Review on Smart wheelchair for physically handicapped people.

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Abstract— In today’s world, more number of physically handicapped & elder peoples are depend on others. But today’s world becomes fast, everyone is busy & there are few peoples to take care of these peoples. They find the automated wheelchairs for an easy transportation. The proposed work is to design & develop a smart wheelchair using Voice Recognition & Gesture Control System. It is also have the Obstacle Detection system, where the user may not be able to give proper command at the right time to wheelchair. It can be used efficiently with less effort by the user so that they can use it easily & independently.

Keywords— smart wheelchair, voice recognition system, gesture recognition system, physically handicapped human, Obstacle detection system

1. Introduction

The aim of this project is to design & develop a smart wheelchair which can be easily controlled by voice commands as well as with the help of gesture recognition system. This project facilitates the movement of physically handicapped or elder people.

The system is mainly divided into four components: Voice recognition module, Gesture recognition module, Obstacle avoidance system and wheelchair control system.

Voice recognition module is used for recognizing voice commands such as FORWARD, BACKWARD, LEFT, RIGHT, STOP. Accelerometer module is used for Gesture recognition. The moment of hand is detected by the accelerometer module. Ultrasonic sensors are used to detect obstacles in the path. With the help of ultrasonic sensor we can also calculate the distance between wheelchair and obstacle so we can easily avoid the obstacle. Wheelchair control system is designed with the help of AVR microcontroller, Motor Drivers and Motors.

The smart wheelchair reduces the effort of the physically handicapped and elder people so they can live independently in the today’s fast world.

2. Block Diagram

The implementation of proposed system mainly involves four steps, which are gesture recognition, voice recognition, obstacle avoidance and controlling direction of wheelchair using microcontroller based on the received voice or gesture commands by using motors. The block diagram of the system is shown in Fig. 1.

3. Block Diagram Explanation

1. Power Supply Unit:

When we work with electronics devices, we always need one basic thing i.e., Power. In every electronic circuit power supply is needed. For the proper working of each and every component, it is important to supply the exact amount of voltage and current. If the power exceeds its limit, it can be damage the component.

The +5 volt power supply is based on the commercial 7805 voltage regulator IC. This IC produces a steady +5 volt output, accurate to within...
5% (0.25 volt). It also contains current-limiting circuitry and thermal overload protection, so that the IC won't be damaged in case of excessive load current; it will reduce its output voltage instead.

2. **ATMega2561:**

![Fig.2. ATmega2561](image1)

Fig 2 is the pinout diagram of the ATMega2561 controller. The ATMega2561 is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATMega2561 achieves throughputs approaching 1 MIPS per MHz allowing the system designers to optimize power consumption versus processing speed. ATMega2561 has 54 programmable I/O pins. It has six PWM channels.

3. **Voice Recognition Module V2:**

![Fig.3. Voice Recognition Module V2](image2)

The Voice Recognition module V2 can recognize voice commands. With this module, the wheelchair can be controlled by voice. This module can store up to 15 pieces of voice instruction. Those 15 pieces are divided into 3 groups, with 5 in each group. First the module is trained with voice instruction. After training of the module user can give voice command to voice module through microphone. The module is speaker independent. The output of voice module is fed to the ATMega2561 microcontroller. The microcontroller generates control signal to drive motors of wheelchair. DC Geared motors are used for controlling the 2 wheels of the chair independently.

4. **3-Axis Accelerometer (ADXL 335):**

![Fig.4. ADXL335](image3)

The hand gesture module has been prepared by using a triple axis accelerometer sensor (ADXL 335). The relatively low cost sensor provides the data for the orientation of the hand and therefore helps in recognizing the gestures. The accelerometer sensor senses the accelerating force (acceleration due to gravity or g) and thus gives a particular voltage for the x, y and z coordinate orientation. Fig.5 shows the interfacing of ADXL335 with ATMega2561. Output of ADXL335 is obtained at Xout, Yout, and Zout. These pins are connected to the ADC pins of the microcontroller.

![Fig.5. Interfacing of ADXL335 with ATMega2561](image4)
The table shows the position of hand and direction of motion of chair.

<table>
<thead>
<tr>
<th>Hand Position</th>
<th>Direction of Motion</th>
</tr>
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<tbody>
<tr>
<td>FOR</td>
<td>FORWARD</td>
</tr>
<tr>
<td></td>
<td>RIGHT</td>
</tr>
<tr>
<td></td>
<td>LEFT</td>
</tr>
<tr>
<td></td>
<td>BACK</td>
</tr>
<tr>
<td></td>
<td>STOP</td>
</tr>
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</table>

Table 1. Table of movement of Hand and direction of movement

5. Ultrasonic Distance Sensor:

The Ultrasonic Distance Sensor provides precise, non-contact distance measurements from about 2cm to 3 meters. The Ultrasonic Distance sensor works by transmitting an ultrasonic burst and providing an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring the echo pulse width, the distance to target can easily be calculated.

6. Motor Driver (L293D):

The most common method to drive DC motors in 2 directions under control of controller is with an H-Bridge motor. The L293D is an integrated circuit motor driver that can be used for simultaneous, bidirectional control of 2 small motors. It is used to drive 2 DC motors simultaneously, both in forward and reverse direction. The motor operations can be controlled by input logic at pins 2 and 7 and 10 and 15.

4. Working

The paper consists proposal of smart voice recognition and accelerometer based wheelchair. The above proposed work is that it takes advantages of both the Voice recognition technology and 3 axis accelerometer technology enabling patients to move their wheelchair by just giving the voice commands or by just tilting the accelerometer or hand.

The power supply can be achieved by using rechargeable battery. The system needs two different voltage supplies +5V and +24V. The controller needs the +5V supply and DC motors needs +24V supply.

The execution for this work is controlled by an AVR microcontroller for powering DC motors for bi-directional motion for the wheels. The AVR
The microcontroller is programmed to take a decision for any given input. The AVR microcontroller outputs its decision to motor driver to move Forward, Backward, turn Right or Left. The Obstacle Detection System is designed by using the Ultrasonic Distance Sensors. By using these sensors we can easily calculate the distance between the chair and obstacle. Hence we can easily avoid the obstacle.

5. Conclusion
In this paper a Smart wheelchair is proposed with the help of Accelerometer and voice recognition module which is used for physically handicapped people or elder people so that they can easily control their chair themselves and with fewer efforts.

6. References