Web Browser Controlled Robot with Night Vision Camera

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Abstract-**This paper describes an exploration in Web-Browser based control of robots. The objective of this work is that Internet communications can be exploited to achieve greater productivity from machines with local intelligence. Local intelligent systems contact human experts to solicit advice when a problem facing the machine is beyond its cognitive capabilities. A system is to be designed that has limited autonomous competence, but which proves to be significantly more productive through the use of occasional Internet-based human supervision along with its mobility on land and Air (using Quad-copter).**

Keywords-Raspberry pi, Raspberry pi camera, Quad-copter, L293D, Multiwii.

I. INTRODUCTION

Security is the need of the day. Whether it be internet security, home security. For the sake of national security, the Indian Army should be fully equipped with latest technologies. Terrorist attacks are on a rise throughout the world. This has led to an increasing need for surveillance, which is a very daunting task. There are surveillance cameras in some areas, but they have a very limited vision. This is not of much use as the view can get obstructed easily, which has provided an impetus to build a robotic vehicle for surveillance purposes.

A robotic vehicle, used for such surveillance is usually controlled either using remote controls which transmit signals through GSM modules or using radio frequency .But these robots have a limited range as we need better transmitter and receivers which may cost heavily.

Thus, in this paper we have discussed about the robotic vehicle controlled via internet thus increasing the area it surveys. The keyboard manoeuvred surveillance vehicle has thus no range limitations. In this project we use internet to establish communication between the user and a robotic vehicle. A mere home browser can be used to control a robot .This is a reliable connection and a continuous video feedback is available to control the robotic vehicle. This connection between the robot and the controller is established using Raspberry PI. This Raspberry Pi, is connected using Wifi dongle. This Paper also includes the solution to the problem to the mobility of wheel based robots, use of quad-copter to enhance its application , by overcoming land obstacles and night vision camera , again controlled using Raspberry Pi.

Thus, this paper describes how the drawback of a GSM/Radio Frequency controlled robot is over compensated by us Raspberry Pi.

Also, the mobility of robot is enhanced by the Quad-copter system.

Thus this robot can be accessible on Land and as well Air.

II. SYSTEM OVERVIEW

The system consists of the robot, the Quad-copter and the night vision Camera.

A. The Robot

Robot is controlled using Raspberry pi and a motor driver circuit L293D.

The Raspberry Pi establishes the connection between the user and the robot. The connection can be through wifi portal/GPRS using GSM module. Thus making it a limitless transmission, helping the military operations.
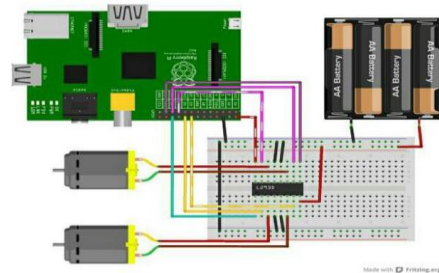

Fig. 1:A pictorial depiction of the connection of the Raspberry Pi with L293D.

B. The Quad-copter Structure.

The paper also shows the greater accessibility of the robot using Quad-copter. We use a version of CRIUS AIO PRO V2 for Multiwii. This is a flight controller: Its role is to send speed signals to the Esc to hold the quad copter in the air. We use the multiwii project because its a known project used by many users with a great community but mostly because programs like this is too complicated for us First at the start up it create a private wifi network with a DHCP server (to give IP address), this wifi network has no internet access and

this only to communicate with the smart phone. Secondly it stat a python program (created by us) who start a web-socket. A web socket is a permanent connection between the server (raspberry) and the client (the smart-phone app), it will serve to received command from the app. Then the same program connects to the multiwii via USB. It will serve to send commands information who come from the smart-phone to the multiwii
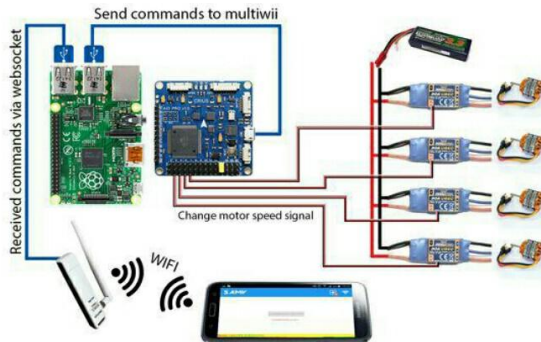

Fig.2:A pictorial depiction of the connection between the Raspberry Pi and the Multiwii

C. Night Vision Camera.

For maximum utility and for spying we shall use raspberry pi camera .This is a special Night vision camera which is interfaced with the Raspberry pi. In advance versions of Raspberry pi no special coding is required for enabling the camera. This Camera being not only use full in providing images at farther ends but also operational in night vision the cost of the entire robot signifies the quality of camera.
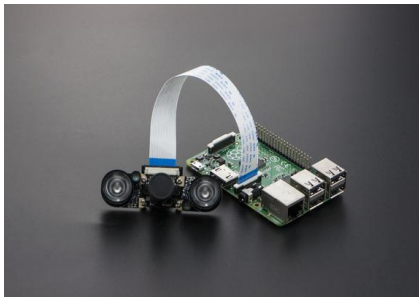

Fig.3: A pictorial Depiction of Raspberry Pi Night Vision Camera

III. METHODOLOGY

In this project, control of robotic unit is from remote end with the use of Internet and also we are able to get the videos from the robot end for the purpose of surveillance. At the user PC, we will have videos on the web browser and also we are able to control the robotic movement and also the camera movement in vertical direction and horizontal direction. DC motors are being used for the movement of robotic wheels and stepper motor is used for camera movement i.e. for vertical movement and horizontal movement. Raspberry Pi B+ is used for video processing and sending the processed video to user PC with the help Internet.With another Raspberry Pi B+ we operate the quad-copter.

The use of Internet does not bring the limitation of range into consideration as if we have the internet access, we can control the robot from anywhere. The images captured by the camera should be processed very fast to provide real time visualization of environment to the user. For this purpose along with low cost we think to use ARM". based Processors. Some of the reasons for using the ARM-based processors are they are economical and consumes very low power, decent processing power, and open development environment. The Raspberry Pi is a miniature computer that plugs into your TV. It is a capable little computer which can be used in electronic applications (projects), and for many of the things that your desktop PC does, like browsing, text editing and games. It also plays high-definition video.

We implemented our prototype situated with three major components like on board camera, Multiwii and a L293D motor driver. The real time video and all other sensor data is displayed in the web-page which can be viewed from anywhere in the world by setting a specific internet address.

Step1: Setting up the raspberry pi. In this step go to raspberry-pi.org and download any operating system you required but here we used Raspbian Wheezy.

Step 2: Install the required packages in the pi and connect the web-cam to the pi, after this you will get MJPG-streamer folder.

Step 3: Design the Login page for the authentication of robot and create the database for accessing. Here we designed the page using HTML, CSS and PHP and data base was created by using MySQL.

Step 4: Now design the console page that provides a way to control our robot this console page is designed based on HTML and PHP and write the controlling of the robot code in shell script based on the L293D/L298 IC logic we have used.

Step 5: Now, we need wifi dongle to connect our Pi with wifi router. After connecting wifi dongle to PI, open WiConfig application (you can find this application pr-installed in raspbian OS) & connect your PI with your wifi router. If it is already connected with wifi router, execute following command into terminal to know IP Address (config).

Step 6: You will find IP address of Pi in output. Do remember this IP Address for further use. We will need it control your Robot.

Step 7: Now build Robot, We can use DC Motor based simple robot. To control your motors we need L293D or L298 IC. Here we connected GPIO pins 18,4 with L293/L298 IC to control Left Motor & 23, 24 pins with L293/L298 IC to control Right Motor

.Step 8: Power Supply, Now the biggest challenge for any autonomous machine is power supply. Here we used 12v rechargeable Ni-MG battery. But as per specifications Pi will

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work on 5 V, So we use LM317 to regulate it to 5v. We connect battery terminals directly to motor driver IC, also parallelly, connect it to input of LM317 IC and regulated it to 5v by adjusting the resistance. 5 V output of this IC is connected with First GPIO of Raspberry Pi B+ in to power up it. Figure 10: IP Control Robot Prototype

Step 9: After connecting all the connections check it once again because if any wrong connections happened then definitely pi will be burn and see that you are giving power supply correctly that is in between 4.9v-5.2v

Step 10: As soon as you connect 5V supply with Pi it will turn on, you can see green LED blinking while start-up process. After some time open browser in your Laptop and write down following link: IP address /file-name. Step11: Download multiwii firmware from https://code.google.com/p/multiwii/

Step12:Download arduino software from https://www.arduino.cc/en/Main/Software

Step13:Open arduino project "Multiwii.ino" Step14:Change arduino board in "Tools">"Board">"Arduino Mega 2560 or Mega ADK" Step 15:Select the port in "Tools">"Serial Port"> And select the multiwii port.

Step16:Next, open file "config.h" Step 17:Search at the beginning of the file the line: "//#define QUADX" and remove comment it (remove the "//" Step 18:Search again the line "//#define CRIUS_AIO_PRO" and remove comment it.

Step 19:All is ready, save the file and run compilation Step 20:Next you will need to calibrate all sensor with Multiwii Conf.

E. Other Hard-wares.

i) Motor Driver

L293D, L298 are dual H-bridge motor driver ICs. We can control the direction of rotation of two motors in both clockwise and anti-clockwise direction. The L293D IC connection with dc motors is as shown below
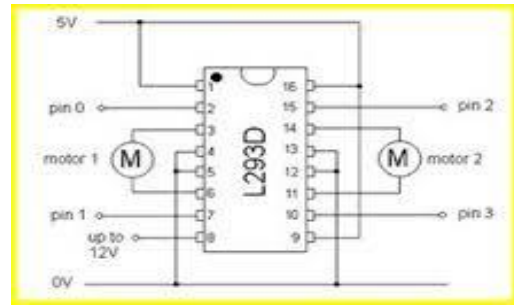

Fig.4: circuit diagram for L293D motor connection.

The logic for moving the motors in different directions is as shown below.

Inputs			L293D Inputs				Motors	
Motor 1	Motor 2							
Fwd	Fwd	Back	Input 1	Input 2	Input 3	Input 4	Motor 1	Motor 2
1	1	1	1	0	1	0	Fwd	Fwd
1	1	0	1	0	1	0	Fwd	Fwd
1	0	1	1	0	0	1	Fwd	Back
1	0	0	1	0	0	0	Fwd	Stop
0	1	1	0	1	1	0	Back	Fwd
0	1	0	0	0	1	0	Stop	Fwd
0	0	1	0	1	0	1	Back	Back
0	0	0	0	0	0	0	Stop	Stop

ii) Multiwii

Multiwii is a open source french project who was based on a arduino. The project is open source so we can find many kind of multiwii. We use a similar version of CRIUS AIO PRO V2. This is a flight controller: Its role is to send speed signals to the esc to hold the quad-copter in the air. We use the multiwii project because its a known project used by many users with a great community but mostly because programs like this is too complicated sometimes for us. The **Multiwii-copter** is historically based on a Wii Motion Plus extension and an Arduino pro mini board. From a very simple, cheap, minimalist flight controller the project has now matured and supports all expected feature including GPS navigation.
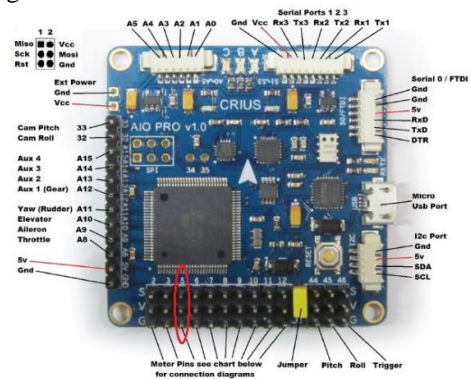

Fig.5: A pictorial depiction of Multiwii system with pin Configuration.

iii) Other Hard-wares

- Motors
- Batteries
- Frame (Quad-copter)
- Chassis(Robot)
- ESC
- Connecting Wires.
- Internet

IV. FUTURE SCOPE

The future aspect of this project becomes great as well desirable. The paper describes that how the range as well as mobility problems can be encountered.

For military purposes, while spying. As this Robot has lessen the range problems it has proved its functionality to be much vast than previous robots. Also it can be moved anywhere due to its Robotic as well as quad-copter structure, that makes it functional on land as well air without disturbing its range. Depending Upon the cost and functionality the range can be further increased using GPRS system making it operational at globular level. In future this can be really help full for the Military to keep an eye on the abounding countries.

V. CONCLUSION

The main motive of the robot was to make it user friendly. The spy robot can easily move on Land and water , capture images and wirelessly transmit them, thus giving the soldiers an intimation about the dangers and situations in the war field. The robot will move depending on the motor direction based upon the input we give through Web Browser. The robot is used for long distance surveillance thus ensuring the security of the region. This helps the forces to view the things accurately that are currently happening in the surrounding area and to plan ahead accordingly.

Also it is cheaper thus its help full to fight range problems, mobility problems as well as cost problems.

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