Movement Detection in Video Surveillance for Security

Yogita K. Dubey[1,] Mayuri Rabade[2] , Mrunali Wasnik[3] , Ashweena Gilbile[4] , Mrunal Vyawahare[5]
and Sakshi Vinchurkar[6]

Department of Electronics and Telecommunication

Yeshwantrao Chavan College of Engineering,
Nagpur, India
[1]yogeetakdubey@yahoo.co.in, [2]4321mayuri@gmail.com,[3]mrunaliwasnik67@gmail.com,
[4] gilbileashweena@gmail.com,[5] mrunalv6414@gmail.com, [6]sakshivinchurkar6@gmail.com

Abstract

In a normal surveillance system, there is the only camera that records the video continuously and consumes extra storage for recording the video as it plays a very vital role in the security system , we propose a system to detect movement in video surveillance for security purpose and also to solve the problem of storage. The suggested new mechanism uses raspberry pi, PIR sensor, GSM module, Vibration Sensor, LCD Display to make intelligent detection and recording objects so that it only captures valid video with the improved and high video quality. The proposed system also records a short video and sends it to the owner via email, hence increasing the security. An alarm is activated if any suspicious activity is detected, such that it can be brought into the notice of the neighbors.

Keywords: Video Surveillance, Suspicious Movement, Raspberry Pi, GSM Module,

1. Introduction

The smart surveillance security system can be implemented at various places as it has many benefits in home applications, industrial areas (reduced theft, protect employees) including remote monitoring facilities from smart phone, for building security system and many more. Various systems have been proposed in the past for suspicious movement detection in video surveillance. The comprehensive review of suspicious human activity is given in [3].

 Security is also a major issue in any surveillance system. Bangali etal [1] proposed GSM based security system with enhanced security as well as communication of a text message for necessary actions. Persis et al [2] presented a PIR based security system with exclusive video transmission. The system has the advantage of low cost with high resolution and low power consumption feature.

Cui etal [4] proposed abnormal event detection system for traffic video surveillance. Simple image processing algorithms are used here to classify the object from the video as normal or abnormal. Agraval etal [5] proposed suspicious human activity recognition system for video surveillance to detect the cheating activities in examination hall using speed up robust features.

Goswami etal [6] proposed an algorithm to detect unusual events for ATM security using morphological operation. Aitfares etal [7] propose a suspicious behavior detection system of people by monitoring camera using segmentation and tracking of object. Experimentation was carried out on real world images. Shariff etal [8] proposed smart unusual event detection system for enhanced

security using low resolution camera and ARM 7 LPC 2148. The system also triggers alarm message. Prajwal etal [9] proposed a system for the ddetection of unusual events like face masking, camera masking, fight or overcrowding in low resolution video. The system has prevention ability of thefts.

Concerning about all safety aspects, the idea is being proposed to easily handle machine to machine communication and make the system work more efficiently without any human intervention. Raspberry Pi 3B+ module is used which is a full-fledged credit card sized computer. This module has a faster 64-bit, 1.4 GHz quad-core ARM Cortex-A53 CPU, with a GPU and 1GB RAM. The SD card contains the Raspberry Pi's operating system. The recommended OS is called Raspbian.

2. Proposed System

The the main objective of this system is to make a smart surveillance using Raspberry Pi along with PIR sensor and Raspberry Pi-Camera. PIR sensor is used to detect the motion whenever someone comes within its range. Moreover, GSM module is used for mail or call notification. As soon as PIR Sensor detects the motion, Pi-Camera activates and captures an image or video of few seconds when detecting suspicious activities based on a Human behavior. Here we are using semantic knowledge to detect the suspicious behavior of single person as well as behavior of number of people (i.e. group of people) like to reduce theft, protect employees etc. Once it has captured any suspicious behavior of human or any lathering object it will take a snapshot of that activity and send it to the user as well as it will generate the Alert at the same time for every suspicious activity. In this way the owner of the system will be notified of the suspicious activities taking place at their residents or workplace.

Functional circuit diagram of the proposed system is shown in Figure 1. This circuit diagram contains Raspberry Pi, LCD display, GSM module, resistor, PIR sensor, vibration sensor, buzzer. The commanding Raspberry Pi manages all the peripherals operations in the circuit. The input is provided to raspberry pi through python coding and according to the program it provides the output whenever the system detects motion in any kind through alarm and SMS notification.
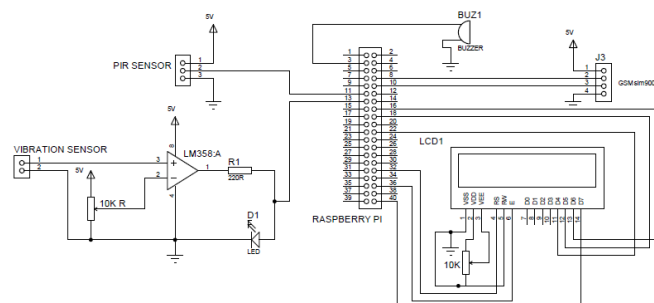

Figure 1. Circuit Diagram of the Module

3. Components Used

A. **Raspberry pi(3 Model B+) :** Raspberry Pi shown in Figure 2 is a credit card sized , single board, low cost small computer which is capable of performing various functions within a low power consuming system based on Linux. For booting up the system we have used here an 8GB SD card .It require a 5V power supply to operate and it consists of many I/O general purpose GPIO pins for interfacing with external devices. The main advantage of raspberry pi is it's capability to work as a normal computer and also it provides a resolution of 10S0p without lagging.

Figure 2 Raspberry Pi Module

B. **PIR Sensor :** Passive Infrared (PIR) Sensor is shown in Figure 3. Here 'passive' indicates that the sensor does not emit the infrared signals rather it detects the radiations that comes from the human body within certain range. Then the radiations detected are further converted into an electrical charge. This charge is then provided to the output pins of the devices for amplification . It ranges up to 10 meters at an angle of approximately 150.

Figure 3 PIR Sensor

C. **GSM MODULE :** A GSM module shown in Figure 4 is a chip that establishes a communication between any computing machine or system . It requires a power supply of 12V to setup the interface for computer. Its basic function is to send mail and monitor the signal strength. This is implemented here in the project to generate SMS and send it to the owner as soon as any motion is detected.

Figure 4. GSM Module

D. LCD Display : A liquid crystal display shown in Figure 5 is an electronically modulated device that uses properties of liquid crystals along with polarizers. Here, LCD display is used to reflect the message that we get when any motion is detected and then it is further sent to the owner via mail. The message that will display on the LCD is coded through basic python programming.
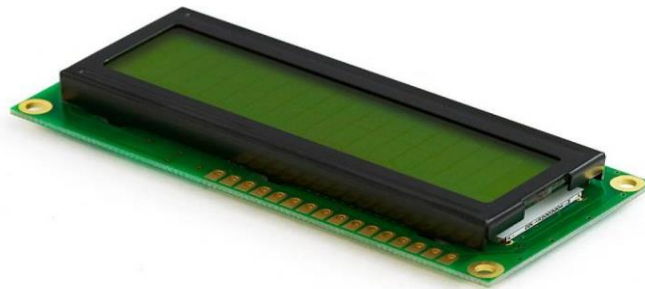

Figure 5. LCD Display

E. Vibration Sensor : Vibration sensor also known as piezoelectric sensor are flexible devices used for various purposes. With the help of piezoelectric effects it measures various parameters like temperature, pressure, strain etc. The sensitivity of this device ranges from 10mV/g to 100Mv/g. This sensor is used here to sense the motion when detected into camera.

F. Buzzer : Buzzer is a mechanical audio signalling device used in the system for getting alert notification by beeping for the time span set up by the user . It is a two pin device with a DC power supply from 4V to 9V.

G. Pi Camera : The raspberry pi camera shown in Figure 6 is a high quality 8 mega pixel sony IMX219 image sensor custom design add-onboard for raspberry pi featuring a fixed focus lens. It is capable of 3280x2464 pixel static images, and also supports 1080p30,720p600 and 640x480p90 video.

Figure 6 Pi Camera

4. Flowchart and Methodology

The goal of the system is to achieve a smart surveillance security system by motion detection. Following procedure is being followed. Firstly, the setting of raspberry pi is done by it's desired operating system and then SD card is inserted into the slot. With the help of HDMI cable, it is being monitored with the keyboard or mouse. After this, the LCD is initialized along with it's input output pins. Then it checks the status of both the vibration and PIR sensor. If any motion is detected it will display the message on the LCD and a video of 5 seconds is recorded and sent to the owner via mail or call. Thereafter few minutes the buzzer or alarm beeps for alerting.
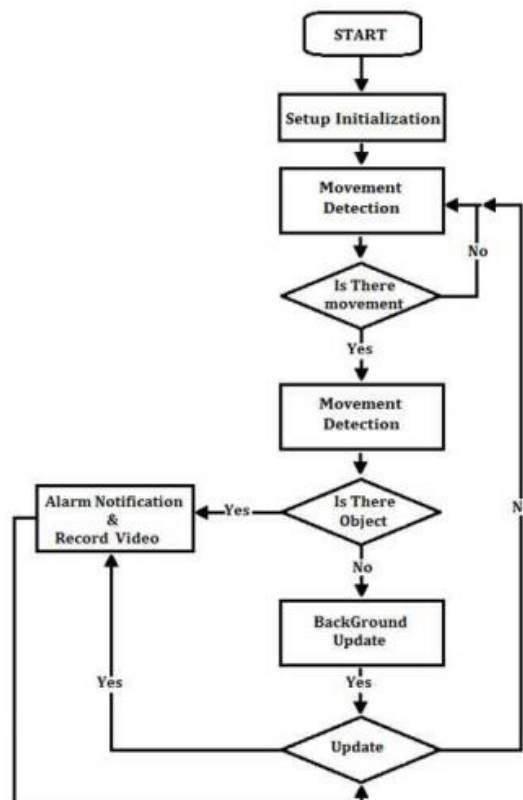

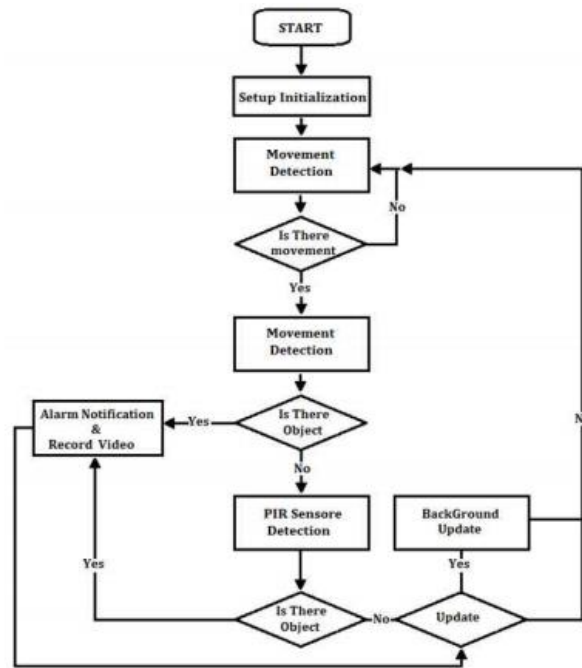Figure 7: Flowchart diagram general system before the motion is detected by the module.

Figure 8 Flowchart diagram general system before the motion is detected by the module.

The system contributes to the situation alertness and hence emergency situations can be easily handled and hence can be used for various security purposes.

5. Conclusion and Future Scope

Suspicious Movement Detection in video Surveillance contributes to the situation alertness in real time. It has been designed in such a way that it is capable of recording the video of 5 seconds and send it to the owner via Mail. This uses GSM module for communication and then the buzzer beeps as soon as the motion is detected for the time interval set by the user. With the help of the system emergency case could also be easily solved. Hence this smart surveillance system designed can be used at various places for various purposes such as spy, bank, military areas, bank lockers, industries offices, etc. Future is easier and promising with upcoming innovative technologies. We can use image processing to make it more enhanced for any user to implement it. Also live video streaming can be added up further. Instead of PIR sensor some other sensor with more strong and clear sensing can also be used as PIR sensor has only wide angle of about 150, So it can be replaced by another sensor that is capable of sensing objects in more than 10 meters.

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Bibliography

	Yogita Dubey presently working as Assistant Professor, Department of Electronics and Telecommunication Engineering, Yeshawantrao Chavan College of Engineering, Nagpur. She has completed B.E. (Electronics Engineering) from Manohar Bhai Patel College of Engineering, Gondia and MTech (Electronics Engineering) from Yeshawantrao Chavan College of Engineering, Nagpur, and PhD from RTM Nagpur University. Her research includes brain image analysis, texture classification, echocardiography image analysis, satellite image classification and Signal Processing. She worked on two research projects. She has published more than 30 Papers in International Journals and Conferences. She is Senior member of IEEE, life member of ISTE and member of IACSIT.
	Ashweena P. Gilbile, B.E. in Electronics and Telecommunications B.E. in Electronics and Telecommunications, Yeshwantrao Chavan College of Engineering
	Mayuri S. Rabade, B.E. in Electronics and Telecommunications B.E. in Electronics and Telecommunications, Yeshwantrao Chavan College of Engineering
	Mrunal P. Vyawahare, B.E. in Electronics and Telecommunications B.E. in Electronics and Telecommunications, Yeshwantrao Chavan College of Engineering

	Mrunali P. Wasnik, B.E. in Electronics and Telecommunications B.E. in Electronics and Telecommunications, Yeshwantrao Chavan College of Engineering
	Sakshi S. Vinchurkar, B.E. in Electronics and Telecommunications B.E. in Electronics and Telecommunications, Yeshwantrao Chavan College of Engineering