Gesture Controlled Smart Wheelchair

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ABSTRACT

Gesture Controlled wheelchair is a robot which can be controlled by human gestures. User just needs to wear a gesture device in which a sensor is included. Sensor records the movement of hand in a specific direction which will result in the motion of the robot in the respective directions. Wheelchair and Gesture instruments are connected wirelessly through radio waves.[3] User can interact with the wheelchair in a more friendly way due to wireless communication. We can control the wheelchair using accelerometer sensors connected to a hand glove.[4]

Index Terms: *Gesture Device, Wheelchair Control System, Smart Wheelchair, Assistive Device, Mobility Assistive Device*

Introduction:

Nowadays, there is significant increment in the number of old/disable people in world. The mobility is one of the major problems to have an independent life for old and disabled people. They need assistance from others in their daily life.[3] According to several research, both children and adults get benefits from having access to independent mobility. Independent mobility increases educational opportunities by reducing dependence on others. Abnormal child has lack access to some facilities.[4] As this disable people are dependent on others, this cause deprivation and feel de-motivated. For adults, independent mobility is an important aspect of self-dignities.[3]

The increment of the Accident, Misadventures, Wars and paralyzed people make main reason to develop new control method for mobility assistive device. There are still some problems to be solve, that is to save, the experience of human computer interaction needs to be improved. To solve this problem, mobility assistive devices such as robotic/smart wheelchairs have been developed. Some of the Robotic Wheelchairs are featured with controlling interfaces like joystick, manually by switches.

In this paper the gesture interaction by hand method is developed to control the mobility assistive device in our case we used a smart wheelchair. Hand gesture recognition system is mainly used method in the human robot interaction system. Hand gestures are a natural and powerful way of communication in daily life so that it can be used to control robotic wheelchair. The aim of this research is to develop system to control a Robotic Wheelchair by hand gesture which can operate in and outdoor environment as well as indoor environment.[3]

Research Elaborations:

In this design approach the required components are

1. Accelerometer(mpu6050)
2. Arduino uno (atmega328p)
3. transmitter circuit
4. Receiver circuit
5. Motor-driver IC(L293D)
6. DC-motors

The simple block diagram of the wheelchair working is shown below

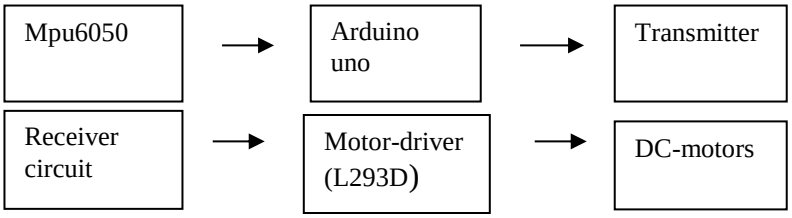

FIGURE 1. BLOCK DIAGRAM OF GESTURE CONTROLLED SMART WHEELCHAIR

Here is the simple block diagram of the smart wheelchair system. First of all, the accelerometer sensor detects the hand movement and if the accelerometer is moved more than 60-degree angle than the accelerometer detect any direction and by the movement of the accelerometer the microcontroller (Arduino uno) atmega328p sense the direction and it sends the message to the transmitter circuit. at the other side the receiver circuit receive the message from transmitter and the receiver circuit send the instruction to motor driver IC(L293D) and by the instruction of motor driver the DC-motors works.[1]

Circuit Development:

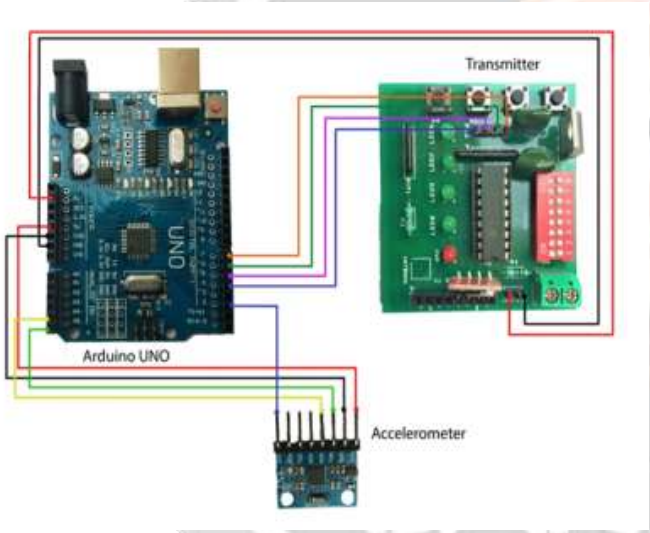

FIGURE 2. CIRCUIT DIAGRAM (HAND CIRCUIT)

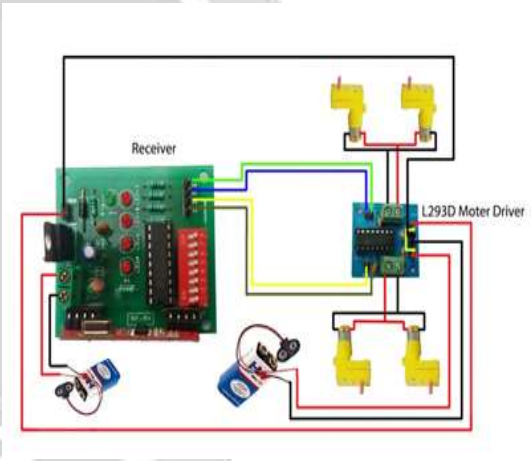

Figure 3. Receiver circuit diagram

Figure number (2) and (3) illustrates the circuit diagram of the proposed gesture-controlled wheelchair system. Look at figure no 2. It consists an Arduino uno (atmega328p), accelerometer (MPU 6050), transmitter circuit. The SDA and ground pin of mpu6050 is connected with the A4 and A5 pin number of atmega328p where the supply pin of mpu6050 connected with the 5V pin of Arduino(atmega328p). and the INT pin of mpu6050 connected with pin number 2 of Arduino uno. Where the pin 4,5,6,7 of Arduino uno connected with the capacitive remote buttons of transmitter circuit and the 5v pin and ground pin of Arduino uno connected with 5v pin and ground pin of transmitter circuit. Also check the figure no 3. Which consists the receiver circuit, L293d motor driver IC and pair of DC-motors.[1]

Here receiver circuit connected with motor driver IC and the pair of 2 motors connected parallel with the motor driver here is only idea model so power supply of whole system is 5v. [1]

Operating Principle:

The user can control the wheelchair via hand gesture movement. The accelerometer, Arduino uno and transmitter circuit are implemented on hand glove. after wearing the glove on hand, the user can control the wheelchair. If user tilts his hand in left direction then if mpu6050 is tilted more than 60-degree angle Arduino pass left direction instruction to transmitter. transmitter pass the instruction to the receiver. And receiver pass that instruction to motor driver l293d and resulting the dc-motor move in left direction.[1]

Result Analysis:

So, our project is in phase 1 we just implemented our idea in small prototype

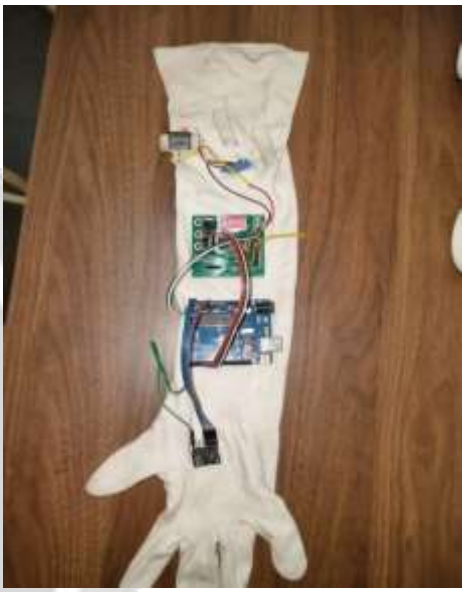

Figure 5 and 6 shows the hardware connection of the wheelchair system. It consists Arduino uno accelerometer and transmitter- receiver circuit, motor driver IC and DC motors. When the accelerometer moves in the particular direction the working of system start.[1]

Future scope:

There are lots of future scopes for gesture controlled smart wheelchair. Here 12V battery supply is used if we make actual product but if Bluetooth module hx05 implemented then we can connect smartphone with Bluetooth module and then we can move wheelchair with movement of smartphone.[1] for paralyzed people we can mount accelerometer on head cap then paralyzed people can move with the movement of head.[2] if we mount solar panel with battery then battery can charge with solar energy.[2]

Conclusion:

This is the main design approach of gesture controlled wheel chair using microcontroller. the purpose of these product is to make a costless, reliable, and user-friendly smart wheelchair system for physically disabled people. speed control and autonomous control can be added later. And in near future many more things can be added to make whole system very easy.

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