Gesture and Voice Controlled Wheel Chair for Disabled

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Abstract— The number of physically disabled is considerably increasing. There is a need to develop an automated wheelchair system for the disabled which reduces extra human efforts. This project proposes an idea with accelerometer, voice capturing and recognition module, ultrasonic and infrared sensor systems integrated in this wheelchair. Intended user can control the system by wearing a glove fitted with accelerometer for controlling the movement and direction of the wheelchair or by giving voice commands. The sensor senses the angle of the hand, i according to the tilt of hand, microcontroller detects the change in voltage and the motion of the wheel chair can be controlled.

Keywords: Accelerometer

I. INTRODUCTION

Old citizens or disabled persons become dependent on other members of the family to navigate through their or within residence. A smart wheelchair can be a useful assistant for them. Recent development in the field of robotics, automation, embedded system, artificial intelligence etc. can be combined and utilised to design such a wheelchair. It can be controlled wireless by adopting a proper communication system. The chair can be controlled by voice recognition as well as hand gesture method with directions as needed. There would be many people who would be able to move only a particular part of their body or people who are too old to move on their own and need support from another person.

II. METHODOLOGY AND IMPLEMENTATION

Gesture recognition is an emerging technique for gesture-based interaction, which suits well the requirements in ubiquitous computing environments. Gesture recognition is a type of perceptual computing user interface that allows computers to capture and interpret human gestures as commands. The gestures are sensed using an accelerometer and sent to the application running on the computer. We use a simple machine learning algorithm to match the live accelerometer data to recorded examples of different gestures, sending a message back to the computer when it recognizes a gesture similar to one of the examples. The system only recognizes individual occurrences of discrete gestures; it doesn't provide information about how the gesture is performed. Still, it can be used for a wide range of interactive applications. There are usually two ways to evaluate the performance of the gesture recognition algorithms: user- dependent and user-independent. Earlier work on gesture recognition focuses more on user-dependent gesture recognition, in which each user is required to perform a couple of gestures as training/template samples before using the system. One of the solutions to this problem is to reduce the user's efforts in training by adding artificial noise to the original gesture data to augment the training data. The user- independent gesture recognition does not require a user to enroll any gesture samples for the system before using it, where the model for classification has been well-trained before and the algorithm does not depend on users. The user-independent gesture recognition is more difficult than the user-dependent one since there is much more variation for each same gesture. Gestures are a very spread means of communication among people. There are two implementations of gesture recognizing systems: sensor- based and vision-based. The sensor-based solutions use accelerometers or gyros for detecting the gestures, whereas vision based uses a camera for movement data.

The hand gesture can be implemented in wheel chair using ADXL345 accelerometer. The raspberry pi uses wireless LAN adapter to send accelerometer values to raspberry terminal and receive the command, what to do for that values on wheel chair motor.

To run the code we have to install operating system Raspbian (recommended) and install the python with libraries required in operation. The important ones are adxl345, busIO (for serial protocol), board and RPI.GPIO. Using installer makes above work easy.

To control the motors relay module/driver can be used. Which work on axis values. ADXL345 is 3-axis accelerometer (X, Y and Z) and it is attached to the hand. The raspberry pi works on the basis of X, Y and Z values given by accelerometer. The orientation of accelerometer changes the axis values which decides which direction to move and turn. For our convenient we adjust the values In between 1 to -1. Which will decide the movement of wheel chair. For the values of X-axis to 1 and other axis to 0, the raspberry read the predefined task assigned for that particular values. The module will give command to motor for that defined direction. The motor is connect to wheel chair via connecting chain which, makes running and turning smooth. In our case we have taken this values for forward direction. While turning, the axis values co-ordinate with each other for appropriate and smooth turn.

III. CONCLUSION

The motive of this project is to help the poor disabled people with the highly effective automatic controlled wheel chair and reduce the dependency of the physically disabled on others. The operator has to wear a hand band on which the accelerometer is fitted, which makes it simple and comfortable to operate and for the ones who cannot make hand gestures can use the voice commands through the microphone placed in front of the user. Therefore making it convenient for the people with different disabilities to operate this wheelchair. The parts and required electronic components are collected from the market at a reasonable price, which also makes the device cost effective and will be affordable for the people to purchase it

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