IoT based Smart Surveillance System

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Abstract- *This paper proposes a smart surveillance system based on Internet of things using Raspberry Pi. Security plays a very important role now a days may be in any place like home, office, school, organizations.cctv camera may be used for surveillance but the intruder can easily destroy the camera and hence surveillance system may fail.Also the cctv footage consume lot more memory hence using the concept of Internet of things we design a surveillance system so as live motion will be captured using a Raspberry Pi camera and at same time a notification will be send through an email. additional sensors are attached as a hardware part like temperature sensor,Gas sensor ,humidity sensor.The standard values are programmed and will be displayed on LCDdisplay and if ever the values exceed the standard value an email notification will be sent to the user.A relay driver is attached for safety purpose for in case of fire or any danger the whole system will get trip and hence safety will be maintained.The program is written in python environment.*

Keywords- Internet of Things, Raspberry pi, Raspberry pi camera, python.

I. INTRODUCTION

The Internet of things (IoT) is the network of devices such as vehicles, and home appliances that contain electronics, software, sensors, actuators,
and connectivity which allows these things to connect, interact and exchange data.The IoT involves extending Internet connectivity beyond standard devices, such as desktops, laptops, smartphones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and everyday objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. CCTV camera systems capture the image of the intruder and saves it for further use. So there is lot of memory requirement besides extensive power consumption takes place. Hence we design a system that can take pictures or videos when the burglary happens and send out an alert signal at the same time is much better than the currently in use surveillance systems. The main advantages of this device are it is simple to implement, small size portable stand-alone device with its own power source, energy capable with instantaneous alert, truly cheap for residential use.

II.LITERATURE SURVEY

The surveillance system has been widely used in manyfields. [1]Mr.Krunal and Mr.Bharat Chaudhary had proposed a Wireless real time video surveillance system to capture the video and sent out it as quickly as possible with negligible time delay and it will send out it to the network embedded web server via ARM9 Board using mjpg streamer algorithm.[2]Fang Mei had implemented Arm based remote video surveillance system. In this system the video is captured by using CMOS camera (OV9650) with 1.3million pixels.

In this the video is captured continuously and by using an enhanced moving objective recognition algorithm an alarm message is sent to the user‟s mobile phone via email.[3] Jeevan and, Keerthivasan, Mohamad, Murugan had proposed an sms altering system with real time network video capture. In this system the fire and PIR sensors are interfaced with the Raspberry Pi.The video is captured for a given period when these sensors are sensed and also the captured video is stored in the RT Raspberry Pi memory. This system is a real time system based on RT Raspbian.For altering the controlling person GSM module is interfaced from the client. And At the same time Live video can also be viewed in the sharing network by using the IP of the pi:8080.[4] Kumar,Murthi Sharma,Sridevi and Pravin had implemented an sms altering system with real time video capture based on ARM9.In this system the Ethernet interfaces for wired and wireless internet accesses is used. In this system the real time video is captured and also alerts the controlling person by using Global system for mobile communication module. This system is a real time system based on RT Linux. And also the Captured video is displayed both on the display at the client and in the sharing network.[5]Ying wen,ZongHan,Li sih shen had proposed an Embedded surveillance system to enhance the sensing reliability by using ultrasonic signal coding and PIR sensors. The ultrasonic sensor and multiple PIR sensors will interface to Arm 7 microcontroller. The sensors group detects an intruder by using majority voting mechanism and captures the image by using web camera and upload sit through internet.

III.PROPOSED METHOD

The proposed system uses Hardware as well as Software requirements. The hardware part consists of

Raspberry Pi, Temperature Sensor, Gas Sensor, Humidity Sensor, Accelerometer sensor LCD display Relay driver, Wi Fi Router.

The software requirements Raspbian OS , Python programming language. Open CV, Win 32 Disk imager. The camera is connected to Raspberry Pi via the USB port. The Sensor is connected through General Purpose Input Output (GPIO) pins of the Raspberry Pi. The RJ45 LAN cable to connect to the Internet for sending and receiving data. When motion is detected the camera captures the image and sends out an alert email to the user. The duration for recording can be set according to the user convenience. The data can be uploaded to external server such as FTP or SFTP or Cloud Servers. Raspberry Pi executes the processing of all the data and after the data are analyzed then uploading images and Videos to the MQTT server and instant email notifications with attached snapshots to user.

SYSTEM ARCHITECHTURE:

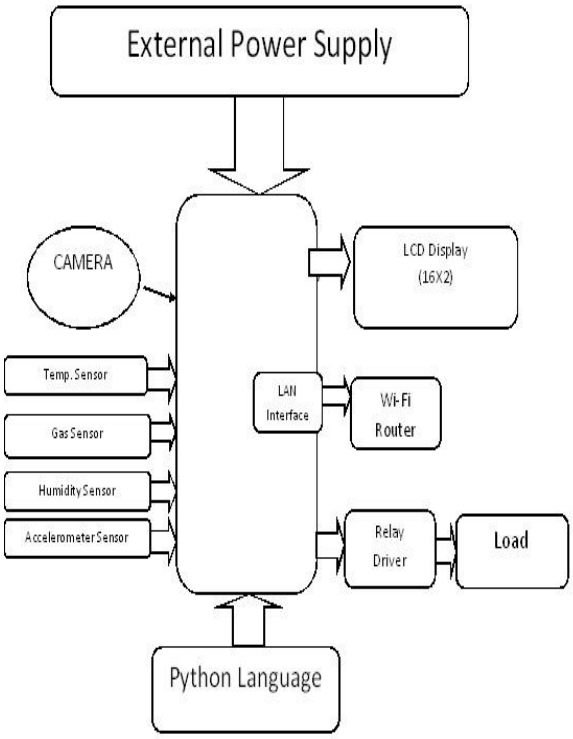


Fig.1Blockdiagram of IOT based Smart Surveillance System

1) Raspberry Pi: It is a credit card sized single board computer ,Broadcom BCM2835 SoC Multimedia processor. It has ARM 1176JZF-S (armv6k) 700MHz processor 512MB RAM,HDMI slot is used to detect the audio output. composite RCA, two universal serial bus slots are present.A SD card slot is present to install operating System. Ethernet port is used to connect the internet. GPIO 40 pin interface allows us to control and interact with real world. the Raspberry pi can be used as a really powerful microcontroller which can accomplish almost any functions, and also it can act as a normal use computer with keyboard, mouse and monitor connected\

2) Accelerometer Sensor: The MPU-6050 is the world's first integrated 6-axis Motion Tracking device that combines a 3-axis gyroscope, 3-axis accelerometer, and a Digital Motion Processor (DMP) all in a small 4x4x0.9mm package. With its dedicated I2C sensor bus, it directly accepts inputs from an external 3-axis compass to provide a complete 9-axis Motion Fusion output. The MPU-6050 Motion Tracking device, with its 6-axis integration, on-board Motion Fusion, and run-time calibration firmware, enables manufacturers to eliminate the costly and complex selection, qualification, and system level integration of discrete devices, guaranteeing optimal motion performance for consumers. The MPU-6050 is also designed to interface with multiple non inertial digital sensors, such as pressure sensors, on its auxiliary I 2C port.

3) Temperature Sensor: The one wire1 Digital Temperature Sensor - DS18B20 from Maxim (formerly Dallas) is a great c1hip for measuring temperature in your projects. The device uses One Wire protocol. 1You need only a Raspberry-Pi board, a DS18B20 and a 4.7KOhm resistor. The DS181B20 can be powered by between 3.0V and 5.5V so you can simply connect its GND 1pin to 0V and the VDD pinto +5V from the Raspberry Pi. However, the DS18B20 can al1so extract its power from the data line which means we only effectively need two wires to connect it up. This makes it great for use as an external sensor.

4) Humidity Sensor: DHT22is anoutput calibrated digital signal. It utilizes exclusive digital-signal-collecting-technique and humidity sensing technology, assuring its reliability and stability.Its sensing elements is connected with 8-bit single-chip computer. Every sensor of this

model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of programme in OTP memory, when the sensor is detecting, it will cite coefficient from memory. Small size & low consumption & long transmission distance(20m) enable DHT22 to be suited in all kinds of harsh application occasions. Single-row packaged with four pins, making the connection very convenient.

5) Gas Sensor: The MQ-6 Gas sensor can detect or measure gases like LPG and butane. The MQ-6 sensor module comes with a Digital Pin which makes this sensor to operate even without a microcontroller and that comes in handy when you are only trying to detect one particular gas. When it comes to measuring the gas in ppm the analog pin has to be used, the analog pin also TTL driven and works on 5V and hence can be used with most common microcontrollers.

6) Relay Switch:A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary to control a circuit by a low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and most have double throw (changeover) switch contacts.

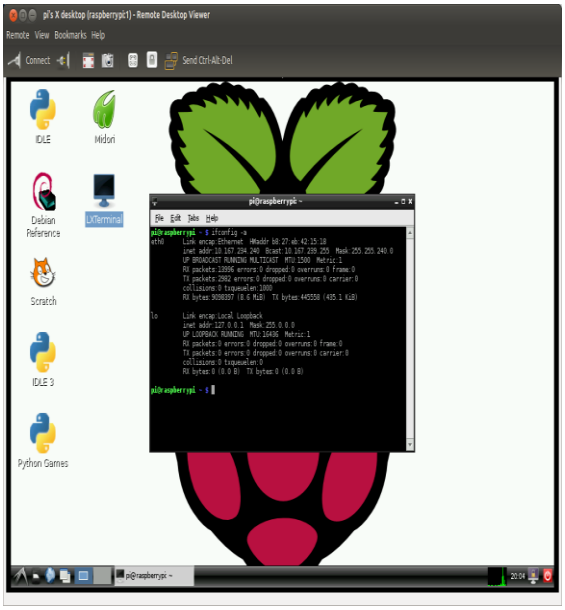
7) Raspberry Pi Camera: Raspberry pi camera board plugs directly into the CSI connector on the Raspberry pi.The Raspberry pi camera module attaches to Raspberry pi by way of a 15 pin Ribbon cable to the dedicated 15-pin MIPI camera serial Interface (CSI) which was designed especially for interfacing to cameras. It‟s able to deliver clear 5 mega pixel resolution image or 1080p HD video recording at 30frames/sec.

8) LCD Display: Various display device such as seven segment display,LCD display, etc can be interfaced with microcontroller to read the output directly. In our project we use a two line LCD display with 16 characters each.

Steps to Install Raspbian os:

1) Download the Raspberry Pi operating system.
2) Unzip the file that you just downloaded
3) Download the Win32DiskImager software
4) Writing Raspbian to the SD card

5) Booting your Raspberry Pi for the first time



IV.SOFTWARE IMPLEMENTATION

Software implementation uses Raspberry Pi and Python programming Languages,The program includes capturing image when motion is detected save the image and send email notification to the user.

A. Installation of Rpi.GPIO:

To do this enters the following command into LX Terminal:
“sudo apt-get install python-rpi.gpio”

B. Installation of I2C-tools:

Then enter the following command in LX terminal
“sudo apt-get install i2c-tools”

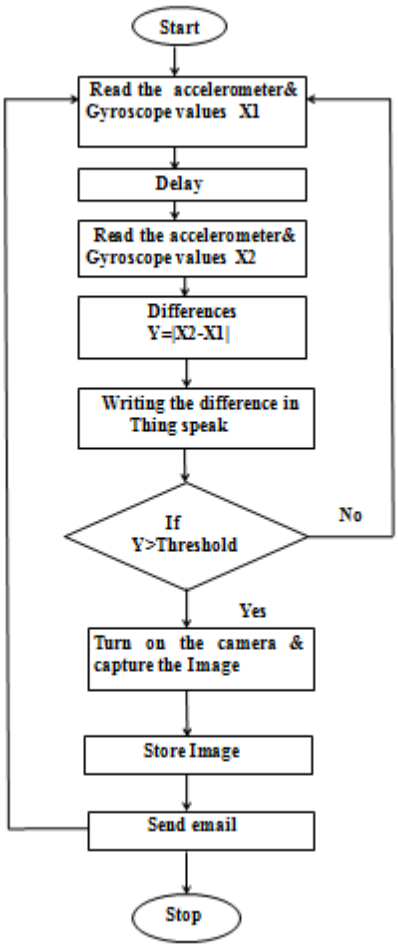
C. Installation of python-smbus module:

Then enter the following command in LX terminal
“sudo apt-get install python-smbus”D. Installation of python-picamera:For installation of picamera the following command is used.“sudo apt-get install python-picamera”

E. For sending email:

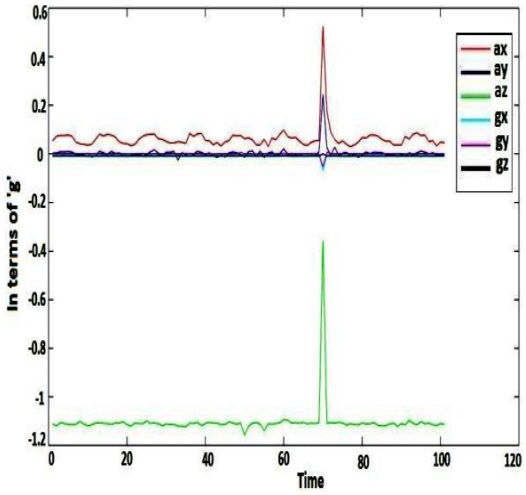
For sending email we want to “import smtplib”. SMTP is a protocol, which handles sending email and routing e-mail between mail servers

V. FLOW CHART OF PROPOSED METHOD

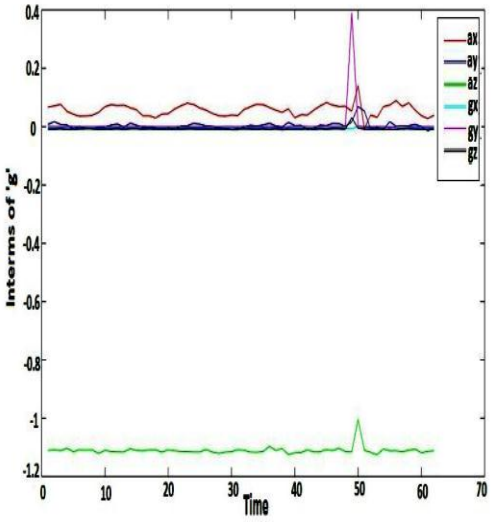


VI. EXPERIMENTAL RESULTS

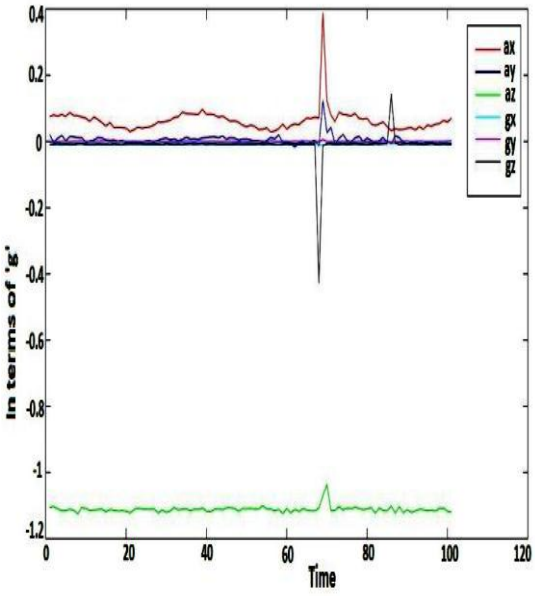
The proposed system will capture the image when motion is detected and send an email notification to the user.. Thus a door movement can be detected by setting a threshold value. The system is portable and can be easily placed behind the door for motion detection. Number of trails has been done to note the Accelerometer x-axis, y-axis and z-axis readings in different directions like hitting in x, y and z directions.



a. hitting in X direction.



b. hitting in Y direction



c. hitting in Z direction

VII.CONCLUSION

In this paper we implemented a smart Surveillance System using Raspberry Pi. The system works in standalone mode without requirement of PC. motion is sensed and the image is captured in the Raspberry Pi camera and an email notification is send to the user. The relay driver is provided so that if the value exceeds the standard value it will trip thus providing safety. It has small size and is portable can be placed at door and easily detect motion.

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