Low Cost HD Video Surveillance and Recording System Using Raspberry Pi

Rashmi Mishra, Vandana Khare

Abstract— This paper describes about building a video surveillance and recording system using raspberry pi micro computer which records the HD video by motion captured night vision camera.Presently, the Closed-Circuit Television (CCTV) system is used for surveillance as well as for security of people. But there are several shortcomings in the CCTV system, like sometimes pictures are not that clear to identify the person and huge storage space is considered necessary to save the surveillance information, and cost remain moderately high. The paper discusses design and realization of a low-cost HD video surveillance and recording system using Raspberry Pi, a single board computer which records video only when the object is moving, by the night vision camera. The recorded video will be saved in external hard drive. The programming is done using python language. Moreover, the system uses the motion detection which notably decreases storage re-quirement and save investment expenses. The motion detection is realized using Raspberry Pi, which enables live streaming camera together with motion detection.

Keywords: Raspberry pi 3, Night vision camera, External Hard Drive, python

1. INTRODUCTION

Closed-circuit television monitoring arrangement has become so popular device in today's society. Hospitals, Supermarkets, schools ,factories, hotels, and companies have their own CCTV arrangement for 24/7 monitoring. As an alternative of the traditional wireless CCTV surveillance cameras, Customers can now own their reasonably priced security systems with the tiny super computer known as Raspberry Pi. There are many problems in the video surveillance system for instance: picture is indistinct, anomalies cannot be identified automatically and plenty of storage spaces are required to save the surveillance data. To overcome this problem we use Open CV for motion detection.

This paper discusses about video surveillance and recording system using raspberry pi micro computer which records the HD video by motion captured night vision camera for industrial and commercial applications. Here in this project Open CV is used for detecting only when object is moving using Raspberry Pi processor.

The Raspberry Pi is almost of the size of an ATM card, single-board computer which was developed by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2837 system on a chip (SOC), that comprises an Broadcom BCM2387 Chipset 1.2GHZ Quad-Core ARM Cortex-A53 processor, Video Core IV@400MHZ and was at first shipped with 1.2GB of RAM, afterward upgraded to 512

MB. Raspberry pi 3 is the third generation of raspberry pi, and with the speed improvement by a factor of ten over first generation of raspberry pi.

The Raspberry Pi processor can be called as the controlling device for the system. Wi-Fi module, Bluetooth module Relay boards are interfaced to ARM Cortex-A53 processor Raspberry Pi. The data which is received by the Wi-Fi module from Android smart phone is given as input to the ARM Cortex-A53 processor. Here the all the input modules i.e. Camera, external hard drive keyboard and mouse are interfaced to the Raspberry Pi. Camera detects when the object starts moving and immediately it starts recording through Raspberry Pi. Here the program is written in python .This system stores the video only when the object is moving and stores in external hard drive.

2. HARDWARE DESCRIPTION

2.1 Overview of Rasberry pi

The Raspberry Pi 3 Model B can be used to perform numerous applications. Model B brings you an extra powerful processor, improves in its speed by a factor of ten compare to the first generation Raspberry Pi. Additionally it has the wireless LAN & Bluetooth connectivity which makes it the ultimate solution for powerful connected designs. Its features includes 1.2 GHZ Quad Core ARM V8 Processor inbuilt Wi-Fi and blue tooth, 1 HDMI Port , 4 USB Ports ,1GB of RAM 40 pins, Ethernet Port, Micro SD card slot,1 micro USB slot, 1 DSI,1 CSI, Video core 4 model GPU,3.5mm audio jack.

Figure.1. Raspberry pi 3

2.2 QHM495LM Night Vision Camera

QHM495LM Night vision camera is used for capturing video. It is interfaced to raspberry pi through USB port Camera captures movements and sent the video to external hard drive. It captures video when the object is moving.

Figure.2. Night Vision Camera

The raspberry pi 3 has 4 USB ports to connect modules with this port. The proposed system uses a external hard drive which is connected to USB port on raspberry pi 3.A USB flash drive which is used to storing and retrieving any type of data such as audio, video and text documents etc. Using USB flash drives we can copy the data from one computer to another.

2.3 USB external drive

The USB external drive is a USB-connected computer storage using semiconductor non-volatile random-access memory.

Figure.3. External Hard drive

2.4 LED Display

The LCD screen has a normal Cold Cathode Fluorescent Light (CCFL) backlight, whereas the LED screen uses light emitting diodes (LED) which more energy efficient & also having thinner television screen. Although LED TVs are still LCD TVs as the screens themselves consist of liquid crystals. LEDs are placed behind the LCD screen, illuminating the pixels to create an image.

Most of the LED TVs make use of white LED edge lighting to shine light across the display. The main benefit in this type of TVs is their thickness. Other LED TVs use Red, Blue & Green (RGB) LED backlit that provides improved display quality.

Figure.4. LED Display

3. HARDWARE IMPLEMENTATION

The following figure will give you an idea about the block diagram of the system .Raspberry pi is interfaced with the night vision camera module which is used for capturing video

set in the area selected for surveillance and recording. Here, OpenCV python is installed for detecting object. After the code (python script) is initiated for the video surveillance and recording system is initiated, the video recording will be saved in memory (external hard drive). The keyboard and mouse are the input devices which are used for giving commands. After the recorded video we can see in monitor with VLC media player.
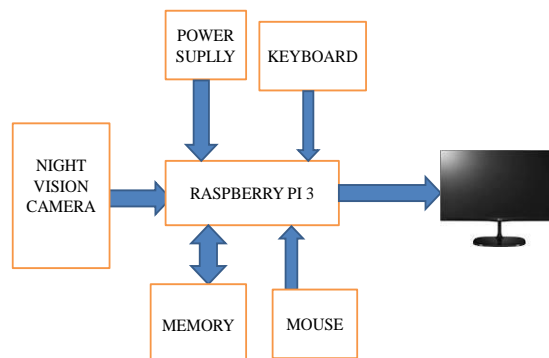

Figure.5. Block Diagram

The proposed system uses Raspberry Pi 3 board and USB camera module as primary components in system execution. Raspberry Pi uses Raspbian Operating system is programmed in python, which is High-Level Object Oriented programming language that allows to connecting the Raspberry Pi to the real world.

A proper micro SD card is given a proper format and using SD formater and setup with latest Raspbian OS setup. To do So, the Raspbian OS is downloaded from Raspberry Pi's official website.

The micro SD card,containing Raspbian OS is then connected to Rasberry pi system. The Raspberry Pi is now plugged into a monitor via HDMI cable and the Keyboard and Mouse are plugged into the Raspberry Pi these are used for input devices.After proper connection power on using Micro USB 5V@2A power Supply Once the raspberry pi OS is installed, the initial boot completes.

Figure.6. project kit

After setting up of Raspberry Pi by connecting Wi-Fi , OpenCV is installed on Raspberry Pi. by installing all dependencies and image video I/O packages and and python 2.7 and Python 3.0 on Raspberry pi . After installing OpenCV, compile the python code for motion detection and recording then video will be save in external hard drive when the object is detected.
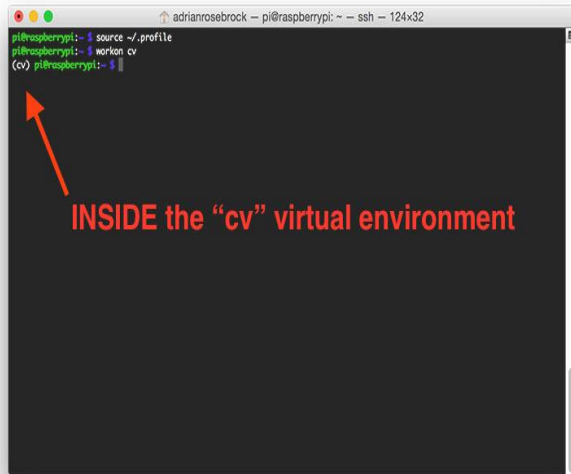

Figure.7. CV window

5. OPERATION OF THE PROPOSED SYSTEM

After installing the system into the required location, Switch on the power supply. As power is on, the raspberry pi will boot which takes a while. Once the booting is done, run the program file.As the python program is for motion detection, the recording will start as any movement is detected. As it detects any moving object, the recording will start and we will get notified about it as shown in figure 12.This recording will be saved on to the hard drive connected to the system and can be on the computer.

6. RESULTS

The Raspberry Pi board is interfaced with Camera, Keyboard, Mouse as input and with external hard drive and monitor for displaying recorded video.
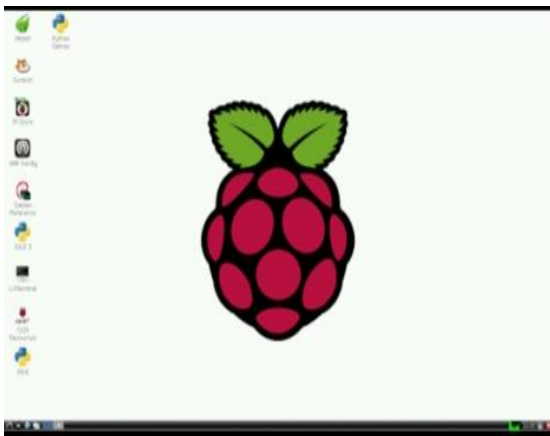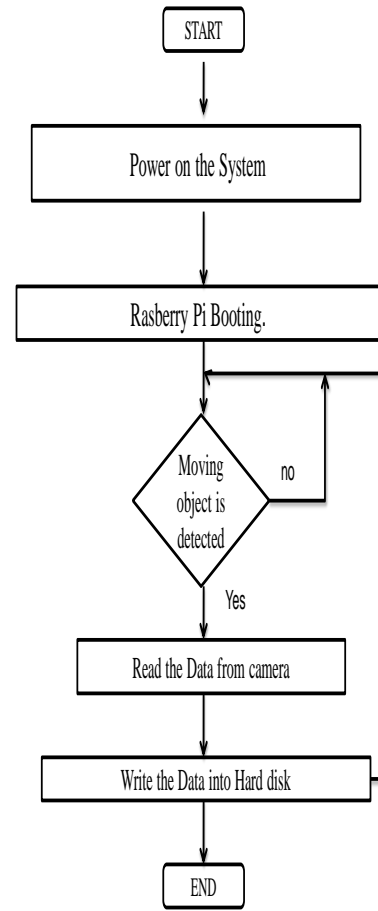

Figure 8: Raspberry PI page

Figure.9. Flow Chart

The proposed system is controlled by Raspberry Pi. The above figure shows Raspberry Pi desktop.
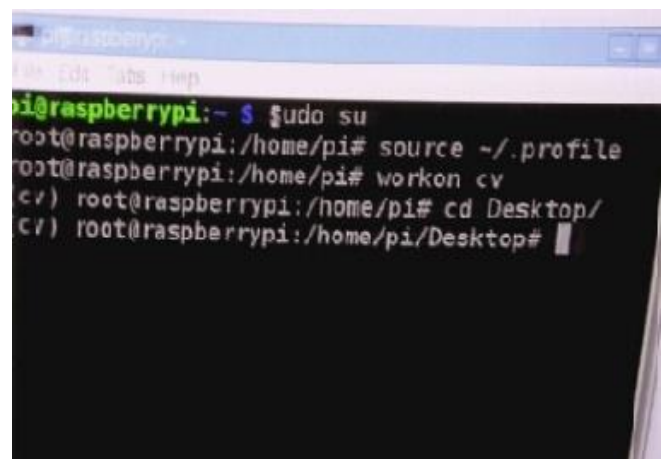

Figure.10. Open new terminal enter the above commands to get Work on CV

Figure.11. after getting Workon CV then enter the path of program and execute it

Figure.12. video recording when object is detecting and saved into external hard drive while running the code

Figure.13. Recorded video is playing on VLC media player by connecting external hard drive to system

7. CONCLUSION

The proposed system "LOW COST HD VIDEO SURVEILLANCE AND RECORDING SYSTEM USING RASPBERRY PI" is designed and tested fruitfully ,using all the features of hardware components used to developed it. All the hardware components are placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented. It can be used in commercial spaces, schools, hospitals, as well as in the Military for security purposes, As we have seen the areas where it can be used, so it will surely help the society..

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5. Robust andSensitive Video Motion Detection for Sleep Analysis. Biomedical andHealth Informatics, Adrienne Heinrich, Dmitry Znamenskiy, Jelte Peter Vink IEEE Jour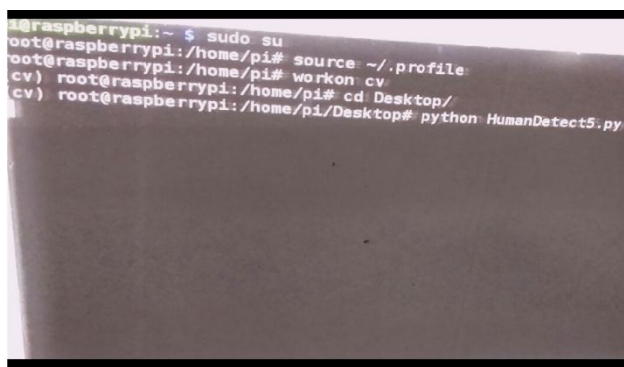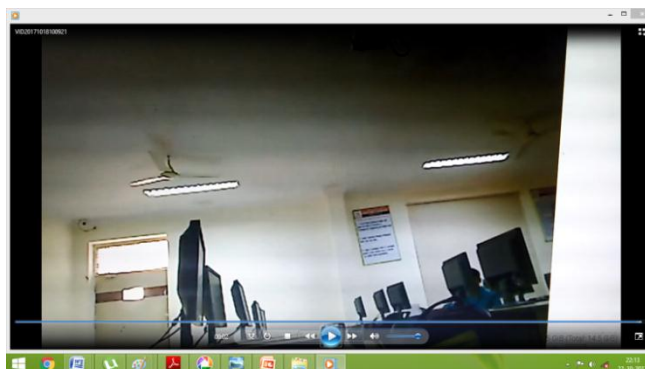nal of (Volume:18 , Issue: 3) , 2168-2194,20 September 2013.