An IOT Approach for Motion Detection Using Raspberry PI

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Abstract—Internet of things is mainly used to transfer the data over a network without requiring human interface. This paper's aim is to provide security system for households, Offices or Industries etc. Here we are developing an application to continuously monitor the environment. Mainly this system detects the changes in the environment i.e. if there are any motions are detected then this system is going to alarm the person/owner. Whenever the motions are detected, this system captures the images of the motions and these motions are sent to the owner mail ID and also it will sends notification to an android application. So the user will take necessary action based on the notification received. In the proposed solution, the raspberry pi is interfaced with camera module.

Keywords- Internet of Things; Raspberry Pi

I. INTRODUCTION

The internet of Things (IOT) is the internetworking of physical devices, buildings and other items embedded with electronics, software, sensors, actuators and network connectivity that enable these objects to collect and exchange data. It is expected that by 2020, 20 billion devices will be connected with the Internet. This system is built in general purpose and so area is not limited for the use of system and include many applications where it can be used which replace existing system. It is also user friendly as if user can access the system from remotely as well as locally as per the situation.
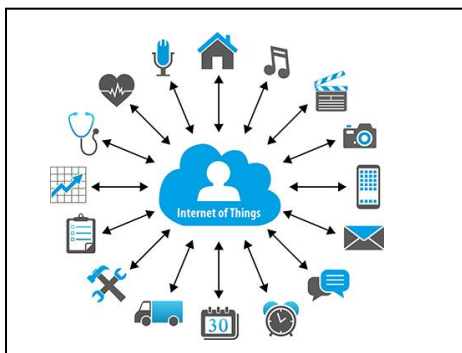

Fig 1: The IoT Different Services, Technologies

As of late security concerns have developed hugely, it is essential for all to have the capacity to defend their property from common damages, for example, burglaries, pulverization of property and so on. As the innovation is generally developing in present day world, the strategies utilized by hoodlums and looters are likewise similarly enhanced in Taking. Along these lines, it is vital for the surveillance systems additionally to be enhanced with the evolving scene. This project is focused on developing a surveillance system that detects motion and to respond speedily by capturing an image and relaying it to an administrator device through the internet platform. The system will require Raspberry Pi module, motion detection sensor, camera and internet connection. User can monitor the system form anywhere in the world.

Raspberry pi is credit card sized computer that has the capability to become a camera security system when its own camera board is used. A new methodology has been developed to detect the motion. PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. When ever PIR detects a motion inside the room, the image will be captured through camera and stored temporarily in the raspberry pi module. A python script is used to send email notifications every time motion is detected. With these components, a cost effective, low power and efficient security camera system is made. Therefore, advantages like these, makes this application ideal for monitoring in prevented or secured areas.

The core problem faced by any system is its cost effectiveness. The existing systems available are CCTV cameras, fingerprint detection, face recognition, so these traditional methods employed for building such security systems includes costly sensors and different modules which unnecessarily increase the cost and complexity and are also difficult to implement.

These limitations provided us an impetus to build a cost effective, efficient, high speed processing security system that can be controlled and monitored miles and miles away through the internet.

II. NEED FOR PROJECT

It is beneficial to integrate and implement IOT into security system to detect motion, for example, when you are at remote location and you want to monitor and get notification if any activity happens at your home or office. The project aims to provide technology oriented and low cost system to monitor motion detection. Main emphasis is to provide user friendly interface, which would send quick notification to user through email or text message.

III. PROPOSED WORK

This project is focused on developing a surveillance system that detects motion and to respond speedily by capturing an image and relaying it to an administrator device through the internet platform. The system will require Raspberry Pi module, motion detection sensor, camera and internet connection. It will come up with an implementation of a surveillance system which presents the idea of monitoring a particular place in remote areas. The system can be monitored by the user from anywhere in the world.

Surveillance System consists of mainly two parts:

- *Hard-Wired Surveillance Systems:*

In this type of systems wires are used to connect the cameras, motion detectors, power supply and LAN cable with the pi.

- *Remote Access Systems:*

In these type of systems we are able to monitor and control a surveillance system from anywhere in the world through an Android device.
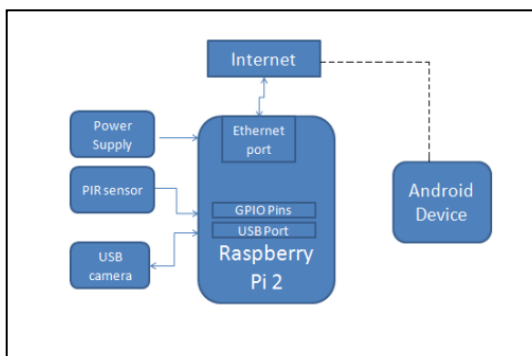

Fig 2: Block Diagram

From the above block diagram it is clear that the project is divided into two sections, the raspberry pie will be in a remote place, spying the activities. The controlling of the device will be done from anywhere in the world through an Android application. The system consists an USB camera to capture the images of the intruder.

A. System Overview

The functionality of the different components is listed below:

- *USB Camera:*

USB Camera is used to capture the image when PIR detects a motion and sends it to the Raspberry Pi's USB port. Here USB Camera model 2.0 is used.

- *Raspberry Pi:*

The Raspberry Pi is a credit-card-sized computer, can function as a proper desktop computer or be used to build smart devices.

- *Android device:*

An Android device is needed to see the captured pictures remotely and furthermore get the notification message.

- *PIR sensor:*

A PIR or a Passive Infrared Sensor can be used to detect presence of human beings in its proximity. The output can be used to control the function of USB camera.

- *Pushetta Application:*

Pushetta is an application made to push real-time notifications to a wide range of devices (cell phones, programs, savvy TV, etc.,).We can push notification from cloud in the event that we enrolled on Pushetta website.

System works on Raspbian operating system and it requires internet and 650 mA@5v power supplies.
Image is captured through Opens and programming to send notification is done in with Python scripting language.

Whenever PIR detects any intrusion it will send signal to the raspberry pi GPIO pin. Raspberry pi senses that signal and triggers the USB camera for capturing. The captured image temporarily stored in raspberry SD card along with that system will send one notification message to user's android device.

B. Project Implementation

- *Setting up Raspberry Pi*

We need to write the desired OS into a SD card, and then insert SD card into Raspberry pi Micro USB slot. Connect Mouse and Keyboard to it. Attach power cable along with HDMI cable which connects the Raspberry pi with monitor. Provide DC input power supply to Raspberry pi.
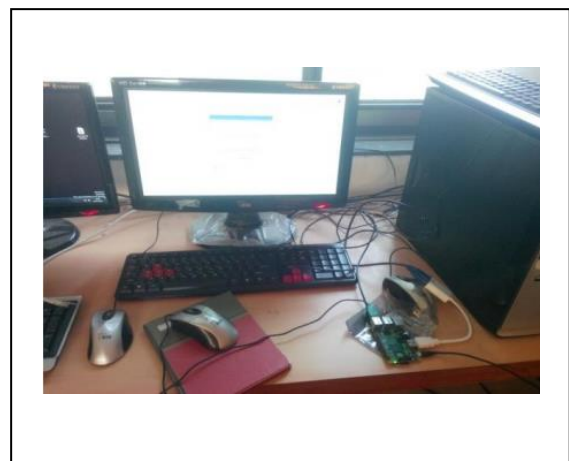

Fig 3: Setup for Raspberry pi Installation

- *Operating raspberry pi without display, keyboard and mouse*

Provide internet connection to Raspberry pi through RJ-45 cable, give power supply and attach USB camera, without using any pc through Putty raspberry pi can programmed, and then system works in standalone mode. Through IP address of raspberry pi system's command window can access.
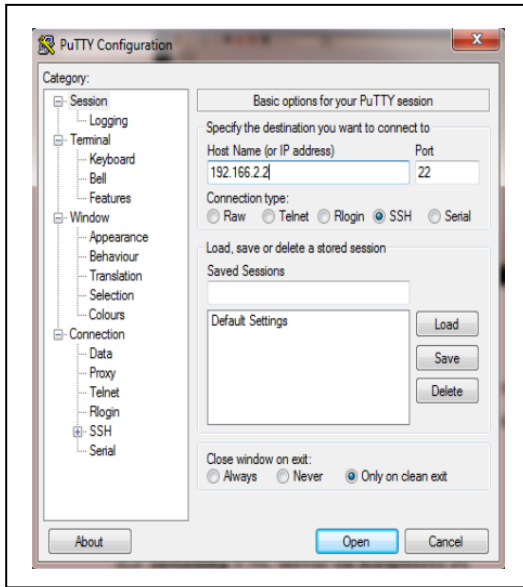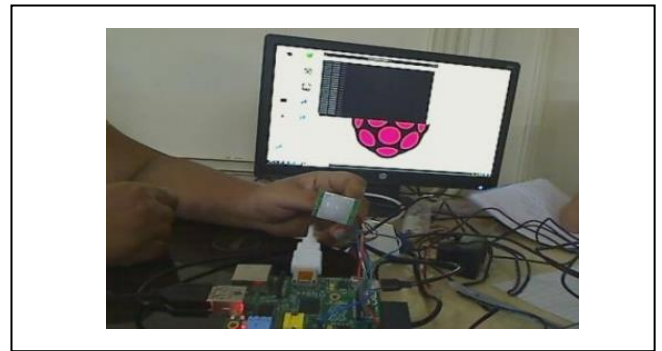
Fig 4: Putty configuration

- *Installing VNC Server on Raspberry Pi*

Use following Command to install VNC.

$ sudo apt-get update
$ sudo apt-get install tight VNC server

- *Client Side (Laptop)*

To operate raspberry from remote location download VNC client and enter IP address of pi dynamically, Since it has SSH, Using network pi could be operate from anywhere as long as it is connected to network.

- *Running VNC Server at Start Up in Raspberry Pi*

VNC enable the system operations remotely with GUI of raspberry pi, so ensure that VNC automatically starts at start up in raspberry pith connections between PIR and raspberry pi hardware should be as shown in fig.
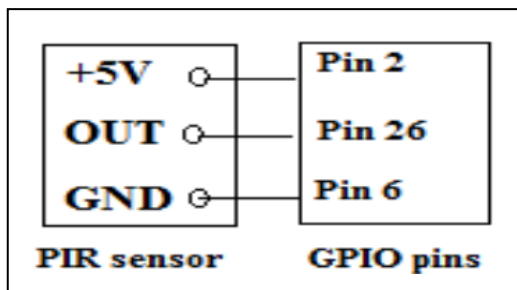

Fig 5: Connections between PIR and pi hardware

- *Motion Detection*

Motion flag activates when python script failed to match the last and present frames of live video, when the flag activates system triggers the camera to take continues snapshots.

Fig 6: Capturing images when motion detected

- *Sending Notification*

When PIR detects a motion it sends signal to pi, signal triggers camera, it will send notification to the user through an Android application. Peseta is the application used here. Before that subscription for one channel is required. When the intrusion detects it will send notification to that particular subscribed channel.
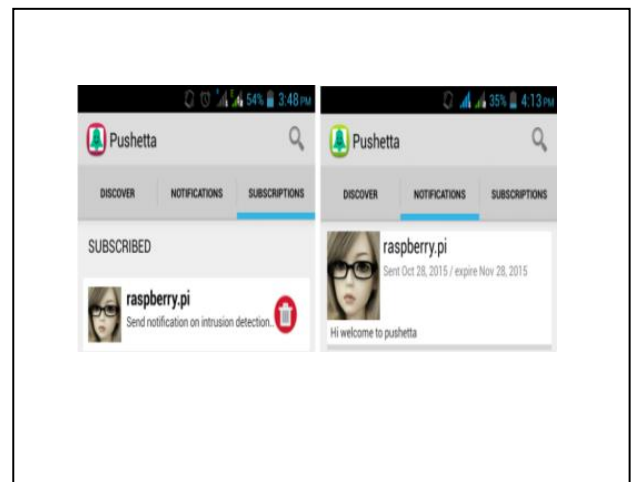

Fig 7: Subscribed channel and notification on that channel

IV. FUTURE ENHANCEMENT

This system can be enhanced in future by adding additional infrared emitting system to detect the people face if they wore the mask on his/her face. Apart from this we can interface sensors like Gas sensors, Smoke sensors and Fire sensors to provide alerts respectively.

V. CONCLUSION

Raspberry Pi turns out to be a brilliant, economical and effective platform for executing the home automation. This project basically concentrates on the motion detection and it empowers the owners to monitor their homes and building even from remote areas. This system could be an option for costly security systems are being utilized as a part of the present days. This system does not require any exceptional changes in the foundation at where it is installed. It can be executed without much trouble.

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