Movement Detection Based Cost Effective Image Surveillance System Using Raspberry PI

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Abstract: Surveillance systems are used for the data acquisitions in order to monitor the control over an environment and get a good overview of the targeted place which can be secured and have a reassurance of safety to the client. But all the previous systems depend on the human who is monitoring the flow i.e. overviewing the output of those surveillance cameras and control the appropriate response by analyzing the data acquired. Now this is all a tedious work which can be changed as we have a dynamic development in the increase of machine work and reducing the human involvement in the analyzing process and make it an intelligence system. We use an image acquisition system using sensor support and based of the movement detection in the proximity of the sensor and it automatically compiles a message to receive to the user through a SMS carrier and also mailing the acquired image through the mail over internet and we can check the live data of the camera using a port address over the same network using IOT. The script we use for all the programming function for this is python as its cross platform support will help in the execution of this project successfully in a single program. In the modern times we have many smart surveillance systems but they are in the affordable range for the small scale business industry and also in the local society such as towns and districts they are eager to acquire a smart security systems for their offices, shops and for protection of their merchandise but cannot go forward due t the pricing range for such system. This is a low cost and efficient system of image acquisition which almost at the half price of whatever smart surveillance we have in the society now-a-days. The paper is comprised of the brief work done in the future usage of the new form of the image surveillance system.

Keywords: SMS, IOT. The script, offices, The paper is comprised of the brief work done

I. INTRODUCTION

In today's society the security of our own premises has become an important task which can be aided by the technology provided by our computers and one of the major security measures is by using surveillance and we can define a surveillance as monitoring an environment remotely and controlling the camera to secure the place we are overviewing. This paper comprises of an image acquisition system using Raspberry pi. We use a PIR sensor, a ultrasonic sensor for the movement detection in the proximity of the environment and we interface these sensors on the GPIO port of the pi and we have a camera interfaced over Usb terminal and connect the pi to a network.

The software we are using is python programming tool in which we have programs for a sms, ultrasonic and a main program in which we can call all the other programs as sub process which helps in the single process execution of the whole operation.

1.1 Why Raspberry pi?

In raspberry pi we can interface the different sensors using the GPIO port and we have many interfacing ports for connecting the camera like through Usb or direct Pi camera. This triumph the 8051 microcontroller capabilities. Now the programming software we use is python in raspberry pi, although this python is a powerful and a flexible programming tool due to its clear syntax it is easy to understand and learn. We use only one program in the execution of the system and we can call the sensor program, message carrier program, webpage using php program is directly in the main program. Here there is much code optimization and also the simple execution. We do not need to execute the web access program which is in php separately as we can use it directly called from the main program. These are the reasons we use raspberry pi with python rather than any other micro controllers and other programming languages. We can have the thorough output with simple execution and also simple assembly connections.

1.2 Why both PIR and Ultrasonic sensors?

PIR sensor is a pyro electric sensor which is used for detecting in change in motion by the IR waves in the environment, basically it detects the human body heat radiates infrared waves and it is then detected by the sensor. Every object radiates the low energy IR waves. This sensor detects in change in temperature through which it detects and sends the output signal. Ultrasonic sensor works on the principle that it sends high frequency ultrasonic waves through the trigger pin and receives the reflected waves and through which it calculates the distance between the sensor and the target. It can detect any shape or object with any complexity. Now if the room temperature changes it also affects the PIR sensor which may not be able to correctly distinguish the target and also objects are ignored by the PIR sensor, here the ultrasonic sensor comes in to picture where it is not affected by the change in environment and so it compensates the drawback of the PIR sensor.

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The ultrasonic sensor detects any target which comes in its way and it always detects the object closer to it and here if an object and a person are standing in the range of the sensor but object is a bit close then the ultrasonic sensor detects the object first now here the drawback is that sensor cannot distinguish the difference and the PIR sensor can detect the human in the range and compensate for the ultrasonic sensor. These are the reasons we use both ultrasonic sensor and PIR sensor in our project for the motion detection.

1. Existing system

The basic surveillance system consists of a camera connected to a monitor through a cable so that we can control the images captured through the camera. The word surveillance is a French word for watching over which can be considered as watching through the camera as an eye in the monitor connected to it. The basic surveillance system is as shown below
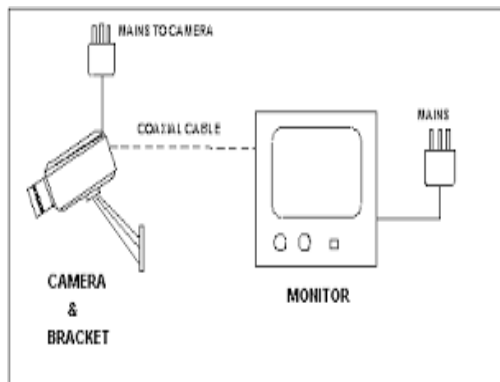

Figure.1. Monitoring system

II. PROPOSED SYSTEM

The surveillance system we are building is based on movement detection using two types of sensors and the image captured can be monitored and also the alertness will be sent to the user over internet so that he will be notified of the current status of the environment.

We use raspberry pi as the system and two motion sensors we use are ultrasonic sensor and PIR sensor, we have an Usb camera for image capturing purposes.

This system captures the image whenever either of the sensors is detected and sends a message alert to the user mobile and also it sends the captured image from the system to the user through email over the internet. We can also check the image through a portal if we are connected on the same network.
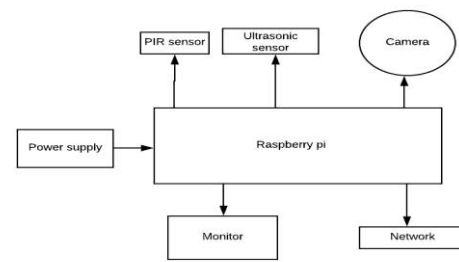

Figure.2. Block diagram of overall system

2. Implementation

4.1 Algorithm:

Step 1: Start
Step 2 : Initialize Raspberry Pi, PIR sensor, Ultrasonic sensor,USB camera.
Step 3: Run python program
Step 4: If either PIR sensor or Ultrasonic sensor is detected capture the image using camera
Step 5: Send the sms through twilio portal and also send mail with the attachment of the captured image
Step 6: If any error occurred in sending mail display that error occurred and exit the program. If no error occurred go to step 3.
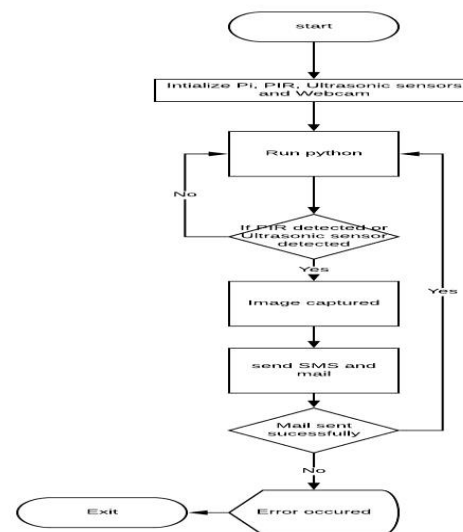Step 7: stop

4.2 Flow Chart

Figure.3. Flowchart representing the operation

As shown in the algorithm the basic functionality of the Raspberry pi kit the flow chart corresponding to it is given below. Also in order to access the image online we can acess it through the web portal with the appropriate destination address over the same network using the IOT functionality and a webpage code using PHP.

III. RESULTS

According to the implementation process of the previous chapter the output results can be shown as below
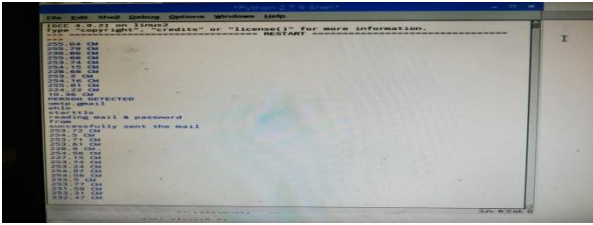
5.1 Output on python:

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Figure.4. Output terminals on python shell

In the above figure we can see the output values from the PIR sensor which calculates the distance and displays in CM. When a person obstructs it immediately it shows the message and initiates the sms and mail process after sending successfully it continues with the result.

5.2 Output SMS:

Figure.5. SMS notification on Phone

As you can see that as the sensor detected it sends the message to your phone `as "PERSON DETECTED" through twilio messaging service.
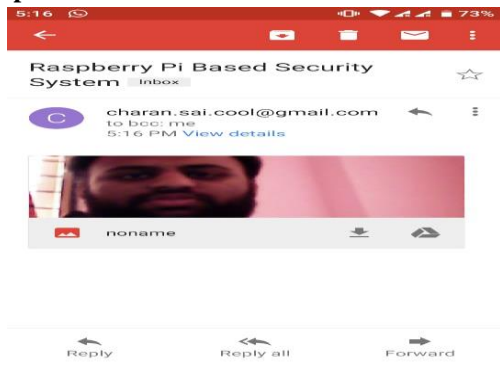
5.3 Output Mail:

Figure.6. Output Mail with the Image

The mail is send to the user after the message is sent and gives the result with mail attached with the image over the internet.

5.4 Output on PHP

Figure.7. PHP Output on a webpage

The result of the image detection can be seen using the PHP program on a network by using the IP address with a backward slash and the destination address of the image and program as you can see that the image is detected and can be seen in the window above.

IV.   CONCLUSION

Raspberry pi we use comprises with the accomplishing the image acquisition over internet on the perquisite that an abnormality has been detected through the sensor which are interfaced to the pi. The fact that we are using the Linux based operating system and programming with python software gives us the edge on the flexibility on improvement i.e. does not bound you on a fixed platform. The image acquired through the detection is sent through mail to the user gives us the instant alertness over the situation of the environment. The messaging of the detection through the twilio based service gives us another way to alert the user even in case of offline environment of the user. The image can be checked up in a same network by the port destination address gives a way to monitor the access of the environment. This image surveillance system can be used as an isolated part of a bigger network or can be ventured in the small scale business industry. As it is financially a probable system which gives us an instant alertness what more do you need?

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