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RASPBERRY PI BASED SMART SURVELLIANCE SYSTEM

S. Srikanth*[1], Ch. Sai Kumar*[2], N. Uday Rao*[3], R. Srinivasa Rao*[4]

*[1,2,3] Student, Department of Electronics and Communication Engineering,
ACE Engineering College, Hyderabad, Telangana, India.

*[4] Associate Professor, Department of Electronics and Communication Engineering,
ACE Engineering College, Ghatkesar, Hyderabad, Telangana, India.

ABSTRACT

The common problem often faced by humans is monitoring their surroundings. Nowadays, people want one sole thing that is to make them feel safe and secure. Starting from the houses to industries, surveillance is very essential to fulfill their safety aspects as burglary and theft have always been a problem. In this paper, we have designed and implemented a IoT platform-based home security system. Whenever a human intrusion is detected in front of home door or at the place of install then the system sends a security alert to user/owner about the intrusion through email on his/her smartphone or computer. The email alert will contain image of the intruder which is captured by Pi-camera of the intruder. Raspberry Pi-3 is used to control the whole home security system with Python programming. This system can be installed at the main door of user home or office, then user can get the email alert on his/her smartphone or computer from system anywhere in the world over internet. The user can also see the live streaming of the place where the camera is installed by connecting to the local server of the camera. Raspberry Pi is a small-sized computer that has the ability to plug into a computer monitor or any other display and can be connected to a keyboard and mouse for operation. It has an operating system called Raspbian OS and can be a very handy system to run applications in programming languages like Scratch and Python.

I. INTRODUCTION

Nowadays, people want security to make them feel safe and secure. The commonly used security system is the CCTV (closed circuit Television). The cost of implementation of CCTV depends upon the size and use of the system. It is usually installed in various places like buildings, hospitals, malls, parking lots etc. With the help of CCTV one can monitor the area 24/7, or the footage if stored in a location can be retrieved when required. It can be used to detect the crime and allow the authorities to identify and solve a crime.

Surveillance is important in various fields such as banking sectors, military areas, or personal security. Due to rise in burglary and theft activities, surveillance systems are proving to be a great source of security. Due to increasing technology people are relying on new technologies for security purposes. Security systems such as CCTV have proven to be popular for security purposes due to their cost-efficient nature and easy maintenance. Surveillance is very helpful to investigate/prevent criminal activities, for recognizing and monitoring threats.

Also, surveillance systems have always been playing a vital role in dealing with the theft cases. These CCTV systems tend to monitor activities continuously. This results in high power consumption and memory wastage. Moreover, it does not give alert on any suspicious activities detected. There are systems available in the market other than CCTV such as Retina scanner, fingerprint scanner, IR lasers only with the drawback that they are expensive with high implementation and maintenance costs. Hence, such systems are not a preferred way for security purposes for small scale applications. Hence, the proposed system covers all these drawbacks by its efficiency, portability. This surveillance system is low- cost and user-friendly too.

II. WORKING

This paper deals with the design and implementation of Smart surveillance system using Raspberry pi and PIR sensor. The aim is to make a surveillance system using Raspberry Pi with PIR sensor and Pi-Camera. The proposed home security system captures image using pi camera based on information given by the PIR Sensor. PIR sensor is used to detect the motion, whenever someone comes within its range. As soon as PIR Sensor detects the motion, Pi-Camera activates and captures an image. This image is then stored in the system. Raspberry pi operates and controls PIR Sensor. The captured image is sent to the owner and alerts him/ her of the intrusion. The email is sent to a mail host through SMTP protocol. The attached file is an image that shall be analyzed by

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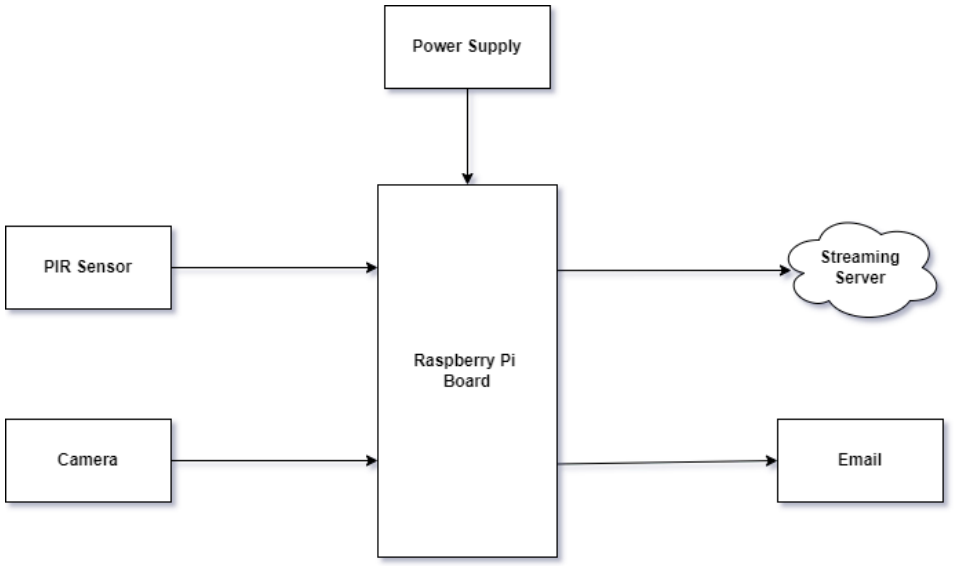
the owner. Also, we can monitor the surroundings using a remote server over the internet. Using IP address, the user can live stream his/her surroundings on a mobile or in system. All the other modules solely depended on the PIR GPIO pin to go HIGH.

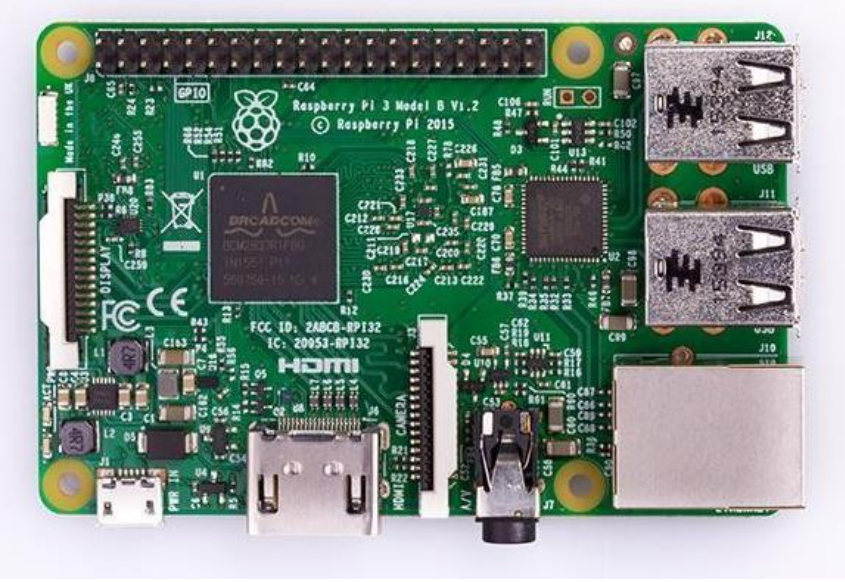
BLOCK DIAGRAM



Block diagram

EXPLANATION OF EACH BLOCK

RASPBERRY PI



The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes theoriginal Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processer, 10x faster than the first-generation Raspberry Pi. Additionally, it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs. The Raspberry Pi 3 Model B is equipped with a quad-core 64-bit Broadcom BCM2837 ARM Cortex-A53 SoC processor running at 1.2 GHz, making itabout 50% more powerful than the Pi 2. Which means the new Raspberry Pi 3 can be used for office applications and web browsing.

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RASPBERRY PI 3 MODEL B

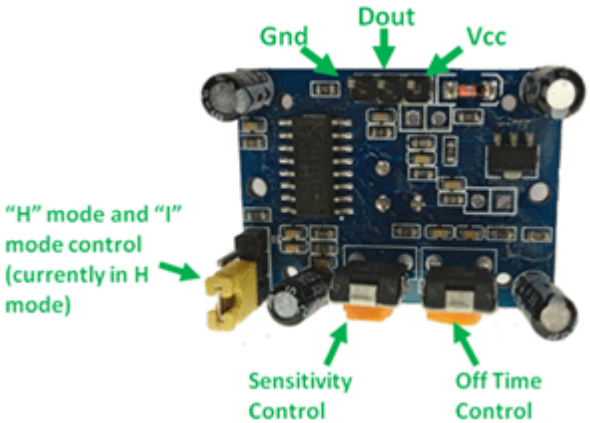
PI CAMERA MODULE

The Camera Board on the Raspberry Pi is a small printed circuit board with a camera on it. The PCB is connected to a ribbon cable which connects to the Pi itself on its own port. The ribbon can be extendable. The camera on the board is very small (5MP camera). As for now it is the only Camera made specifically for the Pi therefore these specifications cannot be updated. Since it uses 250mA, externally powering the Pi should be sufficient enough for the camera. Specific configuration settings are required to initialize the camera plus Python scripts to enable it take picture.

Pi Camera Module

PIR SENSOR

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR- based motion detectors. All objects with a temperature above absolute zero emit heat energy in the form of radiation. Usually, this radiation is invisible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose. The term passive in this instance refers to the fact that PIR devices do not generate or radiate any energy for detection purposes. They work entirely by detecting the energy given off by other objects. PIR sensors don't detect or measure "heat"; instead, they detect the infrared radiation emitted or reflected from an object.



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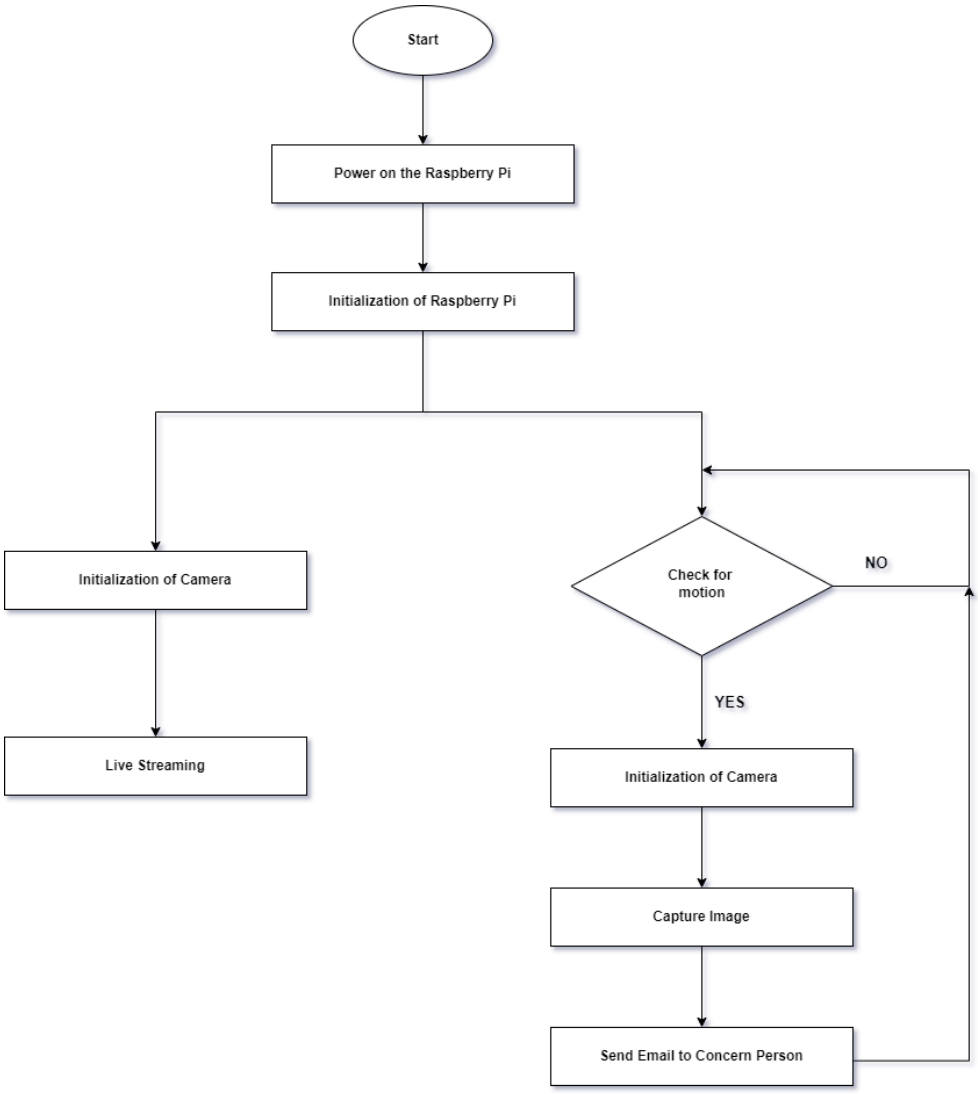
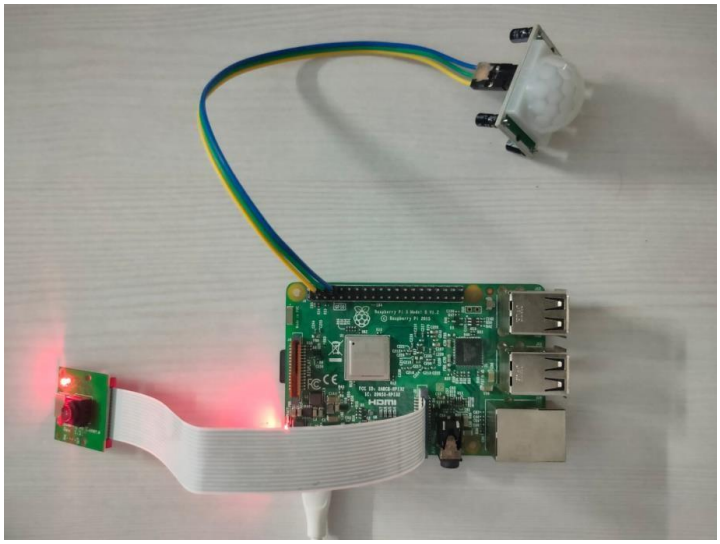
PIR Sensor

FLOW CHART



Flow Chart



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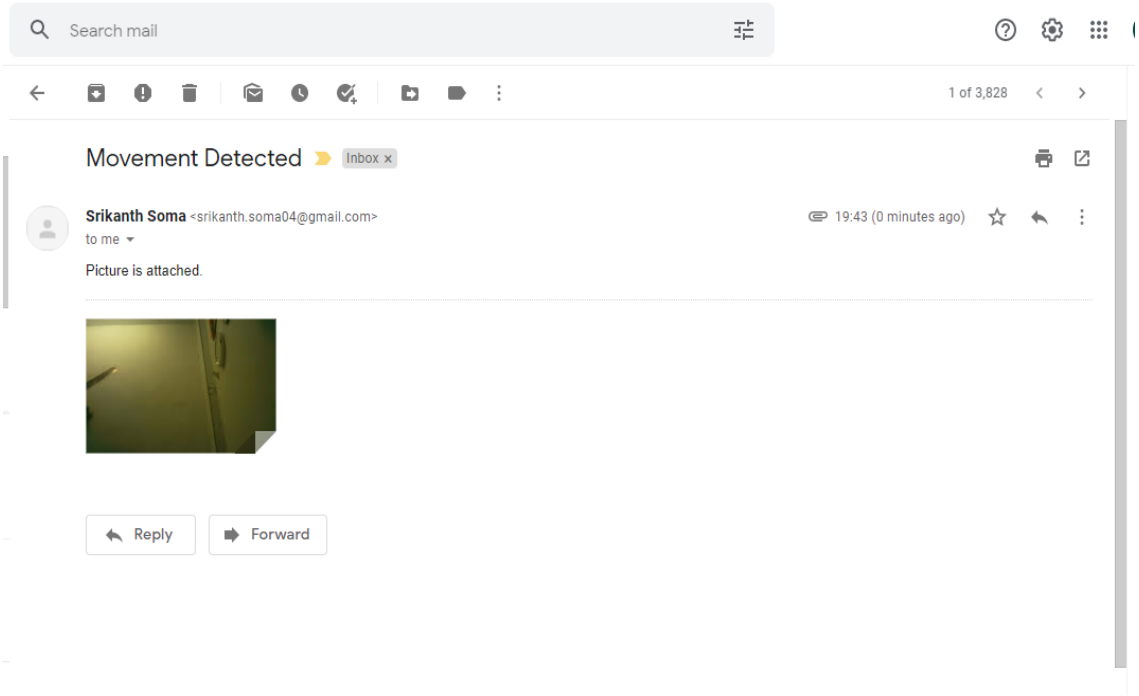
III. RESULTS

Photo of project module with power supply



Email attached with the image

Treaming Server

IV. CONCLUSION

The project work "Raspberry Pi Based Smart Surveillance System" is completed successfully and results are found to be satisfactory. The main processing unit used in the project work is Raspberry Pi and it acts as the brain of the system and processes the data from the sensor. Also,Python IDLE software is needed for Raspberry Pi based projects. Python code is used in the Raspberry Pi.

The project designed and implemented a security system based on the Raspberry Pi. The aspects of the system

are: motion detection using a PIR sensor, capturing image using a Pi Camera and sending out an alert through e-mail and live streaming through a local server. It did not however achieve the option of image processing in the Raspberry Pi because of system constraints i.e., processor speed.

Thus, we have designed a smart surveillance system capable of capturing image and transmitting via email. It is advantageous as it offers reliability and privacy on both sides. It is authenticated and encrypted on the receiver side; hence it offers only the person concerned to view the details.

This system is also capable of live streaming. It is advantageous as it offers real footage of the surroundings. It offers reliability and privacy as the user only view the streaming by entering the IP address of the Raspberry Pi.

Surveillance system provides an efficient way for monitoring suspicious activities at the place of install. Traditional systems are efficient and have low maintenance cost. However, energy consumption is more as the system is continuously powered on. Proposed smart surveillance system provides energy management by turning the system ON, based on the occurrence of a particular motion. System will sense the motion and depending on the detected motion system will switch on the camera,capture the image of intruder and send a notification on owner's smart phone or computer via email over the internet.

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