

Controlling a Raspberry Pi Robot over Internet with HTML & Shell Scripts

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Abstract - For making aware of the new environment one should go there and analyze what is happening, but life is precious so robots are used instead. The main theme of this paper is to develop a Raspberry Pi based robot which can be controlled remotely via internet. The robot has been primarily built over Raspberry Pi which controls data transmission between the server and the robot, and controls the motion of the motors via motor controller L293D. The robot direction is controlled by using Wi-Fi module through webpage over internet. The camera in the robot can be used to visually control the robot directions even from far places as well as to get the live video feed over the webpage.

Key Words: Robot, Raspberry Pi, IOT, Wi-Fi Module, Webcam.

1. INTRODUCTION

IOT based robot plays an important role in many area where people can't reach easily. The rapid growth of industry and advancement of technology has resulted in reduction of human efforts, the main reason for which being robot. In this project we use internet to establish communication between the user and a robotic vehicle. This is a reliable connection and a continuous video vehicle. Due to the use of internet, there is no limitation on range or distance between the user and the robotic vehicle. Robots have found an increasing demand in a wide range of applications in our life. Their use in defense has increased by the day. In today's world, robots find use in various places be it to detonate buried bombs or in industrial applications or even robotic components used

in children's toys. The complexity of computer software depends on how difficult the robot's tasks are. In Wi-Fi Robot for Video Monitoring & Surveillance System, the proposed robot motion will be controlled with PWM techniques using a Microcontroller and Bidirectional DC Bridge for Motor Driving. It is proposed to address the low cost, efficient, high speed processing & control hardware for the self-navigating robotics application.

2. PROPOSED THEORY

The first part is construction of the robotic vehicle. With the help of inbuilt Wi-Fi and network settings an internet connection is established between the robotic vehicle and the user. Then robot captures the images using a webcam and stores them into the memory. The next task is to capture and send live video feed using internet at a rate sufficient to make them seem like a live video to the human eye. The next task is to capture and send live images using internet at a rate sufficient to make them seem like a live video to the human eye. This was initially implemented using LAN before moving to internet. The desired result was achieved by sending compressed low resolution images so that transmission would not be affected in case high upload speeds were not available. Then the program was made more dynamic by varying the resolution of the video to be transmitted depending on the upload speed available at that particular time. Like for example in case of availability of good upload speeds, high resolution video will be sent and vice versa in case of low upload speeds.

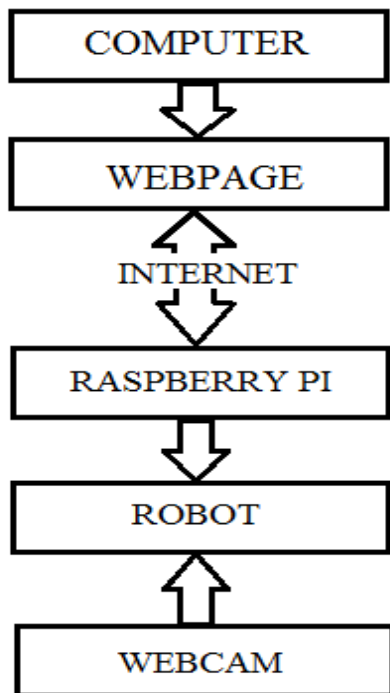


Fig -1: Flowchart

3. DESIGN AND IMPLEMENTATION

3.1 Raspberry Pi

Raspberry Pi board is a miniature marvel, packing considerable computing power into a footprint no larger than a credit card. The processor at the heart of the Raspberry Pi system is a Broadcom BCM2835 system-on-chip (SOC) multimedia processor. The

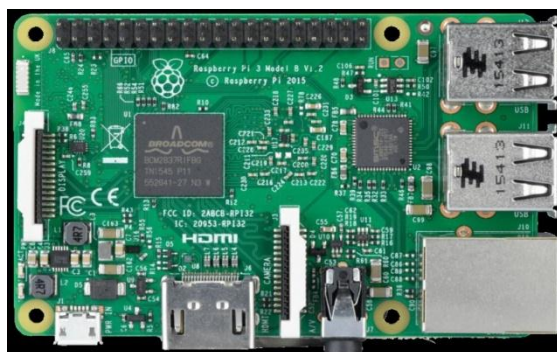


Fig -2: Raspberry Pi

Firstly we format our SDcard using SDcardFormatter then with the help of Win32Diskmanager select the Raspbian file and download all image into sdcards drive and click write

until it is done. Then put the SD card in your Raspberry Pi, connect the keyboard, connect it to your HDMI monitor and plug in the USB power.

With the help of IP Scanner Package determine the IP address and ssh into it or you can also use the command like **ipconfig** and hook the Pi directly to a monitor Now we have to run package updates by using various command like **sudo apt-get update** and **sudo apt-get upgrade** after installing update we have to use command **sudo reboot**. Now we have to assign static IP Address to SD card. After assigning static IP address and connecting to Wi-Fi we have write code for motor driver so that it can rotate. Also We have to write code for live streaming and WEB SERVER so that we can control our robot easily.

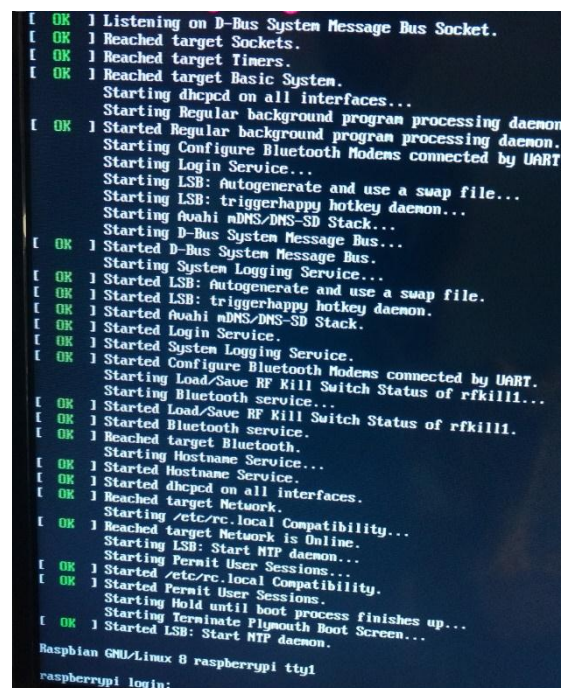


Fig -3: Raspberry Pi terminal window

3.2 Chassis

It should have 2 wheels along with a free wheel. These wheels are controlled with the help of two motors which is controlled by a motor driver L293D. We will connect the L293D motor driver with the Raspberry pi.

3.3 Web Camera

The visual feedback is provided by a webcam. It can have a resolution of up to 25MP, Frame rate of 30FPS along with night time vision. It is plugged into the USB port of the Raspberry Pi.

3.4 Wi-Fi Connection

Connection between user and robot is established via internet. Robot is connected to internet using Wi-Fi. Dynamic

IP address is assigned to the Raspberry Pi. Connection of Raspberry Pi is shown clearly on Modem.

ID	Client Name	MAC Address	Assigned IP	Lease Time
1	android-e7ca5880825a8e49	8C-77-16-C3-9A-EB	192.168.0.100	01:34:22
2	<u>raspberrypi</u>	<u>B8-27-EB-43-F0-BC</u>	<u>192.168.0.101</u>	<u>01:59:31</u>
3	suraj	A4-1F-72-54-12-41	192.168.0.103	01:40:04
4	suraj	B8-76-3F-11-34-BA	192.168.0.104	01:40:10
5	android-96152f916b064e36	E0-98-61-C7-6C-C8	192.168.0.102	01:44:49

Fig -4: Raspberry Pi IP Address

4. RESULTS

As shown below we built a raspberry pi controlled robot and gave it vision using a webcam.

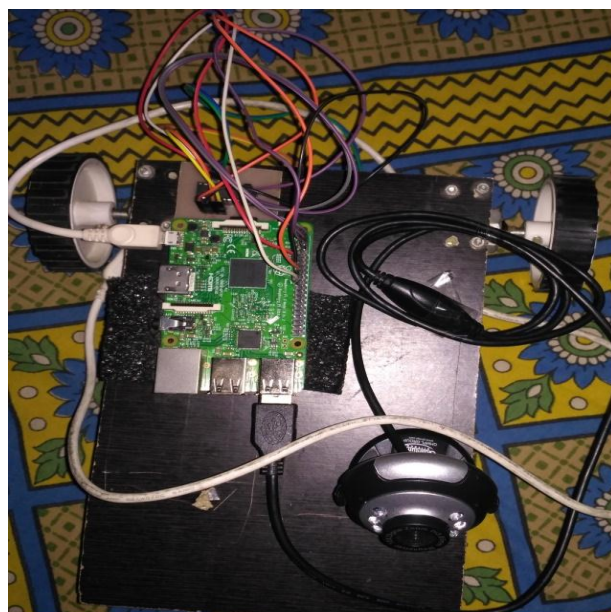


Fig -5: Robot

The video was sent in 640 x 480 video quality. The video is sent directly to the assigned webpage using raspberry IP and port. The webcam continuously captures and sends video feed directly with a delay of less than 1 sec.

The motion of robot is quite swift. The robot responds to the motion command given on the webpage in less than 1 sec.

The above robot is controlled through internet via a webpage whose view is as in diagram below.

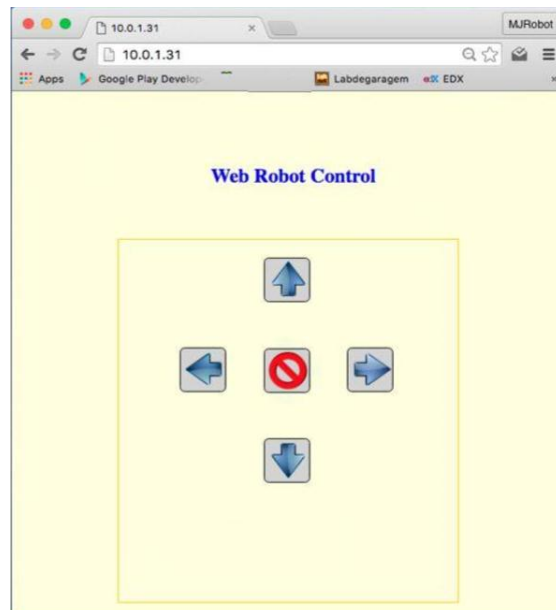


Fig -6: Web Page

The webpage can be accessed via a pc as well as on a cell phone on a browser and can be controlled through it.

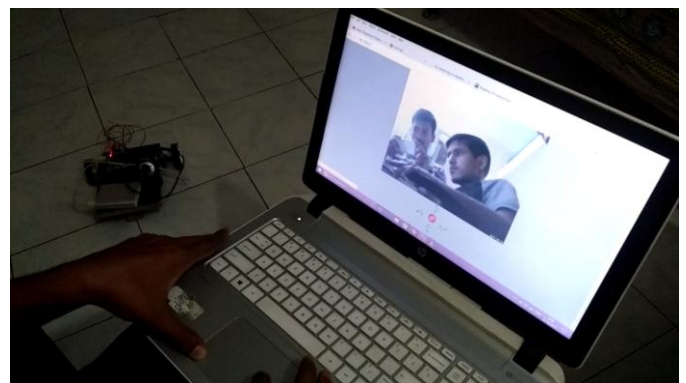


Fig -7: Robot Controller

5. CONCLUSIONS

In this project we used raspberry pi working on Raspbian OS. Raspbian is a versatile platform and interfacing is pretty easy.

Here we conclude that using raspberry pi for video transmission and robot control went pretty well and the response was faster than expected. The connectivity due to Wi-Fi gives response in <1sec. But cooling apparatus must be installed for protection to the raspberry pi.

6. FUTURE SCOPE

There are lots of improvements that can be made on the current design and technology and lots of additional features

can be added. We can use different types of sensor so that we can use robot in different field i.e. Temperature Sensor, Pressure Sensor, Heat Sensor, Position Sensor, Proximity Sensor.

We can also add Text To Speech converter in our robot. We can also mount rotating camera on the Robot which can help to know the position of Robot accurately.

We can also turn our robot as an UAV (Unmanned Aerial Vehicle) which can save our soldier in spying.

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