



Telepresence Robot with Handgripper

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ABSTRACT

This paper proposes the virtual telepresence robot with pic and place hand gripper. Here the wheeled robot is placed in the remote location with a camera interface. The user can control the robot wirelessly with the web page created. The visuals of the remote location can be viewed in the users smartphone with dual screen which is placed in the virtual headset. The use of virtual headset is that it makes the user to feel as he/she present in places at a time i.e., his/her true location and remote location. The camera is moved in the direction of the users head movements to get the virtual presence. This also contains a hand gripper that is used to pick and place the things in the remote location.

KEYWORDS: Raspberry Pi, virtual reality, hand gripper, virtual headset

1. INTRODUCTION

Now a days robots are used in most of the applications such as manufacturing, transport, earth and space exploration, surgery, weaponry, laboratory research. They reduce the man power by performing the human tasks and also reduce the human loss. In our project we are using a robot that is place in remote location and controlled by user and moved in right and left, front and back directions. This robot will reduce the human transport time to desired location and also makes the user to feel as if they were in desired location by using virtual reality. This robot is used in military to surveillance the area instead of humans.

2. RELATED WORK

^[1]In this paper the system consisting of the robots will capture the images or videos will regularly be streaming the video to the users and the robot will be working according the commands given by the user through

smartphone or remote system. It receives input from the smartphone via Bluetooth or Wi-Fi, Smartphone reads the accelerometer and magnetometer data of the direction in which user gives the command. This data is sent to the Raspberry pi Wi-Fi in which it turns, provides these values as input to the servomotor. Two servomotors are used to move the Rpi Camera in both horizontal and vertical direction. The video captured by Rpi camera can be viewed on a smartphone or the desktop.

^[2]This project's main goal is to develop a pick and place robot that is embedded with a robotic arm having a gripper at its end. It is controlled through Bluetooth using an app developed in MIT app inventor.

3. PROPOSED SYSTEM

The proposed system is the combination of the above two systems. With this the user can see the remote

location visuals and at the same time he can control the things in remote location through a web page interface. As the system has virtual reality technique the user can feel that he is present in the location where the robot is placed and moving the things that are present in that location. [2]In this the things are controlled through Bluetooth but in the proposed system the things are controlled through a web page developed.

4. METHODOLOGY

Raspberry Pi

The RASPBERRY Pi 3 is a credit card sized computer that plugs into your TV and a keyboard, it's like a little PC which can be used for many of the things that your desktop PC does, like spreadsheets, word processing and games. It also plays high-definition video. The design is based around a Broadcom BCM2837 SoC, which includes an ARM1176JZF-S 1.2G hz processor, Video Core IV GPU and 1 GB of RAM. The design does not include a built-in hard disk or solid-state drive, instead relying on a microSD card for booting and long-term storage. This board is intended to run Linux kernel based operating systems.

This is the brain of the project. All the peripherals that are required for the project are connected to the raspberry pi. It includes the program that required to control the camera, robot movement and hand gripper.

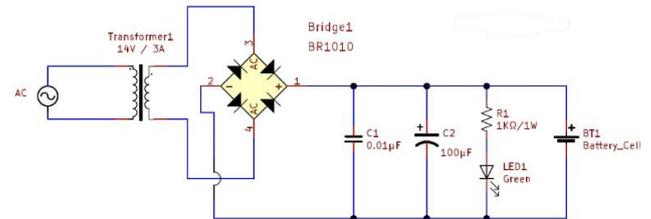
Power Supply



A rechargeable battery, storage battery or secondary cell (formally a type of energy accumulator), is a type of electrical battery which can be charged, discharged into a load, and recharged many times, as opposed to a disposable or primary battery, which is supplied fully charged and discarded after use. It is composed of one or more electrochemical cells. The term "accumulator" is used as it accumulates and stores energy through a reversible electrochemical reaction. Rechargeable batteries are produced in many different shapes and sizes, ranging from button cells to megawatt systems connected to stabilize an electrical distribution network.

Several different combinations of electrode materials and electrolytes are used, including lead-acid, zinc-air, nickel-cadmium, nickel-metal hydride (NiMH), lithium-ion (Li-ion), lithium iron phosphate (LiFePO4). In this project we are using dry acid type 12v 1ahm battery for power supply of the robot and arm.

Charging Circuit



From the above circuit diagram, we can see that the 18V AC is being converted to 18V pulsating DC which is in turn converted to smooth DC with the help of the Capacitor. This 18V Smooth DC is converted to 12V DC by the Voltage Regulator 7812. At the output of the regulator, we get some spikes which are not desirable. These spikes are removed with the help of another capacitor used. We can get 12V Steady DC at the output terminal which can be indicated if the LED glows.

Camera Module



The camera consists of a small (25mm by 20mm by 9mm) circuit board, which connects to the Raspberry Pi's Camera Serial Interface (CSI) bus connector via a flexible ribbon cable. The camera's image sensor has a native resolution of five megapixels and has a fixed focus lens. The software for the camera supports full resolution still images up to 2592x1944 and video resolutions of 1080p30, 720p60 and 640x480p60/90. Installation involves connecting the ribbon cable to the CSI connector on the Raspberry Pi board.

Servo Motors



A servomotor is a rotary actuator that allows for precise control of angular position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors. Servomotor is a rotary actuator or linear actuator that allows for pulse control of angular or linear position. Hence servomotor works on the principle of pulse width modulation. Its angles of rotation can be controlled by timing of pulse applied to the control PIN. Servomotors are small in size servomotors contain 3wires those are power, ground and control. And the servomotor rotational is just 180 degrees it can't operate beyond it. We can note it down as a disadvantage of servomotor.

Gear Motors



A dc motor uses electrical energy to produce mechanical energy, very typically through the interaction of magnetic fields and current-carrying conductors. The reverse process, producing electrical energy from mechanical energy, is accomplished by an alternator, generator or dynamo. Many types of electric motors can be run as generators, and vice versa. The input of a DC motor is current/voltage and its output is torque (speed).

Virtual Headset



VR Box is nothing but a virtual reality (VR) platform used with a head mount for a smartphone. i.e Its a HMD as same as Google Cardboard. VR BOX is Google Cardboard adoption of plastic body HMD in which you can place your Android or iOS smartphone to enjoy virtual reality games, app, 3D videos, 360 immersive 3d videos etc. Virtual Reality Apps: In this we are using Dual Screen Multi Browser Application for virtual reality. ADJUSTABLE DESIGN: we can adjust the position of the resin spherical lens slightly by rolling the gear on the top of the 3D VIRTUAL REALITY VR BOX

Hand Gripper

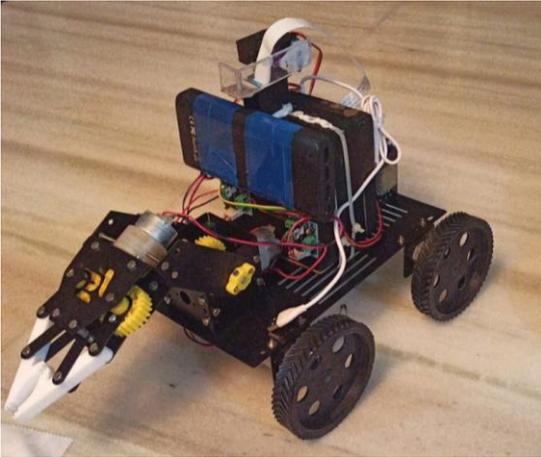


The Gripper module is state of the art robotic arm designed indigenously by Robomart. It can be used in various 'pick and place' kind of robots. It works on DC Motor (9 to 12V DC). Change in rotation direction of the DC Motor, generates Jaw Open & Close Action. The DC motor can be easily be controlled with the help of any microcontroller along with L293D Motor Driver module. Gripper assembly Plates. 2x (Fiber Grippers). 1x (45 RPM DC Metal Geared Motor). 1x (Worm Gear). 2x (Spur Gear).

HTML

The Hyper Text Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript. Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

5. RESULTS & CONCLUSIONS



After successful integration of hardware & running the software, the system is able to send the head movement signals to raspberry pi and the camera module is approximately moving according to user direction after receiving the commands from raspberry. The raspberry pi is also able to receive the signal from web page to control the movement of robot and to control the action of hand gripper, that are send by the user.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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