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# REAL TIME VIDEO SURVEILLANCE SYSTEM BASED ON EMBEDDED WEB SERVER RASPBERRY PI B+ BOARD

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**Abstract**— In this paper live video streaming is designed. As technology is growing day by day, it's a revolutionary step towards video surveillance system by means of which one can monitor the entire system remotely on real time basis using embedded web server and Raspberry Pi B+ board. An USB camera is being used to capture the data from the remote location and then using mjpg streamer algorithm these captured data is transmitted over internet using embedded web server and Raspberry Pi B+ board on the TCP/IP based network. As live streaming operation was needed, mjpg streamer algorithm is implemented by means of which live streaming data is converted into different frames and then these frames are transmitted via the internet using Raspberry Pi B+ board. Mjpg streamer algorithm can be used to stream JPEG files over an IP-based network from the webcam to a viewer like Firefox, Cambozola, Videolan client or even to a Windows Mobile device running the TCPMP-Player. This entire system is based on LINUX- Raspbian OS, so entire system is designed in CGI (Common Gateway Interface) script. CGI programs are the most common way for Web servers to interact dynamically with users. Broadcom BCM2835 SoC (System on Chip) chip as processor ARM 11 is a core of the whole system.

**Index Terms**— Raspberry Pi B+ Board; Broadcom BCM2835 SoC (System on Chip); ARM 11 Processor;USB Camera; LINUX- Raspbian; RTOS; mjpg streamer algorithm; Wi- Fi Modem; Video surveillance; CGI (Common Gateway Interface).

## 1 INTRODUCTION

Live video streaming systems play very important role in many different fields like military exploration and surveillance purposes, search and rescue purpose, security purpose etc. In this systems USB camera, Raspberry Pi B+ board, Wi-Fi modem and a PC is used for the real time video monitoring. In this live streaming system mjpg streamer algorithm is used as real time operation is needed. By means of mjpg streamer algorithm, live streaming from camera is converted into different frames and then each one is transmitted through the Raspberry Pi B+ board to the web server. Here we used LINUX based Raspbian operating system, so interface between USB camera and Pi board is in CGI (Common Gateway Interface) script. Here BOA web server is used to display real time video from USB camera to the client side. First, video data is captured from camera and then using mjpg streamer algorithm and Pi Board, it is transmitted to the web server. Here video surveillance from the remote place to the web server is done only within the time delay of few microseconds. Entire video monitoring of the system is under the control of Broadcom BMC 2853.

## 2 HARDWARE DESIGN

The entire system consists of a USB camera, ARM 11 processor boards and a Wi-Fi modem. Using the web server application written in CGI script and html, we had interfaced the server IP and developed a GUI to monitor the video streaming on the PC or on to mobile phone remotely. The preceding and existing live streaming system which entails high end cameras, video servers, network switch and monitoring PC all these resources leads to complexity, expensive, high power consumption, distance limitation, real time operation and also requires more area to establish. In order to overcome the hitch in the preceding and existing system, we present a proficient where it uses few hardware resources for the implementation of the live video streaming system. Raspberry Pi B+ board is a credit-card sized computer that plugs into your TV and a keyboard. It is a capable little computer that your desktop PC does. Embedded Linux is chosen as operating system which provides open-source, multi-task, multi-process, highly modular, multi-platform support, performance and stability to the system.

### 2.1 PROPOSED BLOCK DIAGRAM

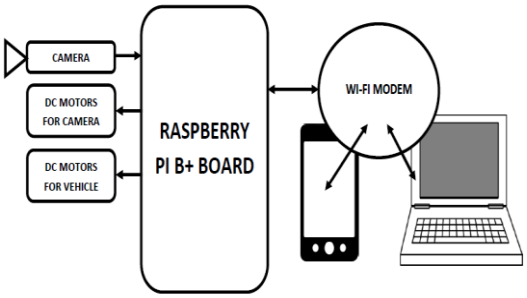


Figure 1: Proposed Block Diagram of System

## 2.2 HARDWARE COMPONENTS

### 2.2.1 RASPBERRY PI B+ BOARD

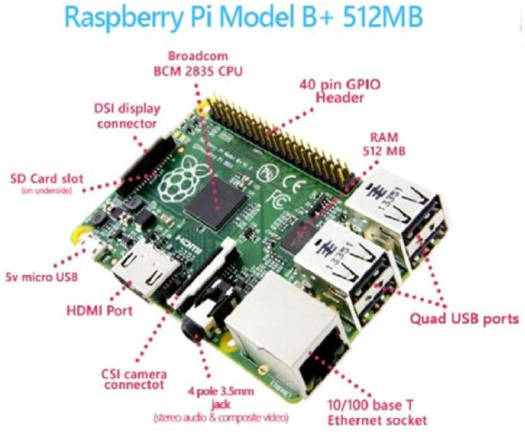


Figure 2: Raspberry Pi B+ Board

The Raspberry Pi is a credit-card sized computer that plugs into your TV and a keyboard. It is a capable little computer which can be used in electronics projects, and for many of the things that your desktop PC does, like spreadsheets, word-processing and games. It also plays high-definition video.

Specifications:

Chip: Broadcom BCM2835 SoC
Core: Architecture ARM11
CPU: 700 MHz Low Power ARM1176JZFS
Memory: 512MB SDRAM
Operating System: Boots from Micro SD card,
running a version of the Linux operating system
Dimensions: 85 x 56 x 17mm
Power: Micro USB socket 5V, 2A
USB: 4 x USB 2.0 Connector
Ethernet: 10/100 BaseT Ethernet socket
GPIO Connector: 40-pin
Camera Connector 15-pin MIPI Camera Serial Interface (CSI-2)
Memory Card Slot: SDIO

### 2.2.2 USB CAMERA-MICROSOFT VX 800

Figure 3: Front view of USB Camera Microsoft VX 800

The LifeCam VX-800 Webcam (Black) from Microsoft is a no-nonsense webcam for use with Windows computer systems. The USB camera features VGA (640 x 480) resolution and a built-in mic for audio.

### a. 2.2.4 WI-FI MODEM - EDUP EP-N8531


Figure 4: Front view of EDUP EP-N8531

Wireless N USB Adapter EP-N8531 allows you to connect a desktop or notebook computer to a wireless network and access high-speed internet connection. Comply with IEEE 802.11n, they provide wireless speed up to 150Mbps, which is beneficial for the online gaming or even HD video streaming.

## 3 SOFTWARE TOOLS

### 3.1 RASPBIAN OS

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. Raspbian OS is the default Linux OS.

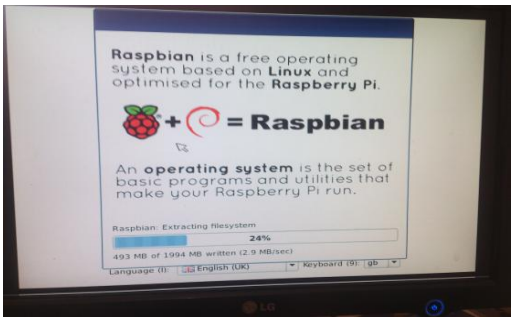


Figure 5: Raspbian OS Instantiation

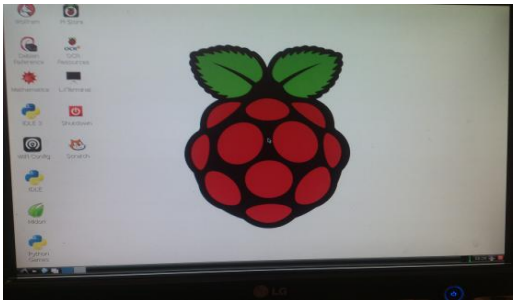

Figure 6: Raspbian OS Desktop

### 3.2 FLOW CHART

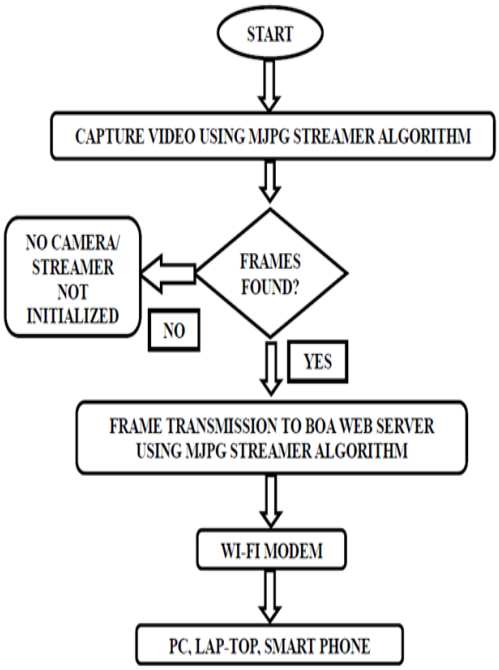


Figure 7: Flow Chart of system

## 3.3 MJPG STREAMER ALGORITHM

MJPG-streamer", is a command line application that copied JPG-frame from a single input plug-in to multiple outputs plug-in It can be used to stream JPEG files over an IP-based network from the webcam to a viewer like Firefox, Cambozola, and Video lan client or even to a Windows Mobile device running the TCPMP-Player [1] Basic command for live video streaming is sudo ./mjpg_streamer **4**i "./input_uvc.so" -o "./output_http.so -w ./www". The input module "input_uvc.so" captures such JPG frames from a connected webcam. "output_http.so" provide output path.

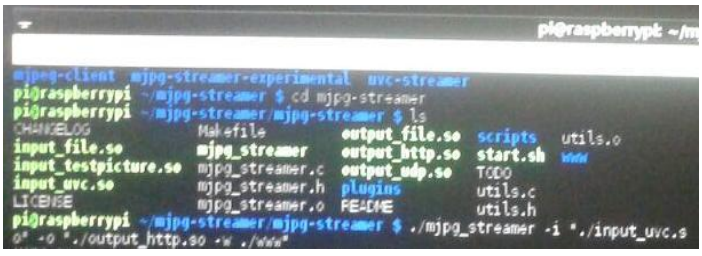


Figure 8: MJPG streamer Installation command

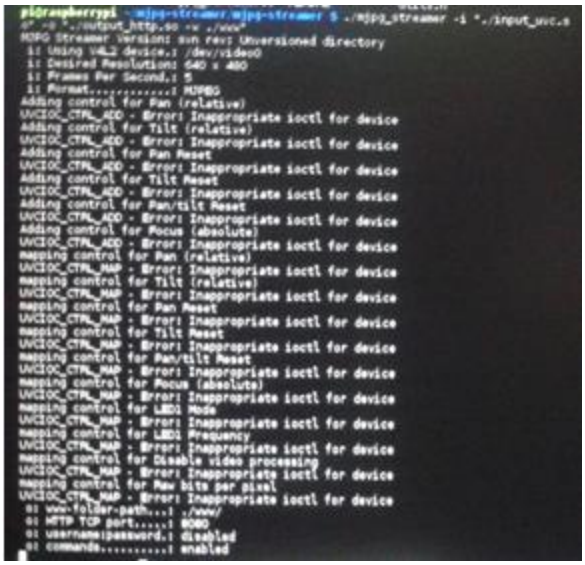

Figure 9: MJPG streamer Compilation

## 3.4 BOA WEB SERVER

Boa is an open-source, small-footprint web server that is suitable for embedded applications. Boa is a single-tasking HTTP server. That means that unlike traditional web servers, it does not fork for each incoming connection, nor does it fork many copies of itself to handle multiple connection. (Saleem Jaffar, Anand Kumar Agarwal, 2014) It internally multiplexes all of the ongoing HTTP connections, and forks only for CGI programs (which must be separate processes).

## 4 RESULTS AND DISCUSSION

Here are some images of the screen shots of this system which got after successful execution of the entire system. This system works efficiently with the lowest time delay about few microseconds. This is because of mjpg streamer algorithm and BOA web server. The processed stream data packets are uploaded into server using TCP/IP protocol and transmitted through wireless device so that user input the corresponding IP- address and then the webpage is opened and the output video is streaming as shown in below Figure 10

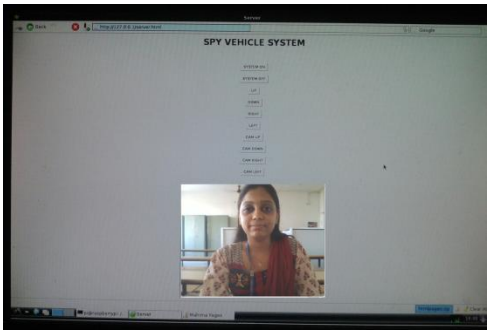


Figure 10: Real time live video surveillance

## 5 CONCLUSION AND FUTURE IDEAS

Real time video surveillance system based on embedded web server and Raspberry Pi board has been introduced in this paper. The embedded web streaming server is based on the ARM Raspbian Operating System. It succeeds in network video monitoring. The system has low-cost, good openness and portability and is easy to maintain and upgrade. It provides remote monitoring facilities and some characteristic properties are illustrated to be useful in the various applications like security in banking, industry environment, in military etc. The system performance has been explained in relation to the response speed of captured video display at the client, transferred video display at the controlling person. With our surveillance system not only remote monitoring but also by minimum time delay in the operation, controlling action will be taking place in lesser span. Thus this application system provides better security solutions. In future, we can be attached different sensors and more features in this system by using Raspberry Pi B+ board.

## 6 ACKNOWLEDGMENT

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