

# IOT BASED REAL TIME VIDEO SURVEILLANCE USING RASPBERRY PI

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*Abstract-Video surveillance is about actively detecting intruder as soon as they enter a secured area, while video surveillance generally means passively recording events for future use. There are several defects in the video surveillance systems such as picture is indistinct, complex structure, Poor stability, lot of storage space is needed to save the surveillance information. In this paper, we are presenting anovel technique to detect any movement in the video, In this system, we use the Raspberry pi chip as the microprocessor, single-board computer which follows motion detection algorithm written in python as default programming environment. In addition, the system uses the motion detection algorithm to significantly decrease storage usage and save investment costs. The algorithm for motion detection is being implemented on raspberry pi, which enables the live streaming camera along with Detection of motion .IOT video monitor system provide a practical solution for remote wireless monitoring with low cost. Security surveillance system is less expensive and has longer life.*

**Keywords:** *Raspberry pi,IOT, video surveillance, motion detection*

## I. INTRODUCTION

Surveillance is the monitoring of behavior, activities or other changing information for the purpose of influencing managing, directing, protecting people. This can include the observation from a distance by means electronic equipment such as CCTV(closed-circuit television) and RFID(radio frequency identification). Video surveillance that enables embedded image capture capabilities that allows video images or extracted information to be Compressed, stored or transmitted over communication networks or digital data link. There are several defects in the video surveillance systems such as picture is indistinct, complex structure, Poor stability, lot of storage space is needed to save the surveillance information [1]. Video surveillance is expensive for normal people to set such kind of system so the people are using IOT based low-cost security systems which will help them for secure their commercial places [2]. Hence we introduce a real time security. Everything is encompasses are real time and could be seen in almost every place (both public and private). And it gives automatic alert when an object is jamming or crossing a railroad or rail track,

or a motion recognition sensor which alerts authoritative personnel.

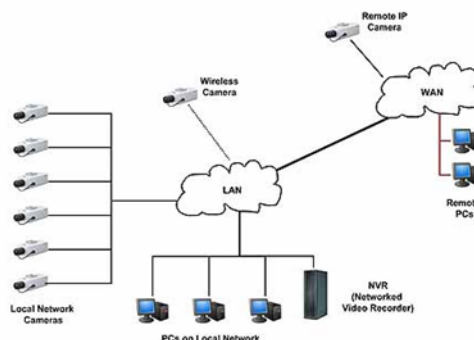


Fig1:Video Surveillance.

Automatic alerts when an object is blocking or crossing and also gives accurate and timeliness are the main advantages of real time surveillance security. In this system, we use the Raspberry pi chip as the microprocessor, single-board computer which follows motion detection algorithm written in python as default programming environment. In addition, the system uses the motion detection algorithm to significantly decrease storage usage and save investment costs. The algorithm for motion detection is being implemented on raspberry pi, which enables the live streaming camera along with detection of motion [3]. Video data is captured from a Pi camera. IOT video monitor system provide a practical solution for remote wireless monitoring with low cost. Security surveillance system is less expensive and has longer life, which captures and hosting real time intruder images and arises of alerting alarms[4]. The live video camera can be view for any web browser, even from mobile in real-time.

## II. METHODS AND MATERIALS

Raspberry pi is a small single-board computer, which can be used in electronic project, and for many of the thing that your desktop PC does, like spreadsheets, word processing browsing the internet and playing games. it works as if a normal computer at a relatively low-price

and also low cost server to handle light internal or web traffic. Raspberry Pi camera module can be used to take high-definition video, as well as stills photographs.

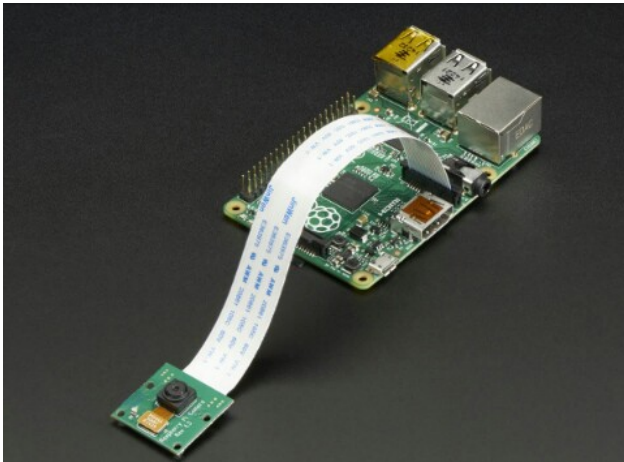


Fig 2: Raspberry pi with PI camera.

IOT is the inter-networking of physical devices, vehicles, buildings and other items –embedded with the electronics, software, sensors actuators and network connectivity that enable these objects to collect and exchange the data. IOT as an ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.



Fig3: Internet of things.

### III.RELATED WORKS

A. CCTV (closed-circuit television), it uses the video cameras to transmit a signal to a specific place. In these types of surveillance systems, the person who is stationary and is located in that particular area can only view what is happening in that place. But it is costly for normal residents to setup such kind of system and also it does not inform the user immediately when the burglary happens [5].



Fig 4: Image of CCTV.

#### Disadvantages of CCTV

- CCTV cameras can only monitored a limited area.
- Criminals can vandalize the cameras in various ways, such as sticking gum or spraying something on lens, even be able to change the angle of the camera.
- Wireless CCTV cameras need a specified frequency to send the signals to the receiving and recording station.

B. RFID (radio frequency identification), is a technique facilitating identification of any product or item without requirement of any line of sight amid transponder and reader. In RFID, readers obtain the information from the passive tag by transmitting signals to it. Tag of active type transmits information to the user. Tag of memory and hence it can store more than product code or serial number.

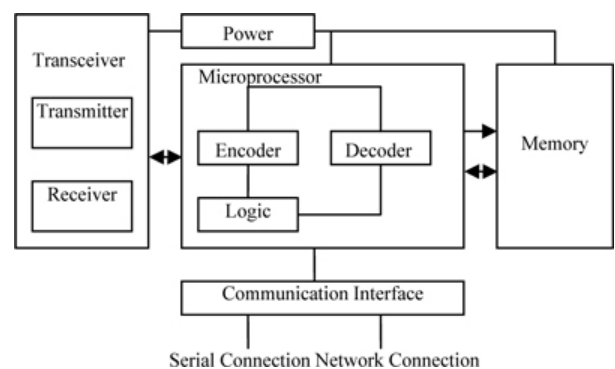


Fig 5: Radio frequency identification (RFID) device.

#### Disadvantages of RFID

- This device need to be programmed which requires enough amount of time.
- Privacy is a concern with the use of RFID on products as it can be easily tapped intercepted.
- RFID is costly due to use of batteries.

C.PIR sensors (Pyro electric infrared sensor), are made of pyro electric (or thermoelectric) materials and usually contain lenses or mirrors in order to focus the infrared light for maximum reception. As infrared light comes in contact with the pyro electric material, which is usually thin sheet, it creates an electrical current that can be measured to determine the intensity of infrared light (depth perception) and the direction that it came from.



Fig 6: Pyro electric infrared sensors.

#### Disadvantages of PIR

- PIR sensors can only receive infrared light and cannot emit it like other type of infrared sensors.
- This PIR sensor is expensive to purchase, install and calibrate as well.

#### IV. PROPOSED SYSTEM

The email server .it sends SMS alerts to user mobile automatically through GSM modem. And it also records video that is happening in surveillance area is uploaded to the cloud server directly. When cloud not available then the data stored locally on the raspberry pi and sent when connection restarts .the internet enabled device can access the live streaming video from the camera on any web browser.at the surveillance area the movement of the camera is control through IOT platform to increase coverage area.

The main aim is to provide cost-effective, high security and other application.The hardware module includes raspberry pi, PI camera, DC motor, GSM modern, MAX 2321C and fire sensor. The block diagram of proposed system is shown in fig7.

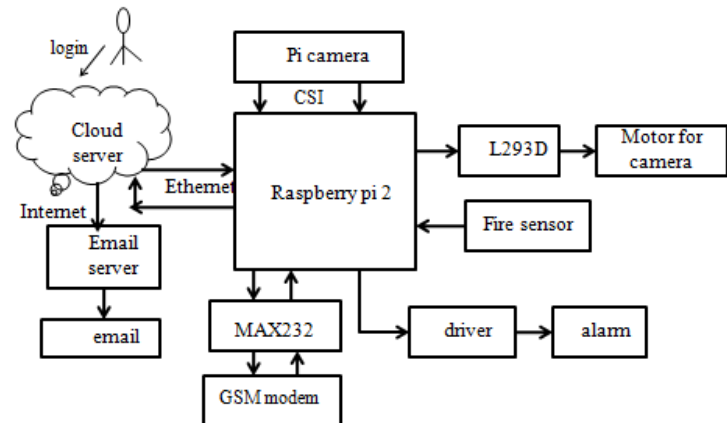


Fig.7: Block diagram of proposed system.

Here Pi camera module is connected to the Raspberry pi board directly through the CSI (camera serial interface). MAX232 IC is a hardware layer protocol converter IC commonly known as RS-232 Transceiver. It consists pair of drivers and receivers. At a very basic level the driver converts TTL and CMOS voltage levels to RS232 voltage levels. Which are used for serial communication between Raspberry pi processor and GSM module. Fire sensor detects the high temperatures in the surveillance area. In this system we are using thermistor for the detection of high temperatures.

Generally we can't drive a DC motor directly with a microcontroller, as DC motor because it requires high current and high voltage than a microcontroller. Micro controller usually operates at +5V or 3.3 V supply and its I/O pin can provide only up to 25mA current. Commonly used DC motor requires 12V supply and 300mA current, moreover interfacing DC motor directly with microcontroller may affect the working of microcontroller due to the back EMF of the DC motor. For this reason we use L293D H-bridge circuit. It is a special circuit, by using the 4 transistors we can control the direction of DC motor. If we give logic bits 1,0 then current flows from VCC to motor positive after motor positive to motor negative and then flows to ground. Then motor rotates one direction .We may change the logic bit 0,1 then current flows from VCC to motor negative after motor negative to motor positive and then flows to ground.

Finally, motion detection algorithm detects the human or object movement, here IOT helps to monitor and get alarms when motion is detected and sends the photos and video to the cloudserver. Moreover, IOT based application can be used remotely to view the activity and get notifications when motion is detected. The photos and video are sent directly to the cloud server, when the cloud is not available then the data is stored locally on raspberry pi and sent when the connection resumes [7].

**A. ALGORITHM:**

1. Converting the current frame and the next frame to the gray type.
2. Comparing pixel peer to peer for the first frame with the corresponding pixel in the second frame.
3. Calculate the average of a selected colour in frame 1
4. Wait X seconds
5. Calculate the average of a selected colour in frame 2
6. if  $\text{abs}(\text{avg Frame1} - \text{avg Frame2}) > \text{threshold}$  then motion detected.

Motion detection is usually a software-based monitoring algorithms which, when it detects motions will signal the surveillance camera to begin capturing the event. Also called activity detection. An advance motion detection surveillance system can analyse the type of motion to see if it warrants an alarm

Motion. Pie (script file format used by python) is a package for detecting motion using the python imaging library PIL by comparing two saved images or frames from a camera we can detect which pixel have changed .a threshold is used to account for noise lower quality images. [6] Motion detection algorithm deals with converting Image from any colour pattern or RGB to gray. The gray frames are compared with each using this algorithm. The motion and moveable objects are detected through gray frames comparison. Once the motion detection occurs, calculation are made from two successive images to determine the type of motion made [1].

Motion detection flowchart is a pictorial representation of motion detection algorithm. Initially the image is captured, camera checks whether the captured image is for first time if it is true then the image is set as a reference image and there will be no comparison between images pixel by pixel. Else the current image is compared with the reference image pixel level. The difference in the number of pixel of current image and reference image is larger than the threshold then we can conclude that motion is detected. And then the system records the full-HD video, save them on the raspberry pi chip. If not the current image is saved as reference image and program will not save the videos data [1].

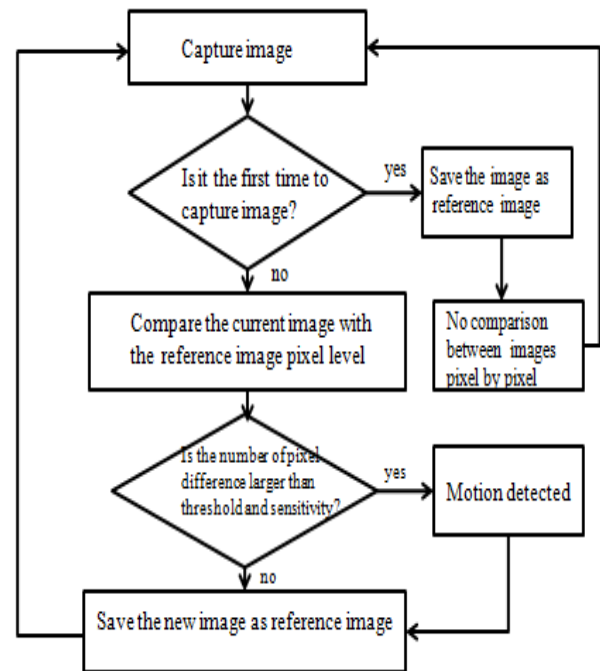
**V. CONCLUSION**

Fig 8: Motion Detection flowcha

This paper provide a cost-effective, high security and other application. Deploying raspberry pi, GSM and pi camera help to detect, monitor and report intrusion motion to the user. IOT based application can be used remotely to view the activity and get notification when motion is detected. The live video camera can be view for any web browser, even from mobile in real-time. In future enhancement, we are planning to make use of security surveillance to detect other mischievous motion using motion detection algorithm. Because the algorithm mainly depends on the threshold value.

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