Motion Sense based Security System

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Abstract - *Security is one the most required aspects of human lives in this present modern world. Presently, there exist different types of security systems for providing surveillance in the areas of interest. These existing procedures of providing security involve a lot of human intervention and storage space. This is not an efficient and economical process. The present paper introduces a smart security system. This system keeps the desired area monitored at all times and detects motion in every frame captured. Once any motion is detected, the owner of the system is sent an alert through sms and also an image of frame with motion is sent through email. The video is also recorded and saved whenever motion exists in the incoming video. This is attained by processing the video in real time using opencv program coded into a raspberry pi, attached to a camera and a gsm module.*

Key Words: Surveillance, Raspberry Pi, GSM, E-Mail, Open CV, Camera, Embedded Systems.

1. INTRODUCTION

A security system defined to be a combination of hardware components and software code that protect life and properties in all kinds of areas from intrusion. A safe, economical and smart security system is what every individual wishes for. A system that can provide surveillance for a large area and at low costs is very useful. The project proposed in this paper can be useful to those who can afford a secure and economical product that can provide security and alert features to any device that has an active internet connected with email logged in and/or that has a SIM (Subscribers Identity Module). Automation has been made easy these days in a wide variety of applications such as smart homes, biometrics, medical cases, industrial applications, etc. The traditional security systems involve CCTV that requires lots of memory for storing the recorded information. Automating the daily activities and applications has reduced the wastage of human power globally. This project improves the current situation in the field of surveillance by automatically alerting the user in the occurrence of any security breach. It also allows for the future reference of the recordings as they need only a small amount of memory, since they are stored only when some kind of motion is detected in the surveillance area.

2. EXISTING SYSTEM

The present Security system uses cameras for recording. They do not provide any kind of smart features for the security purposes.

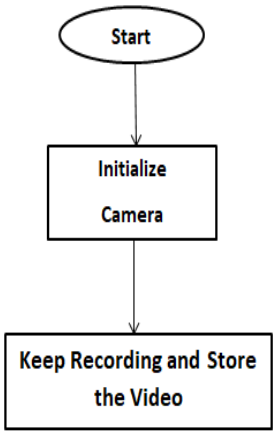

Fig -1: Traditional video capturing security system

In the present system, the equipment is setup and it keeps running continuously. The cameras are powered on and they are connected to a computer to store the output video from them. Here a lot of memory is wasted as the video is stored continuously

without any issue occurring. And also the end user will be able to access any illegal activities after they have occurred by looking at the recorded video.

3. PROPOSED SYSTEM

In the proposed system, the hardware of the existing system exists. And also some extra hardware and software is provided to improve the system abilities. The proposed system consists of the camera connected to a raspberry pi. The raspberry pi is connected a GSM module to notify the user whenever motion is detected. Using OpenCV, a code is written on the raspberry pi to detect any motion that occurs in the incoming video from the camera attached. Whenever motion is detected, an email is sent using a code snippet and a trigger is sent to the gsm module to send a sms to the user with predefined message. Then the video recording starts and is stored in the memory for further reference.

3.1 Procedure

Step 1: Initialize the camera and pre-process the
Incoming frames form the camera.
Step 2: If motion is detected,
- Add the frame for saving into the memory
-Send a trigger to the GSM module to alert the user with a sms
-Send an email containing the frame where the motion is detected
-Store the frame into the video
Step 3: If no motion is detected,
-discard the frames which were pre-processed
Step 4: Display the frames for real time viewing
Step 6: Repeat the above steps continuously

3.2 Flow Chart

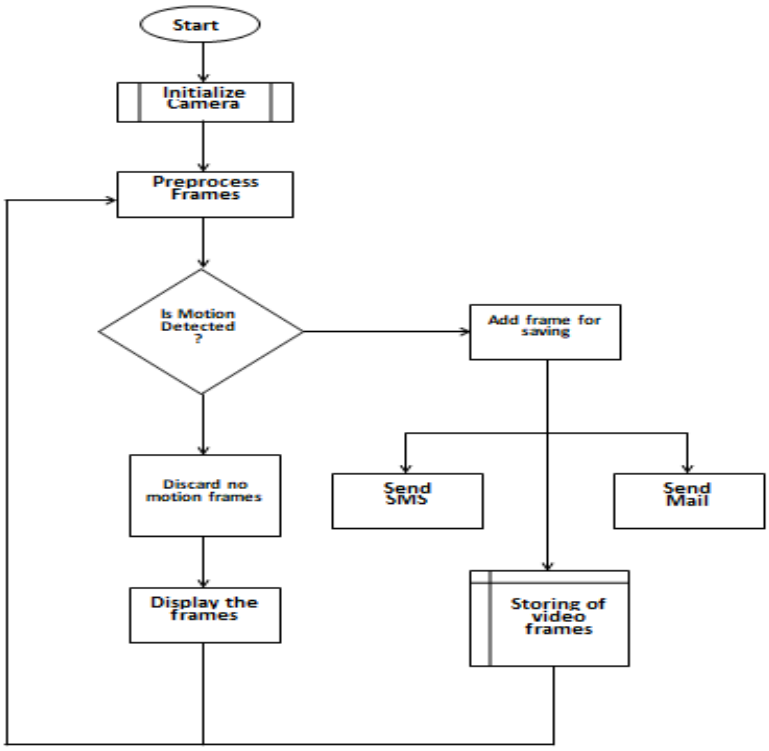

Fig -2: Proposed Security System

4. SYSTEM DESIGN

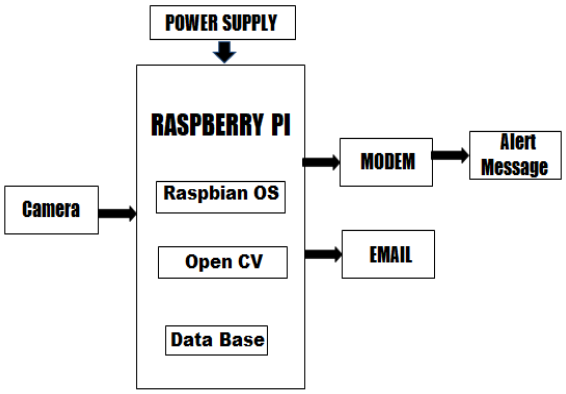

Fig -3: Block diagram of proposed system

In the system, external power supply is provided to Raspberry Pi and GSM Module. Raspberry pi is connected to Pi Camera and GSM Module. The raspberry pi can be connected to mobile or laptop through local wireless network or LAN cable or can be connected to a monitor as a standalone system.

4.1 Raspberry Pi

A microcontroller is a small computer on a single integrated circuit consisting of a processor along with the memory and other programmable I/O peripherals. Raspberry pi consists of on-board CPU, RAM, USB ports, Wi-Fi Module, Camera Interface to connect camera module etc. New models of Raspberry pi are released with updated features.

4.2 GSM Module

The Global System for Mobile Communication (GSM) modem is a wireless modem that works with GSM Wireless network. This kind of GSM modem requires SIM card to be able to operate as digital identity to link with cellular phone network. GSM is used for sending mobile voice and information services.

4.3 Pi Camera

Pi Camera is used a kind of normal camera which is enhanced and optimized to work with the Raspberry pi. The Raspberry Pi is provided with a separate port so that the pi camera can be connected to it.

4.4 Power Supply

Every electrical application requires energy. Power supply is that source module that provides the required electrical energy to the system. A power supply unit or PSU is defined as the one which provides some type of energy to an output equipment/load. The current project requires power to be supplied to raspberry pi and the gsm module. An adaptor connected to an a.c. supply with suitable specifications can be used here.

4.5 OpenCV and other software

OpenCV is a python based image processing library. As raspberry pi is greatly supported with python, opencv is used to provide the motion detection functionality in the current project. The serial library is used to communicate with the GSM module and indicate it to send sms to the end user. The SMTP (Simple Mail Transfer Protocol) library is used to send an email to the user with an image of the motion detected frame attached.

5. MERITS

Advantages of this project can greatly reduce the amount of storage space used for saving the videos. And also the user is notified whenever some motion is detected. By this the efficiency of the system increases and also the security level of the project rises.

6. CONCLUSION

The current system is small in size, has less weight and uses a much less power. The usage of open source code makes it easier to use all the functionalities to the very end and provide the best output. The use of raspberry pi shows an effective embedded security system. It is cheaper and more affordable. It provides a more intelligent and a storage efficient security system. In future, system can be developed such that it contains more powerful processors. It can be provide with more sophisticated software codes. It can also be embedded with more hardware such as proximity sensors, IR face detected, body scanners, etc.

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