AN INTERNET OF THINGS APPROACH FOR MOTION DETECTION USING ARM-BASED SYSTEM ON CHIP

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INTRODUCTION

Objective

Internet of Things (IoT) will play a vital role for shaping day to day life with more comfort with security (Roeland et al., 2011). IoT can send in numerous areas like industries, consumer electronics, smart gadget, bio medical devices, smart home, smart cities, etc. This project main concern is security and data stored safely whenever we want we can retrieve back easily. This project can be used for monitoring server rooms, buildings, auditorium, apartments, etc. (Chen et al., 2011). This anticipate searching for less vitality consuming with ease prototyping and quicker to deliver in the business sector. Motion Detection algorithm is being used in this project for reducing storage space (Ansari, 2011) and also save investments cost whenever motion detects it will give notification via Gmail. It is a

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just concept because of this we can make many applications like Closed Circuit Television (CCTV), Door Security Camera, smart gadgets, selfie cameras, etc.

The linux operating system is used abundantly now-a-days. Linux operating system has many benefits. Linux OS is freely available in the internet. Linux is very stable than windows. It is malware protected. Linux can be easily recoverable than windows. Hence linux operating system is used in this project. Raspbian OS (Linux Distribution) is used in Raspberry Pi.

Motion Detection idea can be convey in numerous parts like Consumer Electronics, Gadgets, CCTV, Door security camera, etc. (Coretta, 1999). Till now all are very expensive projects and lot of wiring needed (You, 2011). My project want to overcome above mentioned things. Not only that Internet of Things will grow rapid speed for making our wish sooner and faster (Huansheng, 2012).

**HARDWARE AND SOFTWARE**

**Raspberry Pi**

Raspberry Pi is a single board computer nothing but system on chip that can be used both with Android and Linux (Aamir, 2015). Raspberry pi comes with different operating system Raspbian OS, Arch LINUX, Windows 10, XMBC, OpenElec, ROS, Android. Raspberry pi have more GPIO pins and Camera Serial Interface CSI slot. Its supports all major programming languages like C, CPP, python, JavaScript. Raspberry Pi comes with different models and raspberry accessories almost compatibility to all models. Raspberry pi comes with application processor and video and audio supported core.

Raspberry pi goals are

1. Developing an innovative projects or gadgets or products.
2. Raspberry pi brings new revolution changes to Universities, student academics, maker, research scholars, etc
3. It will give opportunity to learn large extent python imaging library, open CV, QT, etc
4. Extraordinary platform for DIY world.
5. Provide companies or startups with a great tool for quick prototyping with low cost.

First boot the SD card with rasbian os and insert SD card in Rasberry Pi in 1 in Figure 1, connect pi through HDMI TV and plug keyboard and mouse and check the Ethernet connection in Figure 1.

Specifications of Raspberry pi B plus mention below

1. Broadcom BCM2885 SoC processor operated with 700 MHz embedded ARM1176JZF-S core
2. Video core 4 GPU supports up to 1920*1200 resolutions
3. RAM 512MB
4. HDMI and Micro SD slot
5. Analog Audio and Mic jacks
6. Camera serial interface slot
7. Power bank 5v and 2 amp
8. Ethernet RJ45 for internet
9. The GPIO header has 40 pins; previously it has 26 pins for both Model A and B

**Raspberry Picamera**

Raspberry Picamera supports up to Full HD resolution (1920*1080) and also inbuilt V4L2 driver linux integration with omniVision OV5647 CMOS sensor. Raspberry PiCamera module is designed to be connected via CSI interface to
Raspberry Camera Connector. Connection is made via a FLAT-213-32 PIN cable. Make sure the blue part of the ribbon cable looks backwards respect to the camera side. Lift the brown strip of the Raspberry camera connector and insert the ribbon cable into the connector making sure it going to pull down the strip totally, of the connector to hold the CSI cable (Yong, 2014). To a clearer explanation of how to connect the Raspberry Camera Module you can check the initial part of this video. Raspberry Picamera shown in fig 2.2.

**Connecting via SSH**

SSH is a system correspondence convention which can be utilized for a uber cool usefulness: remote shell control (Yu, 2012).

This essentially empowers you to remotely work a gadget, associated with a system, without direct physical access. On the off chance that you thought this would be just ultranerd stuff, you may be occupied with understanding this.

What you have to get to your Raspberry pi by means of a remote shell? To begin with, watch that these prerequisites are fulfilled:

You are associated with the same system that Raspberry pi is. This can be your home switch, with Raspberry Pi associated by means of Ethernet link and your Laptop trough remote association. You don’t have firewalls empowered that could hinder the correspondence between the two gadgets (INFSO, 2008).

Watch that the two gadgets are on the same subnet, on the off chance that you don’t realize what that implies, you can simply overlook this. Pi connection through SSH is shown in Figure 3.
SSH with Linux

PIL

Python Imaging Library (condensed as PIL) is a free library for the Python programming dialect that includes support for opening, controlling, and sparing a wide range of picture record positions. It is accessible for Windows, Mac OS X and Linux. The most recent rendition of PIL is 1.1.7, was discharged in September 2009 and bolsters Python 1.5.2–2.7, with Python 3 backing to be discharged “later” (Viren, 2014).

Advancement gives off an impression of being ended with the last focus on the PIL store coming in 2011. Consequently, a successor venture called Pillow has forked the PIL archive and included Python 3.x backing. This fork has been embraced as a trade for the first PIL in Linux conveyances including Debian and Ubuntu.

METHODOLOGY

Requirements and Specifications

This project uses Raspberry pi and Raspberry PiCamera and android mobile phone or laptop must be connected to internet via WiFi or Ethernet. PiCamera capture new image when motion detects by using Frame Difference Motion Detection Algorithm.Basic block Diagram shown in Figure 4.

BLOCK DIAGRAM

Motion Detection

Two popular Motion Detection Algorithm being used one is Frame Differencing Method other Background Subtraction Method (Lipton, 1998). This Algorithm has their own strengths and its weakness. This Project preferred Frame Difference Motion Detection Algorithm (Adreinne, 2013). This algorithm checks RGB pixel value in current frame and previous frame should be greater than brightness threshold then we will consider. All RGB pixel value of difference between current and previous frame should be greater than brightness threshold then we will consider. The above brightness threshold value

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Figure 4: Entire Project Hardware

![Figure 4: Entire Project Hardware](image-url)
should be greater than optimal threshold then motion detected (Bahlmann, 2005).

**Motion Detection Algorithm**

First calculate the average RGB value in previous Frame, Second calculate the average RGB value in current frame. If difference between RGB value of current and previous frame should be greater than threshold then Motion detected (Adreinne, 2013).

1. Motion Detection procedure
2. Determine the average of any RGB colour in previous image
3. Stay for a small amount of time
4. Determine the average of any RGB color in Current image
5. Difference between previous frame and current frame should be greater than threshold value then MOTION DETECTED

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**Figure 4: Motion Detection Flow Chart**

![Motion Detection Flow Chart](image)

**Figure 5: Motion Detected Images With Date And Time**

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SMTP
Sender will send a Gmail to SMTP server through SMTP protocol. SMTP server checks the internet connection or not, if internet is connected then sent to near destination SMTP server through SMTP and Finally it reaches to Destination email (Aamir, 2015).

IFTTT
IFTTT provides 300 channel services based on condition statement. If images reach to Dropbox then IFTTT will automatically trigger a mail with attached Gmail (Xueguang, 2010).

EXPERIMENT AND RESULTS
Its show all Motion Detected images in File Explorer in Raspberry GUI in Figure 4.1 and as well as in Dropbox in Figure 4.2 and to whom
those link are sent. Notifications via Gmail with attached motion detected image using IFTTT and SMTP in Figure 4.3.

**CONCLUSION**

This paper is achieved by reduced storage space and cost reduction without sacrifice the quality of Image. If not using motion detection then a lot of cloud storage needed and we have to pay extra money to those service provider. Based on applications, we can do minor changes to this project we can enjoy this project to an extreme levels. Unnecessary no need of extra wirings. Easy to implement in anywhere at any time. Further the motion detected image is sent from Raspberr pi to Dropbox automatically or command line interface. Using this technology we can share our link to multi users allowing them to access the image whenever they want. I have tested this system for 45 days and have found 99.9% accurate notifications and results.

**REFERENCES**


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