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Motion Detection Surveillance System Using Raspberry PI

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Abstract: **- The object of the system is to develop an alert system based on images for detecting the movement of trespassers. The images from the camera are compared with a reference image to detect any motion in the coverage area. If any motion is detected, a series of images are taken and transmitted to the Google drive via a Dongle connected to the Raspberry Pi and an email is sent to the user. Raspberry pi is a credit- card sized computer. There are various surveillance systems such as camera, CCTV etc. An android web application frequently checks the cloud for any new uploads. The user gets notification immediately, if any motion occurs in the coverage area. The user can download the captured images from the cloud through the web application.**

Keywords: **– Reference image**

I. INTRODUCTION

Internet of Things plays an important role in many systems today. It finds applications in nearly every field. For example, in health, agriculture, retail stores, smart watches, automation in industries, home automation etc. Apart from device connection, it can monitor our health related issues like blood pressure, insulin level, calories gone from our body after a workout. It plays an important role in device tracking, and helps to maintain the POS of the business by extending the retailers chain, leading to business growth. Cloud connectivity is the most important application of internet of things in retail integration applications. In secured areas where little or no motion is expected, recording video for the whole duration using surveillance cameras is an unnecessary process which consumes a lot of storage space.

The system must be able to detect motion in the area of coverage and capture images only when a motion is detected and notify the user. This is important, because in complex systems consisting of tens or hundreds of cameras, the operator could not able to notice all the events. In security surveillance systems, image sequences are transmitted to a surveillance centre and displayed on computer screens. Motion detection of objects plays an important role in various areas such as college, railway station, traffic areas, which alerts security officers in case of any burglary in progress while there is still time to prevent the crime.

II. RELATED RESEARCH

1. Renuka Chuimurkar et al (2014) proposed
"Smart Surveillance Security & Monitoring System Using Raspberry PI and PIR Sensor" [1]The system takes video input from the camera. Image processing is done using OpenCV software to detect any motion in the coverage area. If there is any motion, the frame in which motion is detected, is sent to the user's email.

2. John Clement Sunder, et al(2016) proposed "Smart Surveillance Monitoring System Using Raspberry PI and PIR Sensor[2]".Motion in the coverage area is detected using 'Motion detector".
If any motion is detected, the camera initiates recording and alerts the user through a mobile app.

3. V.V.S. Murthy, et al (2016) proposed "An Automatic Motion Detection System for a Camera Surveillance Video [3], In this method, to find a movement, subtraction of the previous one from the current frame is done. When this is done, obviously, the change will be found. In this operation, when background subtraction operation is done, pixel by pixel subtraction takes place. This is the reason for the difference between the two frames is observed as a movement. In this case, we consider the horizontal pixels as the image width and vertical pixels as the height of the image. When it comes to programming part, height is taken as columns and the width is assumed as rows of pixels because they are necessary to have a fixed shape for a frame to capture the input.

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4. Sreedevi M, et al (2012) proposed "Real

Time Movement Detection for Human Recognition [4]".The Comparison of the current frames captured with previous frames for motion detection is done. The frames are stored in the memory if motion is detected. Image processing is done on captured frames and object is identified as human or nonhuman. Once motion has been detected in the live stream, the software will activate a warning system and capture the live streaming video and creates an active alert by sending a message to the cell phone.

III. PROPOSED SYSTEM

The system doesn't require any image processing software (OpenCV) or a Motion sensor to detect motion in the coverage area. It takes subsequent images as input and compares it to detect motion. It also doesn't use any face detection algorithms as in the previous papers.

A. System Architecture

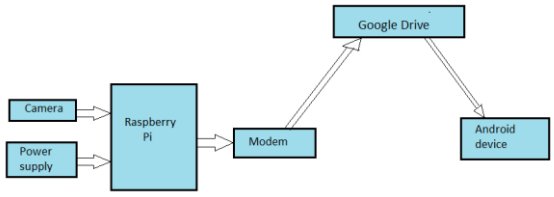

Fig.1System Architecture

Raspberry Pi captures images from camera using the 'python-picamera' interface. An image is captured initially and stored as the reference image. Images are captured at regular intervals of time (Eg.5 sec) and compared with the reference image. The difference between the current image and the reference image is calculated. If the difference is more than a certain limit, (Eg.20%) then the user is informed about the motion in the surveillance area. If the difference is less than the predefined limit, the newly captured image is deleted and the next image is captured and so on.

B. Flow Diagram

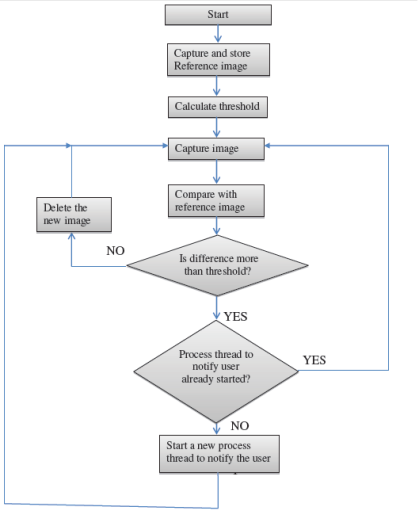

Fig .2 Flow diagram

IV. MODULES

A. Threshold Computation

After storing the reference image, a series of 10 sample images are taken. Each image is compared with the reference image. The difference between the values of corresponding pixels is calculated. The average of the differences between pixel values is calculated and used as the sensitivity value. A series of another 10 images is taken and compared with the reference image to calculate the threshold. If the difference between the corresponding pixel values is more than the sensitivity value, the pixel is considered to be different. The total number of pixels different in each image is calculated. The maximum number of pixels different is taken as the threshold.

B. Motion Detection

Once the sensitivity and threshold are computed, images are captured continuously and compared with the reference image to detect. The images are captured in black and white and in JPEG format. The value of each pixel is in the range 0-255.When two pixels are compared, if the difference between the values is more than the sensitivity value then the pixel is considered to be different. The total number of pixels that are different in the current image is calculated. If the number of pixels which are

different is more than the threshold value, then the current image is considered to be different. This implies that there is a motion in the surveillance area.

C. Reporting To The User

When a motion is detected, the newly captured images are stored in the memory and separate thread is invoked to send the images to the user. The main thread keeps capturing and storing images with the names image1, image2, etc. until no difference is found. The new thread signs-in to the specified Gmail account and sends mail to the user that a motion has occurred. Then, it uploads the stored images to a folder in Google drive in the alphabetical order of the names. The thread uploads images until no new image is found and shares the folder with the user's account.

V. CONCLUSION AND FUTURE WORK

The system can detect motion without using sensors reducing hardware overhead. It is cost efficient when compared to other existing systems. Storage of data is also reduced because only different images are stored. In future, irrespective of the light intensity changes, the system could be able to detect the object movement.

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