Virtual Telepresence Robot Using Raspberry Pi

The main of the project is to design a hand gesture-controlled Robot along with robotic arm for virtual telepresence using Raspberry pi and pi camera.

In this project the smartphone reads the accelerometer and magnetometer data of the direction in which the user turns his head, say, right or left. This data is sent to the modem over Wi-Fi and to the Raspberry Pi board, which, in turn, provides these values as inputs to the servo motors.

In this project to control the robot along with robotic ARM wirelessly through zigbee module which is capable of pick and place of many objects. In this hand gesture movement using MEMS and FLEX sensor which can detects the tilt and provides the information to the microcontroller. Flex sensor gives resistance value in accordance to the direction in which it is bent. These values are fed to the Arduino nano microcontroller with the help of ZIGBEE module, the data is sent to the receiver. At the receiver, the DC motors are interfaced to the raspberry pi to control the direction of the robot. The input from the MEMS sensor is used to moves the directions of robot in left, right, forward and backward directions. The input from the Flex sensor is used to open and close the gripper. Two buttons are used for up/down motion of the ARM.

In this user will control the robot-like forward, backward, left and right directions and control the ARM also wirelessly using zigbee wireless technology and by using simple hand gesture.

The Raspberry Pi is a low cost, **credit-card sized computer** that can be used in electronics projects and it has an inbuilt wi-fi. The task of the project is achieved by using Raspberry pi. This robot with a Pi camera is placed in a remote location to capture the environment in visual form using Raspberry Pi. The captured visuals are displayed on the user's virtual reality (VR) headset.

The main objectives of the project:

- The robot should be able to move forward, backward, left and right on its four wheels with the components on board by receiving commands from hand glove.
- ARM also can move gripper open and close, ARM up and down directions for pick and place the objects by receiving the commands from Hand Glove.
- The pi camera is to capture clear, real-time visuals of the area in front. The camera moves in the same direction as the VR headset.
- Video stream data from the camera should be sent to the Raspberry Pi over the Wi-Fi for being displayed to the user's screen.
- Zigbee based wireless controlling of robot along with ARM.
- Hand gesture movement using MEMS and flex technology.
- Using Raspberry pi, pi camera and Arduino nano to achieve this task.

The major building blocks of this project are:

- Battery Power.
- LM2596 voltage regulator.
- Raspberrypi3.
- SD card.
- Pi camera
- VR head set
- Servo motors
- L293d motor drivers.
- DC motors
- Robot chases.

- Gripper.
- Smartphone with internet connection.
- ZIGBEE Transmitter, Receiver.
- Flex sensor.
- Two Buttons.

Software's used in the project:

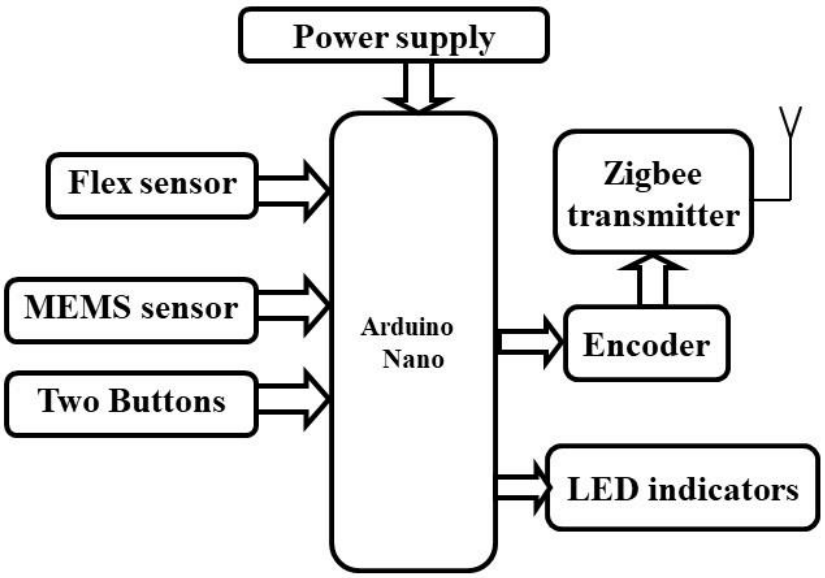
1. Python Programming and Linux OS for Raspberry pi.
2. Arduino IDE studio for Arduino NANO.
3. Express SCH for Circuit design.

Applications Used:

- Wireless IMU is used to control the servo motors.
- Dual Screen Mod Browser is used for live video.
- Network analyzer to get the IP address of raspberry pi.

Block diagram:

Glove Section
1.Transmitter



Robot section
2. Receiver