International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 4 Issue 03, March-2015

Web Surveillance System using Raspberry PI

M. Manoher Rao[1]
M.Tech, Assistant Professor in
Electronics and Communication Engineering
KG Reddy College of Engineering and Technology,
Hyderabad, India

M. N. Narsaiah[2]
M.Tech , (Ph.D), Associate Professor in
Electronics and Communication Engineering
KG Reddy College of Engineering and Technology,
Hyderabad, India

N. Swetha Reddy [3]
B.Tech, (M.Tech) , Teaching Assistant in
Electronics and Communication Engineering
KG Reddy College of Engineering and Technology,
Hyderabad, India

***Abstract*— The aim of this project is to develop a web surveillance system using a RASPBERRY PI port, which basically is an equivalent replacement to small sized CPU of a computer. The camera module is capable of shooting high definition videos like 720p and 1080p resolutions. So wherever the system is installed camera shoots the video in the vicinity of the camera. The output can be checked with the help of the IP address obtained by the raspberry pi..Normal web browsers like Google chrome and Mozilla Firefox are used to check the output. The given IP address is used as a web address to check the output .If the system is connected to the server the output is streamed anywhere in the world. if you are travelling the output can be checked with the help of the mobile by using Google chrome and Mozilla Firefox application.**

Keywords*— *Raspberry pi,pi camera module,Raspbian

I.INTRODUCTION

Generally a basic web surveillence camera costs around 1000$ and high power consumptive,because to stream the surveillance video we need a PC the power comsumption of general PC is around 62-250 watts where as the raspberry pi is minicomputer which is capable of streaming video and processing images for the surveillance ,because the ARM1176 is media processor which does the work without any hassle.The power consumption of raspberry pi is around 3.5 watts which is very low power consumptive system and whole system of web surveillance costs around 150$,so the system is cost effective .since the system is minicomputer various other home automotive system applications can be developed under the same system.so developing various applications for domestic and industrial purposes at low cost and low power consumption with raspberry pi made us select the challenging project.

II.WORKING PRINCIPLE

This project is basically to build a cost effective and low power consumption web surveillance system. In this application we can check the video of the surveillance under the vicinity of the camera and can be streamed to anywhere in the world with the help of a web server or can stream video under local area network. The surveillance can be checked in the web browser with the help of a particular IP address provided by the system.

Also this system can take a photo with time and date if any movement or intruder enters into the vicinity of camera. This photo taking feature is additional feature and this photo is stored in the system.

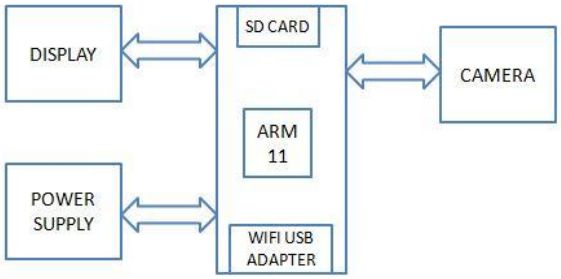


Figure 1.Block diagram of Web Surveillance System

The figure above shows the block diagram of web surveillance system. It consists of Raspberry pi board, PI camera module and display. The power supply for the raspberry pi requires 5V, 500ma.

The camera is a small PCB that connects to the CSI-2 camera port on the raspberry pi using a short ribbon cable .It provides connectivity for a camera capable of capturing still images or video recording. The camera connects to the image system pipeline (lsp) in the raspberry pi's soc where the incoming camera data is processed and eventually converted to an image or video on the SD card.

III.HARDWARE REQURIEMENTS

A.Raspberry Pi

The Raspberry Pi is rapidly becoming a worldwide phenomenon. People are waking up to the possibility of a $35(U.S).computer that can be put to use in all sorts of settings from a desktop workstation to a media centre to a controller for a home automation system.

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi

Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14 RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage.

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language with support for BBC BASIC C, Java and Perl.

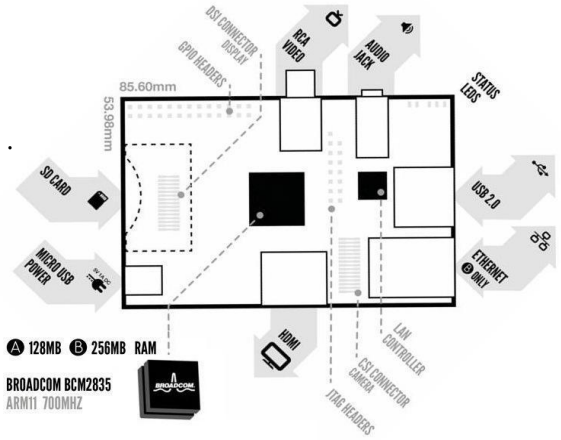


Figure 2. Architecture of Raspberry Pi

You can use the diagram to connect everything together,
Or use the following instructions:

i) Plug the preloaded SD Card into the Pi.
ii) Plug the USB keyboard and mouse into the Pi, perhaps via a USB Hub. Connect the Hub to power, if necessary.
iii) Plug the video cable into the screen and into the Pi.
iv) Plug your extras into the Pi (USB Wi-Fi, Ethernet cable, hard drive etc.). This is where you may really need a USB Hub.
v) Ensure that your USB Hub and screen are working.
vi) Plug the power source into the main socket.
vii) With your screen on, plug the other end of the Power source into the Pi.
viii) The Pi should boot up and display messages on the screen.
ix) It is always recommended to connect the Micro USB Power to the unit last. The Raspberry PI may take a long time to boot when Powered-on for the first time, so be patient.

a. ARM1176JZF-S PROCESSOR

The ARM1176JZF-S processor incorporates an integer core that implements the ARM11 ARM architecture v6.It supports the ARM and Thumb instruction sets, Jazelle technology to enable direct execution of java byte codes, and arrange of SIMD DSP instructions that operate on 16-bit or 8-bit data values in 32-bit registers.

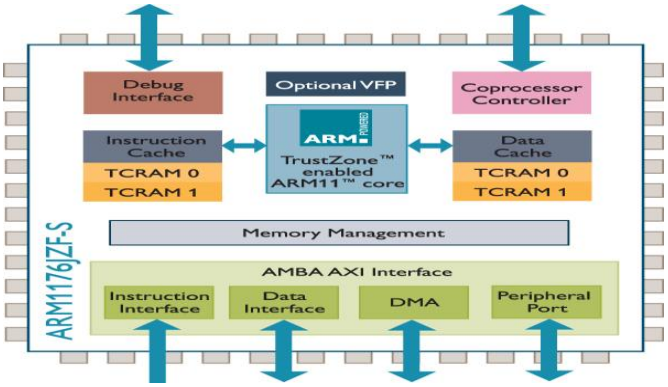


Figure 3.Architecture of ARM1176JZF-S processor

The ARM1176 application processor deployed broadly in devices ranging from smart phones to digital TV's to electronic readers, delivering media and browser performance, a secure computing environment and Performance up to 1 GHz in the lowcost designs. The ARM1176JZ-S processor features ARM trust zone technology for secure applications and Arm Jazelle technology for efficient embedded java execution.

a.1. FEATURES

- Trust Zone security extensions
- Provision for intelligent energy management(IEM)
- High-speed advanced microprocessor bus architecture (AMBA) advanced Extensible interface (AXI) level two interfaces supporting prioritized multiprocessor implementations.
- An integer core with integral Embedded ICE-RT logic
- An eight-stage pipeline
- Branch prediction with return stack
- Low interrupt latency configuration
- Internal coprocessor CP14 and CP15
- Vector Floating –point (VFP) coprocessor support
- External coprocessor interface
- Instruction and data memory management units(MMUs),managed using Microtel structure backed by a unified mainTLB
- Instruction and data caches, including a non-blocking data cache with Hit-under-Miss.
- Virtually indexed and physically addressed caches
- 64-bit interface to both caches
- Level one Tightly-coupled memory (TCM) that you can use as a local RAM with DMA
- Trace support
- JTAG-based debug.

b. SD CARD

Secure Digital (SD) is a non-volatile memory card format foruse in portable devices, such as mobile phones, digital cameras, GPS navigation devices, and tablets computers. Micro SD is a kind of removable flash memory card used for storing information .SD is an abbreviation of Secure Digital. They are also used in newer types of handheld GPS devices, portable media players, digital audio players, expandable drivers, Nintendo flashcards, and digital cameras Raspberry Pi Camera Board.

B. PI CAMERA BOARD

The Raspberry Pi Camera Board is a custom designed add –on for Raspberry Pi. It attaches to raspberry Pi by way of one of the small sockets on the board upper surface This interface uses the dedicate CSI interface, designed especially for interfacing the cameras. This 5mp camera module is capable of 1080p video and still images and connects directly to your raspberry Pi. Connect the included ribbon cable to the CSI (camera Serial Interface) port on your Raspberry Pi, boot up the latest version of Raspbain.

The board itself is tiny ,at around 25mmx 20mmx 9mm and weighing in at just over 3g, making it perfect for mobile or other applications where size and weight are important. The sensor has native resolution of 5 megapixels, and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592x 1944pixel static images, and also supports 1080p30,720p60 and 640x480p60/90 video.

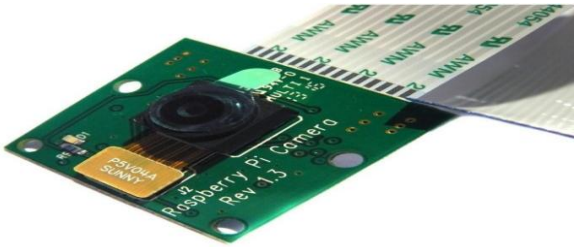


Figure 4. Camera Board

The sensor itself has a native resolution of 5 megapixels, and has a fixed focus lens on board. In terms of still images, the camera is capable of 2592x 1944 pixel static images, and also supports 1080p30, 720p60 and 640 x480p60/90 video. The Camera is supported in the latest version of Raspbian, raspberry Pi's preferred operating system.

The camera board attaches to the raspberry Pi via a 15-wayribbon cable. There are only two connections to make: the ribbon cable need to be attached to the camera PCB and the Raspberry Pi itself. You need to get it the right way round, or the camera will not work. On the camera PCB,the blue backing on the cable should be facing away from the PCB,and on the Raspberry Pi it should be Facing towards the Ethernet Connection.

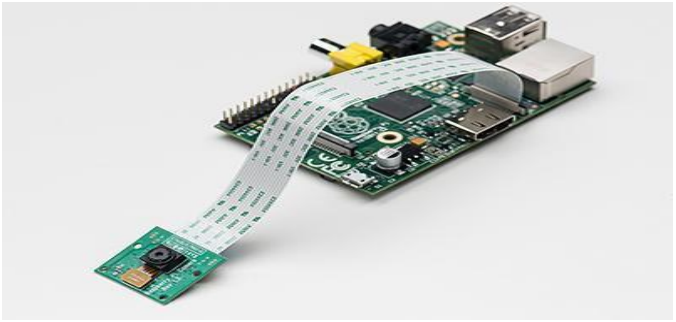


Figure 5. Camera Board connected to Raspberry Pi.

The flex cable inserts into the connector situated between the Ethernet and HDMI ports, with the silver connectors facing the HDMI port. The flex cable connectors should be opened by pulling the tabs on the top of the connector upwards then towards the Ethernet port. The Flex cable should be inserted firmly into the connectors, with acre taken not to bend the flex at too acute an angle. The top part of the connector should then be pushed towards the HDMI connector and down, while the flex cable is held in place. The camera may come with a
small piece of Translucent blue plastic film covering the lens. This is only present to protect the lens while it is being mailed to you, and needs to be removed by gently peeling it off.

There are three applications provided: raspstill, raspivid and raspistillyuv. Both raspstill and raspistillyuv are very similar and are intended for capturing images, while raspivid is for capturing video.All the applications are command-line driven, written to take advantage of the mmal API which runs over OpenMAX. The mmal API provides an easier to use system than that presented by OpenMAX. Note that mmal is a Broadcom specific API used only on Videocore 4 systems.The application use up to four OpenMAX(mmal) components–camera,preview,encoder and null_sink.all applications use the camera component raspstill uses the image encode component,raspivid uses the video encode component and raspistillyuv does not use an encoder and sends its YUV or RGB output direct from camera component to file. The preview display is optional, but can be used full screen or directed to a specific rectangular area on the display. If preview is disable, the null sink component is used they are used for calculating exposure and white balance settings.

IV SOFTWARE DESIGN

The software for the development of this project uses python scripting and it uses RASPBIAN Which is raspberry pi's preferred operating system.

A. RASPBIAN

Raspbian is an unofficial port of Debian wheezy armhf with compilation settings adjusted to produce code that uses "hardware floating point", the "hard float" ABI and will run on the Raspberry Pi. The port is necessary because the official Debian wheezy armhf release is compatible only with versions of the ARM architecture later than the one used on the Raspberry Pi.The Debian squeeze image issued by the Raspberry Pi foundation was based on debian armel which

uses software floating point and the "soft float" ABI. The foundation used the existing Debian port for less capable ARM devices. Therefore, it did not use of the Pi's processor's floating point hardware reducing the Pi's performance during floating point intensive applications or the advanced instructions of the ARMv6 CPU.

B.PYTHON INTODUCTION

Python is a high level general purpose programming language:

- Because automatically compiled to byte code and code is executed, Python is suitable for use as a scrip ting language,webapplicationimplementation language etc.
- Because Python can be extended in C and C++, Python can provide the speed needed for even compute intensive tasks.
- Because of its strong structuring constructs and its consistent use of objects and object-oriented programming. Python enables us to write clear , logical applications for small and large tasks.

V.APPLICATIONS AND AVANTAGES

A. APPLICATIONS:

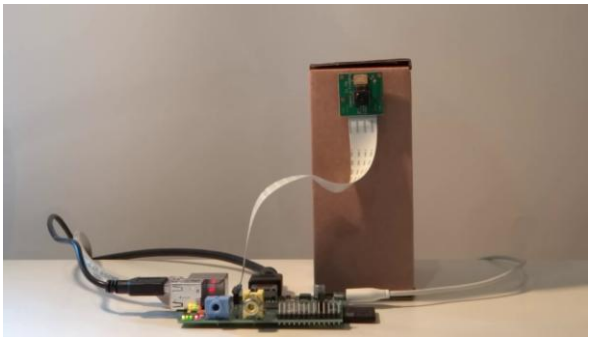
i) Home automation system.
ii) Home security system.
iii) HD surveillance camera's
iv) Media center

B. *ADVANTAGES:*

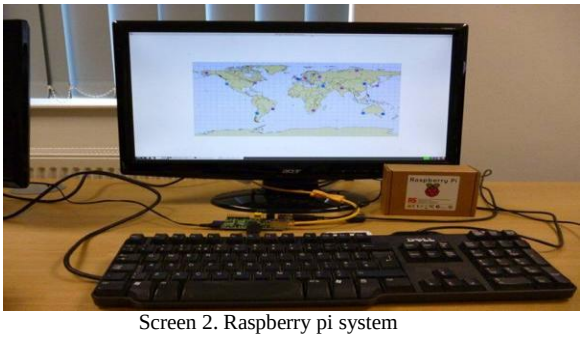
i) Check video on go.
ii) Quick easy & in expensive installation.
iii) Intruder awakening alarms.
iv) Low power consumption.
v) World wide applications.
vi) Applicable to any area.

VI. RESULTS

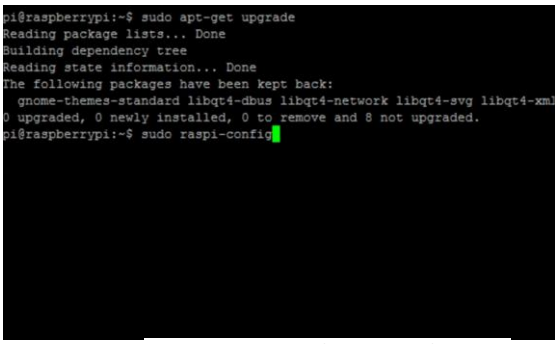
A.*OUTPUT SCREENS:*



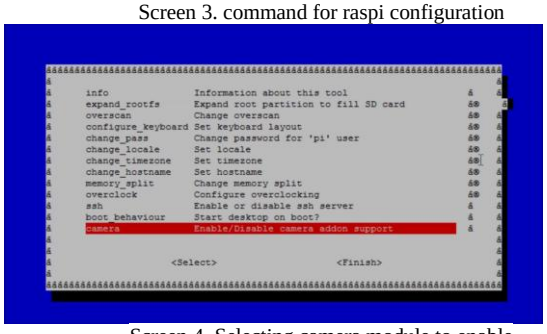
Screen 1. web surveillance camera using raspberry pi



Screen 2. Raspberry pi system



Screen 3. command for raspi configuration



Screen 4. Selecting camera module to enable

Screen 5. Rebooting the system

C. RESULT ANALYSIS:

This project is basically to build a cost effective and low power consumptive web surveillance system. This system has very good efficiency since raspberry pi itself a micro computing system, the camera module is capable of shooting high definition videos like 720p and 1080p resolutions. So where ever the system is installed camera shoots the video in the vicinity of the camera. the output can be checked with help of the ip address obtained by the raspberry pi. Normal web browsers like google chrome and Mozilla firefox are used to check the output.

The surveillance output can be checked in any system if it is connected to the local area network connection. The given ip address is used as a web address to check the output. If the system is a connected to the server the output is streamed anywhere in the world. The output can be checked with the help of the system connected to the internet connection. If you are travelling the output can be checked with the help of the mobile by using Google chrome and Mozilla Firefox applications.

The system has ability such that it can capture the photo of the intruder in the vicinity of the camera. The photo has the additional details like time and date of the intruder comes into the area of the vicinity of camera.

VII. CONCLUSION

Web based surveillance camera using raspberry pi is low power consumptive system, which is easy to install and cost effective. A general web based surveillance system basically costs around $1000 or more than that. But using raspberry pi board total system costs around $120 which can stream same quality images and videos for security purposes.

This web surveillance camera using surveillance camera can be used for domestic and industrial applications.

REFERENCES

[1] Matt richardson,Shawn Wallace,"Getting started with Raspberry Pi",december 2012.
[2] Eben upton and Gerath Halfacree,"Raspberry Pi user guide".
[3] Simon Monk."Programming the Raspberry Pi:Getting started with python paper back-import",january 2013.
[4] http://www.raspberrypi.org
[5] http://www.openrelief.org
[6] http://www.theregister.co.uk/2012/06/12/raspberry_pi_drone
[7] http://www.zdnet.com/raspberry-pi-designer-hints-at-furture
[8] http://www.janbierens.com/2012/05/22/rasoberry-pi-and-the-future.