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Live Video Streaming using Raspberry Pi in IoT Devices

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Abstract: *Nowadays, closed circuit television for security and peace purpose for people. The traditional system has the several disadvantages such as inconvenient to carry, anomalies cannot be detected, storage space needed is more, and cost remains high. This paper provide the design and implementation of the technology called Live video streaming using Raspberry Pi in IOT devices, with a single board computer which computes the Motion Detection Algorithm written in python as programming environment. The system uses the algorithm to significantly decrease the storage space and to save the cost. The algorithm is implemented on the Raspberry Pi, which provide the live streaming with motion detection. The live steaming can be viewed from any web browser or even from mobile in the real time.*

Keywords: Raspberry Pi, Motion Detection, Live Streaming, Video Surveillances.

I. INTRODUCTION

Closed –Circuit Television is a System in which the signal are not distributed but monitored for security purpose. It is an indispensable device used for security purpose [1]. In supermarkets, factories, hospitals, colleges, school, companies have their own CCTV for 24 hours monitoring. Instead of using a traditional CCTV, now they can use the inexpensive security system with a tiny computer called as Raspberry Pi [2]. IP cameras can be used for send and receive data via internet using Internet protocol. A camera can be connected to the Raspberry pi for recording all happenings in area and can live stream in web browser or in mobile The smartphones for accessing the live streaming are equipped with significant processing, storage and sensing capabilities. There are many problem with this video surveillance such as inconvenient to carry, anamolies cannot be detected, picture is indistinct, and required more storage space for saving the surveillance[3].The motion detection can have th greater attract because of its important applications in areas such as traffic monitoring, video surveillance, sign language detection. To overcome this, they need a modern security system , a kind of image acquisition system based on ARM and Linuxha designed. It has a processing system USB camera, LCD monitor and build necessary peripherals for

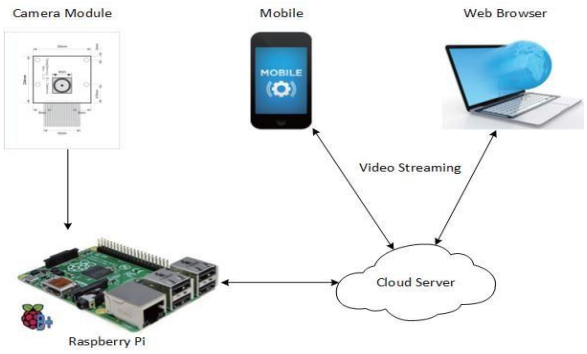

Fig1.System Framework

communication to complete the hardware platform. We apply the Motion detection for live streaming camera to analyses the incoming image and recognize the movement occur. The video can save and store the image for the review require for the administrators. They provide the internet access, through cellular connection and Wi-Fi and

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enable for the new application. Now a days a video application is popular. We need to meet the growing demand of the video application in cellular networks.

II. LITERATURE SURVEY

Live Streaming for Surveillance Systems

Several studies have focused on using Raspberry Pi for surveillance applications. Researchers have implemented RTSP-based streaming to deliver real-time video feeds to cloud servers or local storage devices. Studies highlight the importance of efficient video compression (H.264, H.265) to reduce bandwidth consumption.

Smart Home and Remote Monitoring Applications

Raspberry Pi-based live streaming has been integrated into smart home security systems. IoT frameworks like MQTT (Message Queuing Telemetry Transport) and Node-RED have been employed for real-time video alerts and notifications. Cloud-based solutions enable remote access via mobile applications.

III. OBJECTIVE OF PROJECT

- **Remote Surveillance:** Enable real-time video monitoring from any location using an internet-connected device.
- **Low-Cost & Efficient System:** Utilize Raspberry Pi, which is cost-effective and power-efficient, making it ideal for IoT applications.
- **Integration with IoT Platforms:** Allow for video streaming to cloud-based IoT platforms for storage and analysis.
- **Motion Detection & Alerts:** Implement motion detection to trigger alerts for security and automation purposes.
- **Web & Mobile Access:** Stream video to a web browser or mobile application for ease of access.

IV. METHODOLOGY

The block diagram of the proposed system is shown in Fig 2.1. It consists of Raspberry Pi, Camera module, mobile, web browser.

A. Overview of Raspberry Pi

The proposed system uses Raspberry Pi Model B+ single board computer and some key features:

- Broadcom BCM2835 SOC processor with 700MHz
- ARM1176JZF-S core.
- 512MB RAM
- Video core 4 GPU supports up to 1920x1200 resolution.
- 5Mpix Camera module capable of full HD video @30fps
- Micro SD card slot, 10/100Mbps Ethernet port, 4 x USB 2.0 ports, HDMI, audio/video jack, GPIO header, micro-USB power port, DSI and CSI ports.
- Dual step-down (buck) power supply for 3.3V and 1.8V.

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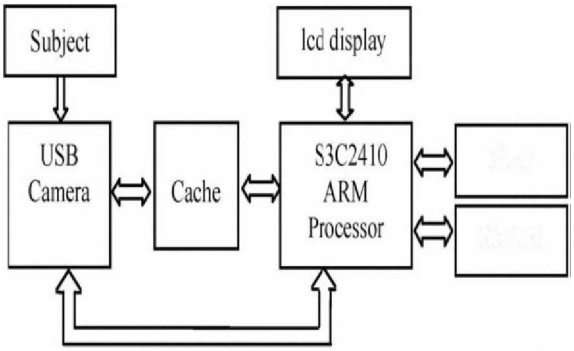

Fig 2 : System Architecture

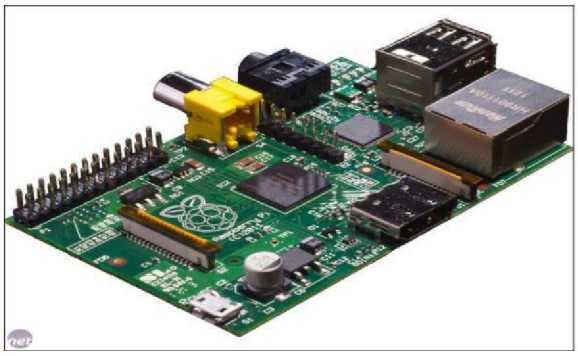

Figure 3: Raspberry Pi device

Initially , Raspberry Pi is new hardware device and provide the all functionality like the personal computer or laptops. It has 6 times more processing time then any other models. The Raspberry pi device is connected with USB and configured with camera module which connected to external monitor for accessing the captured video. This Raspberry Pi, device runs on Raspbian OS and programmed using GNU octave and python, and is open source. The Dynamic host protocol is obtained used for Raspberry Pi and fetch the IP address. When we accessed then we can configured and controlled remotely.

B. Connecting the Camera

Figure 4: Connection of Camera

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A 5MP camera which is capable of the 1080p video and still images and be connected to Raspberry Pi device directly with interface known as CSI(camera serial interface) and install the latest version of Raspbian operating system, then we go with camera. It has a focus 5mp sensor and capable of 2592x1944.
The whole device cost is $75 and this include the Raspberry Pi, USB camera and Wi-Fi adapter.

V. IMPLEMENTATION

The Motion Detection algorithm works on principle of the frame differencing , Comparing that change of pixels value from one frame to another and also for object change in image. The Problem with this detection algorithm is it neither detect the slow moving object, because of sensitivity in the threshold, if it is too low and it detect like shadow and the image change in the sunlight. This algorithm is not able to handle rotating objects.

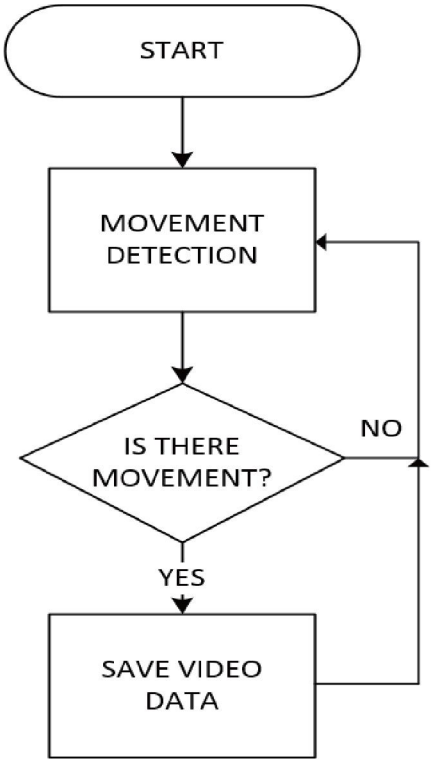
Algorithm: Motion Detection algorithm
1: procedure MOTION DETECTION
2: calculate the average of a selected color in frame 1
3: wait X seconds
4: calculate the average of a selected color in frame 2
5: if abs (avgFrame1 − avgFrame2) > threshold then
6: motion detected

Face Detection

This depends on the algorithm, If motion detected then one frame will be input frame for face detection. It convert the image to gray scale improve the contract of image. The converted image perform through Haar classifier.

Remote Monitoring

To live streaming in the remote places and they need to install a motion software, and a camera for capturing image ,If in the place internet access is by ADSL line and configuration for the router with IP address connected to Raspberry Pi.



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VI. EXPERIMENTS & RESULTS

The below presents the screenshots of the system. Here the control panel with control option to save the file which is used for capture of picture some change in video resolution. When some movement occur it analyze the incoming image and store important items, and here we can view the JPEG images and video will be played smoothly even we can watch on mobile with good reliable performance. While remotely can view in the 640x360 MJPEG image, the Raspberry Pi reports 67% CPU without overlocking.

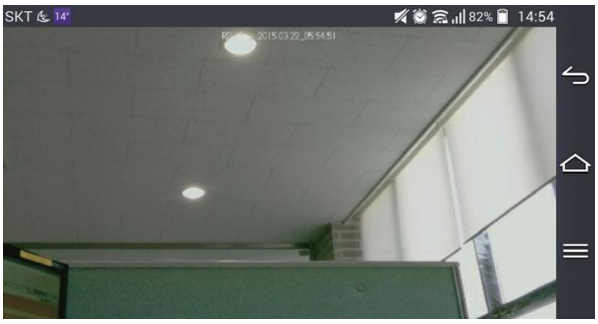

Figure 6: Monitoring Web Interface

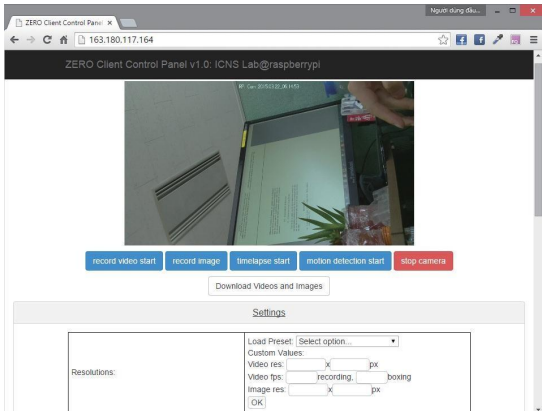

Figure 7: Interfaces on Mobile Devices.

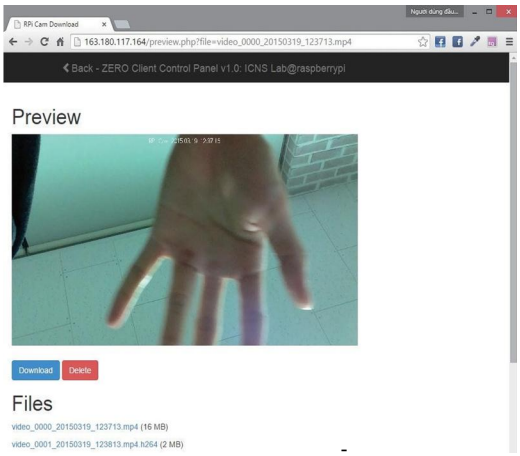

Figure 8: Video Stream in real

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VII. CONCLUSION & FUTURE WORK

An approach for the video surveliance monitoring system with the Motion Detection algorithm to decrease the cost as well as the storage using a raspberry pi as single board computer was propose in paper. But it is far from the final version and need to improve a lot.

In Future we can improve with the threshold value which can be used in the Motion Detection Algorithm. The performance can be enhanced to certain condition. If we have some good threshold value and algorithm can detect the object which are moving and include slow or tiny object.

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