ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 4, Issue 7, July 2015

Raspberry pi Based Smart Supervisor using Internet of Things (IoT)

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***Abstract*— Smart supervisor system using internet things is based on embedded Linux operating system with ARM11 architecture, this paper implemented in a real-time digital video monitoring system with data control and acquisition. Based on the ARM - Linux embedded platform, the real-time video monitoring system fulfills the following functions: to collect video with USB camera, to encode video based on ARM - Linux platform; to transmit video through LAN or internet; to receive, to decode, and to display the H.264 video data in real-time. In order to fulfill the functions above, the chipset BCM2835 from Broadcom is chosen as MCU which has powerful ARM11 application. They are collect and encode video, device operation at a time it is necessary to apply multiple threads to real-time video monitoring system to ensure its real-time performance. The real-time embedded video monitoring system sends video in child thread captures video and encodes it in main thread, and they interact through a circular buffer queue in order to reduce influence between data sending and encoding.**

***Index terms* -USB cameras, PIR sensor, Temperature sensor, Humidity sensor, Router, DC motor, ADC MCP 3208, Raspberry Pi, Relay**

I. INTRODUCTION

Raspberry pi is a credit- card sized computer .It functions almost as a computer. There are various surveillance systems such as camera, CCTV etc., In these types of surveillance systems, the person who is stationary and is located in that particular area can only view what is happening in that place .Whereas, here, even if the user is moving from one place to another. The main advantage is used in security purpose and another advantage that it offers privacy on both sides since it is being viewed by only one person .The other major advantage is that it is a simple circuit .the operating system used here is Raspbian OS.

Temperature and Humidity and Human motion are one of the most frequently observed parameters, and are extremely harmful at temperature and humidity and PIR values for a long times. So proposed system capable to monitoring these values indefinitely without any delay and without putting any harm's way. Our proposed system is implemented on Raspberry Pi and interfaced with four two sensors and with controlling the device also live video streaming is implemented for quick actions.

Mobile video surveillance system has been envisioned in the literature as either classical video streaming with an extension over wire and wireless network system to control the human operator [2]. Remote monitor has become an important maintenance method that is based on the network. There are two units Raspberry Pi Unit and Process unit with wireless link between them. Process unit will send sensor reading to Raspberry Pi Unit which will be uploaded to the server. The USB camera will be connected to ARM11 controller.

II. METHOD

The smart supervisor system is developed in this study of next generation smart supervisor using ARM11. They are observing device operation such as, human motion, temperature & video capture. In above Figure 1 shows the smart supervisor system architecture, When Raspberry Pi B+ model, ARM 11 Processor are used to control this system create two IP address one is to control the device operation & other is video streaming.

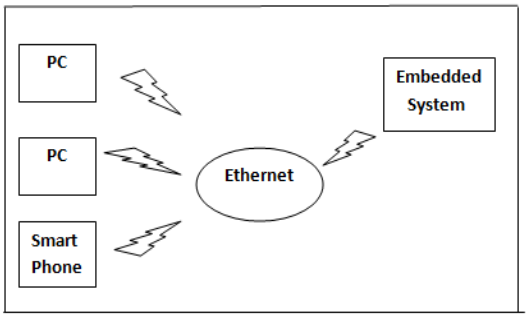

Figure 1.Concept of System Architecture

The smart Supervisor system connected between the Android phone and Wi-Fi.

II. BLOCK DIAGRAM

A. Hardware

The Block diagram of the proposed system consists of Android smart phone, laptop and various sensors like PIR sensor, Humidity sensor, Temperature sensor ,ADC MCP 3208,Raspberry Pi board(Model B+) and Router (smart Wi-Fi). Raspberry Pi model B+ is connected to the USB camera (2 Megapixels) with the help of USB port .In the PC,

Manuscript received July 1, 2015.
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Raspbian operating system is installed. Raspberry-pi works only on Raspbian Linux operating system

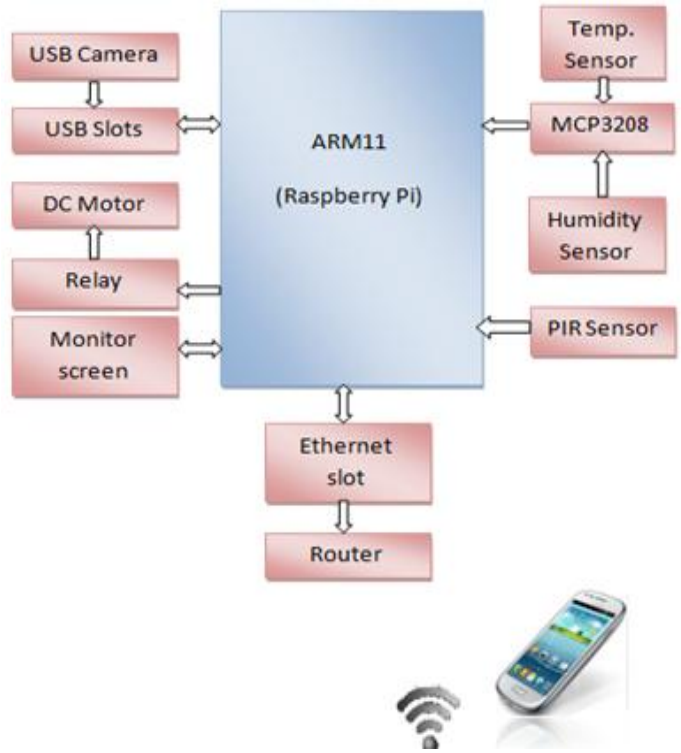

Figure 2: Block diagram of proposed system

The_Block diagram of proposed system the various components are given below:

B. USB Camera:

USB Camera captures the image and sends it to the USB port of the Raspberry Pi board. The camera model used here is USB Camera model 2.0 Megapixels.

C. Raspberry Pi: Raspberry pi is a small credit-card sized computer capable of performing various functionalities such as in surveillance systems, military application, industrial application, Home application etc. The various functionalities of the components are given below the various components of Raspberry- Pi Model B+ is:

• SD Card Slot is used to install OS/booting/long term storage .The total memory of the SD card is about 8GB.

• Micro USB Power Port provides 700mA at 5A.

• RCA Video Out is connected to display if HDMI output is not used. It is mainly used to carry audio and video signals. They are otherwise called as A/V jacks.

• Audio Out Digital audio is obtained if HDMI is used to obtain stereo audio. Here analogue RCA connection is used

. • Ethernet Port is used to connect to the Internet. It also plays important role in updating, and getting new software easier.

• HDMI OUT (High Definition Multimedia Interface) is used with HDTVs and monitors with HDMI input.

Also HDMI-HDMI is used here.

• BROADCOM BCM 2835: It is otherwise defined as System on chip .It is a 700 MHz Processor. It has a Video core IV GPU.

• GPIO 40 pin interface allows us to control and interact with real world.

D. Web server

The primary role of web servers is to access through the internet to the client and delivers the report of web-page. Hypertext Transfer Protocol (HTTP) is the protocol that helps in the communication between client and server. HTML documents deliver are most frequently they are include documents, videos with add to text format. Apache and Lighted are the most favored web server applications for Raspberry Pi.

E. Live Video Streaming

Fig 3 shows the Live Video streaming is an integral part of this project as it serves as the means by which the user can monitor the robotic

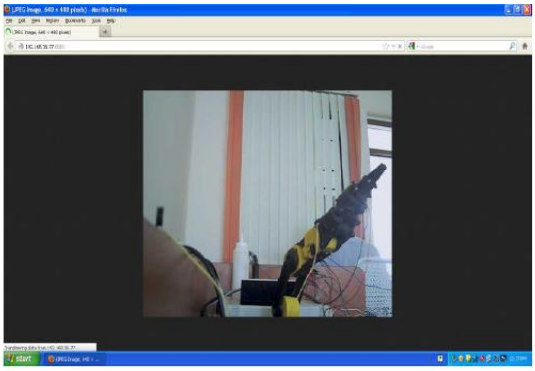

Figure 3 Live Video Streaming

From a remote end, otherwise the user has no other way to determine whether the arm is moving or not, otherwise he is present at the local site where the arm is present. The live video streaming is shown in the Figure 2. The video is out the port 81 and can be viewed from any browser by providing the IP address in the address bar of the client browser.

F. Steps to install raspbian OS

In order to install Raspbian OS, first next out of box software (NOOBS) has to be installed.

1. First step is to allocate the drive for installing OS
2. SD adaptor can also be used for this purpose
3. Download WINDISK 32 utility from source forge project which is a zip file
4. Extract and run the zip file
5. Select the file and click run as administrator

6. Select the image file
7. Select the SD card in the device box with drive letter
8. Click writes and waits for write process to complete
9. Exit the image and eject the SD card

G.Algorithm for video streaming

- START
- Initialize the camera device
- Initialize HTTP port to 8080
- Accept the web request
- Read frames from camera
- Send video frames to web page
- Stop

H.Flowchart for video streaming

In the Figure3.2 shows the typical sequence to access the smart supervisor system micro web server, the user has to enter the IP address.

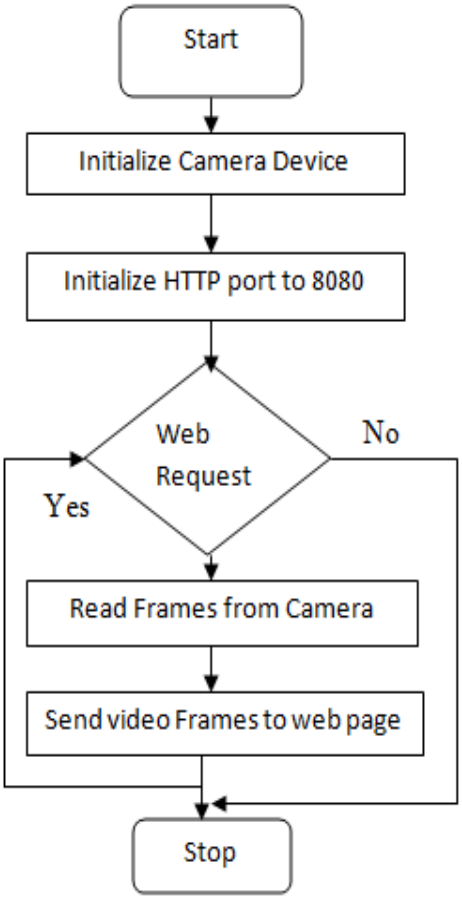

Figure 3.1 Flow chart for Video streaming operation

I. Algorithm for Device operation

- System ON
- Start
- Display the temperature
- Display the humidity
- Display the PIR to detect the human motion/Normal
- Web request the motor ON/OFF
- The condition for web request no then system again starts.

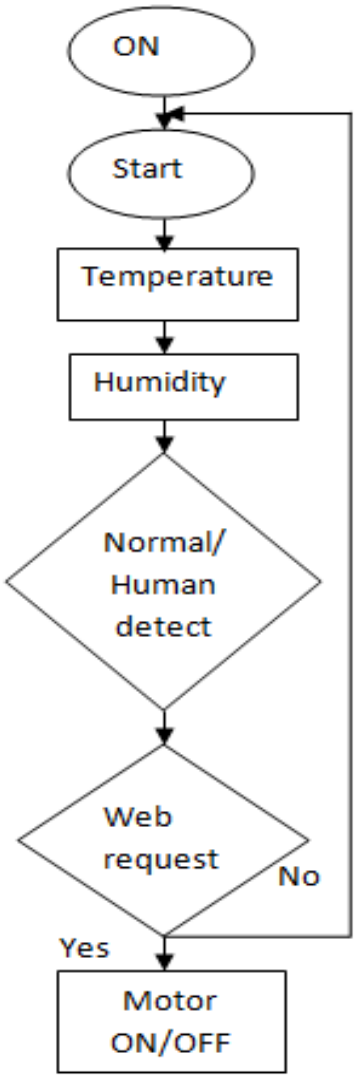

Figure 3.2 Flow Chart for Device Operation

IV RESULT AND DISCUSSION

The smart supervisor system proposed in this paper was fully developed and tested to demonstrate its feasibility and effectiveness. The screenshots of the smart supervisor app developed has been presented in Figure 4.1 As mentioned; authentication is required to access the smart supervisor system. Figure 4.1 (a) shows the smart supervisor system displaying that a temperature sensor, PIR sensor & Humidity sensor value. This message is based on the response received from the smart supervisor system server & Smart phone. If correct IP address is provided, the app then proceeds to display the various device operations as shown in Figure 4 (a) & video streaming operations as shown in Figure 4 (b)

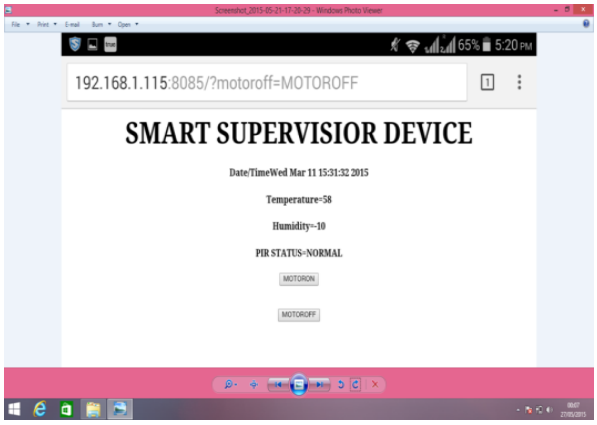

Figure 4 (a) Screenshots of the proposed smart supervisor system app: Device operations

Figure 4. (b) Screenshots of the proposed smart supervisor system app: Video streaming operation.

V.CONCLUSION

Thus we have designed a smart supervisor system capable of capturing video/image and device operation like temperature, human motion, motor on/off transmitting to a smart phone/tablet. It is advantageous as it offers reliability and privacy on both sides. It is authenticated on the receiver side, hence it offers only the person concerned to view the details .Necessary action can be taken in short span of time in the case of emergency conditions such as elderly person enter the restricted area, military areas, smart home system, offices, industries, railway station, Banks etc., Future work is to locate the number of persons located exactly on that area and their position so that accurate information can be obtained on the receiver side.

ACKNOWLEGEMENT

It gives me a great pleasure to submit this project report on "***Raspberry pi Based Smart Supervisor using Internet of Things (*IoT)"**.This is only page where I have the opportunity to express my emotions and gratitude from the bottom of my heart. Behind every success, there is a hidden resource, the power of which is beyond compare. I am very much thankful to the most respected **ME coordinator Prof.V.G.Puranik** who at vey discrete step in study of this subject, contributed his valuable guidance and helped to solve every problem that arise.

I am very much thankful to **HOD Prof.V.S.Dhongde**, department of E&TC for her persistent inspiration.

I would like to extend my special thanks to **Principal Dr.A.K.Kureshi** for spending his valuable time to go through my report and providing many helpful suggestions.

Also I thank to all professors and other staff of the department for their support.

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