates the size of the object and the amount of time it is on the screen. To validate if the object detected by the sensor is a human, we use image processing library provided by OpenCV. If validated by the algorithm, the camera module will capture the picture and send the captured image to the specified Dropbox token as shown in picture 2. It uploads every 5 seconds if there is continuous motion detection. It sto.ps uploading if there is no motion detected as shown in picture 3.



Picture 1



Picture 2



Picture 3

VI. ACKNOWLEDGEMENT

We would like to thank Professor Mo Sha, Professor at Binghamton University and Di Mu, Teaching Assistant for helping us throughout the course and for giving the opportunity to work on such unique project.

VII. CONCLUSION

Installing motion detectors at our home can be very cheap. As shown in our project, which uses minimum hardware and very simple hardware, the installation of rural motion detectors can be very cheap. Motion detectors at our home, offices can be very beneficial. Installation of motion detectors at our home provides improved home security, enhanced safety, cost saving, energy saving as well as being one of the most convenient safety systems.

VIII. REFERENCES

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[3] https://www.dropbox.com/
[4] https://www.raspberrypi.org/products/raspberry-pi-3-model-b