Wheelchair Controller And Device Controller Based On Android

Abstract
Nowadays, handicapped people face problem to control wheelchair by themselves. Sometimes they need other people to help them. This project will provide a new way to control the movement of wheelchair such as turn direction to left, right, forward and reverse direction. The overall wheelchair operation uses DC motor and motor driver module combines with microcontroller system for instance IOIO board. Android based wheelchair controller that consists of android device and a control box that can be attached to standard wheelchairs to control the movement by using a DC motor. Bluetooth communication protocol is used to communicate sensory and command information between the android device and the control box. This project is related to the android-based wheelchair controller. The system is designed to control a wheelchair by using an android...
app. The objective of this project is to facilitate the movement of disable people or handicapped and also the senior people who are not able to move well. The result of this design will allow the special people to live a life with less dependence on others. Android technology is a key which may provide a new approach of human interaction with machines or tools. Thus their problem can be solved by using android technology to control the movement of a wheelchair. In this project, Basic android interface is designed to program the android app that will be able to control the movement of wheelchair. This project integrated micro-controller embedded board and direct current motor to create the movement of wheelchair. The results of this project showed that this project can be used for future research works and to design excellence innovation that meets market need and public interest.

1. Introduction

"World report on disability" (2011) jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately day by day the number of handicapped people is going on increasing due to road accidents as well as disease like paralysis. Among all the disabilities percentage of physically handicapped person is most. If a person is handicapped he is dependent on other person for his day to day work like transport, food, orientation etc. So a voice operated wheel chair is developed which will operate automatically on the commands from the handicapped user for movement purpose. As an input device an android mobile is used, this is also used to convert speech signal into text. Bluetooth module transfer signal from mobile to PIC 16F877 controller which controls the direction of wheel chair and an IR section is used to detect the obstacle in the path of wheel chair. Two DC motors are used with L298 which is a dual full bridge driver IC. The following section gives an idea about statistics on disability in India among which physical disability is having highest percentage.

This project is related to the android-based wheelchair controller. This project could be part of an assistive technology. It is for more independent, productive and enjoyable living. Android-based wheelchair controller is a system where the DC motor is used to move the wheelchair. Nowadays, handicapped people face problem to control wheelchair by themselves. Sometimes they need other people to help them. This project will provide a new way to control the movement of wheelchair such as turn direction to left, right, forward and reverse direction. The overall wheelchair operation uses DC motor and motor driver module combines with microcontroller system for instance IOIO board. Android-based wheelchair controller that consists of android device and a control box that can be attached to standard wheelchairs to control the movement by using a DC motor. Bluetooth communication protocol is used to communicate sensory and command information between the android device and the control box.

There are 4 options for basic motions of a wheelchair to be applied by the user. The four conditions of the wheelchair can be described as the following:

a. Moving forward
b. Moving backward
c. Turning to the right
d. Turning to the left
This project also provided a controller to the electrical appliance by using radio frequency as a wireless connection between control box and electrical appliance. Figure 1 shows the block diagram for overall of the project.

![Block diagram of Proposed System](image)

2. Survey Review

I. **Jayesh K. Kokate** developed a chair which will operate automatically on the commands from the handicapped user for movement purpose. As an input device an android mobile is used, this is also used to convert speech signal into text. Bluetooth module transfer signal from mobile to PIC 16F877 controller which controls the direction of wheel chair and an IR section is used to detect the obstacle in the path of wheel chair. Two DC motors are used with L298 which is a dual full bridge driver IC. The following section gives an idea about statistics on disability in India among which physical disability is having highest percentage.

II. **A. M. Agarkar** provided input to the Arduino which is a Microcontroller used to control the motion of wheel chair via two ways first way is with the help of voice command or second way is with the help of a Touch screen. HM 2007 is used for voice recognition purpose. A switch is used to switch between the input methods. The Arduino controls the movement of wheel chair based on the input signal received from any one of input methods. For movement of wheel chair two DC motors are used.

III. **M. H. Mustafa** provide a new way to control the movement of wheelchair such as turn direction to left, right, forward and reverse direction. The overall wheelchair operation uses DC motor and motor driver module combines with microcontroller system for instance IOIO board.

IV. **Nirmal T M** developed the wheelchair that can control using voice, eye and joystick. And it monitors the room conditions like temperature, humidity, fire etc... And according to patient/user health conditions it will inform the doctor/ analyzer via text message. Also it check the body conditions of the user and according to unnecessary changes in his heart and brain conditions and
inform it any changes happen. According to user wish the wheelchair can be made in to a semi sleeper bed. Also for physically handicapped ones the wheelchair will help to have food/medicines and other needy things which can only done by his hand can be done using robotic hand that is being integrated with it.

3. Wheelchairs Overview

i.) Manual Wheelchairs

Manual wheelchairs are the type that requires people to move them; there are three types of manual wheelchairs namely self-propelled, attendant propelled, and wheelchair. Many manual chairs can be folded wheelchairs for storage or movement into a vehicle. A single-arm drive enables the user to turn either left or right while the two-armed drive enables user to move forward or backward on a straight line. Another type of wheelchair commonly used is a lever-drive wheelchair. This type of chair enables the user to move forward by pumping the lever back and forth.

ii.) Electric Wheelchairs

The electric powered wheelchair was said to be invented by George Klein who worked for the National Research Council of Canada, to assist injured veterans during World War II. A power chair can be used by someone who hasn’t got the dexterity or mobility, perhaps, to drive a mobility scooter due to arm, hand, shoulder or more general disabling conditions, and do not have the leg strength to propel a manual chair with their feet. EPWs can offer various powered functions such as tilt, recline, leg elevation, seat elevation, and others useful or necessary to health and function. A power chair user might also have special seating or arm and leg rest requirements that are better served by a power chair than a mobility scooter. The technology involved in electric wheelchairs is similar to that of mobility scooters and some power chair manufacturers are offering models that look more like a mobility scooter than a traditional wheelchair. Today you will find three general styles of electric powered chairs (EPWs)[13]: rear, centre, front wheel driven or four wheel driven. Each style wheelchair has particular handling characteristics. EPWs are also divided by seat type; some models resemble manual chairs, with a sling-style seat and frame, whereas others have ‘captain's chair’ seating like that of an automobile. EPWs [8] run the gamut from small and portable models, which can be folded or disassembled, to very large and heavy full-featured chairs (these are often called 'rehab' chairs). The user typically controls speed and direction by operating a joystick on a controller. Many other input devices can be used if the user lacks coordination or the use of the hands or fingers, such as chin controls and puff/sip scanners. Power chairs are usually controlled by a joystick on the armrest which can be fitted on either armrest to suit left or right handed use. The arm rest can usually be swung out of the way so that the user can get closer to a desk or table for example. If a joystick control isn’t appropriate for the user’s needs, there are other methods [12] of operating the power chair, including a head controller, a sip and puff tube, fingertip control or foot control for those with C2-3 spinal cord lesions or head injuries (the user blows into a tube located near the mouth, which controls the movement of the chair). A power chair or electric wheelchair can bring independence and freedom to those currently reliant on others. Once you have decided on a power chair rather than a mobility scooter or wheelchair, there are still plenty of other choices to be made. Including the price, the style
and size of the power chair, how portable the power chair is, and how far it goes between charges.

iii.) **Paediatric Wheelchairs**
Most paediatrics wheelchairs fall under the following categories: Standard Wheelchairs – These are the so-called traditional styles, Small Child Wheelchairs [14] – This variety is designed for kids under the age of six, Sports/Lightweight Wheelchairs – These are popular for everyday use because of their sporty appearance, lightweight frames, and independent movement. Junior/Child/Growing Paediatric Wheelchairs – They are intended for children who are six years old and over, Specialty Wheelchair – These models require various alterations to a basic chair such as a tilting or reclining option.

iv.) **Manual Paediatric Wheelchair**
Manual paediatrics wheelchairs are the most popular type used by kids of all ages. Motors do not propel this type of wheelchair [15], so either the occupant or caregiver must push the chair around. In addition, children with severe disabilities are not advised to use such kind of mobility aid since they don’t have the capacity to move without assistance.

4. **Working**
We divided the project into main there sections. The first one consists of vehicle (wheelchair) with all sensory parts. The controlling unit for this section is again separated in o two. One is for motor driver control with vice reorganization part, which will be incorporated in PIC18F877A. And other all facilities like sensors and wireless control will be done using Arduino controller. The vehicle control using voice, eye movement, joystick and remote. According to user’s wish he/she can change the controlling mode. So according to user disability the vehicle will ready to use. Also the sensor part will sense the real time temperature, humidity and obstacle. It will more helpful for the patient to survey form any hazard conditions. These sensory results will be monitored at the LCD fixed on remote controller. The heartbeat sensor unit will also sense the heartbeat and if any drastic change happens it will inform the doctor/concern person via SMS, it is done by GSM module incorporated with the Arduino. These are the features that we incorporate in the vehicle section. The motors used for controlling the vehicle movement is servo motor, and semi sleeper part is also done with servo, and the robotic hand will be controlled using both stepper and servo motor, the control signal will be derived from PIC microcontroller.

![Figure 2: Wheelchair section](image-url)
5. Conclusion

The project implementation will help all the people who are dependent on wheelchair for their mobility. All common man can reach out for this wheelchair to become independent if they hold a smart phone. The application built can be useful for many android phones. Wheelchair is simple to operate and does not need any external help. This research project is aimed towards a developed usable, low-cost assistive robotic wheelchair system for disabled people. In the initial work towards this goal, an indoor navigation system and a graphical user interface have been developed.

6. References

[12] D.P. Miller and M.G. Slack.“Design and testing of a low-cost robotic