



# Voice based Power assisted Wheel Chair control using PMDC motors

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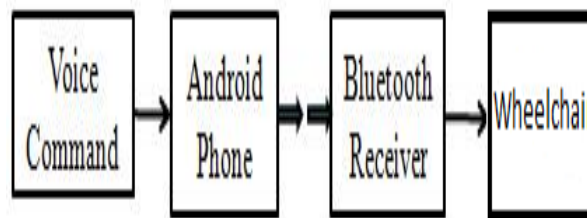
**Abstract:** Most of the usual electric power-driven assisted wheel chairs are using joystick as a input method of control to tactic the powered wheelchairs. The disadvantage of joystick control is that it is not proper for physically disabled person who cannot able to control their activities especially the hands. The planned voice-based powered wheelchair control allows physically disabled person to maneuver the wheelchair easily without the requirement to use hands. The propel of the powered wheelchair depends on the drive system and motor control which consists of Arduino microcontroller and **6V-24V compatible 20A capable DC motor driver**. Once the voice recognition system recognizes the voice commands in comparison to the pre stored memory, the respective coded digital signals would be sent to the microcontroller which then controls the wheelchair accordingly.

**Index Terms - Electric power assisted wheelchair, Arudino, Voice-activated system.**

## I. INTRODUCTION

There are patients who have missing power of both arms and legs, as a consequence of top level spinal cord damage or brain and nervous system disarray. These types of patients can't use the normal wheelchair which depends on the arms muscular force to move the wheelchair. At the same time, they can't use the electrically power assisted wheelchair which is controlled by joystick. So these types of patients still need the help of another person to move their wheelchair from one place to another. Many researchers have planned different methods to control the wheelchair. One of the possible solutions for them is to use their voice to control the wheelchair. Voice recognition technology depends on convert a particular spoken word to an electrical signal which is advance digitized in order to be process by a computer or microcontroller.

In the representation an android function for speech recognition is developed. This application convert the speech command to text and sends it to the wheel chair via Bluetooth. The wheel chair receives the text and compares it with the pre-programmed commands in the microcontroller and execute the related action. This process is depicted in the block diagram shown in figure Fig.1.



**Fig.1 Block Diagram**

## II. ANDROID APPLICATION

Today nearly everybody has a smart phone. Here an android phone is used for speech recognition. An android function was developed particularly for this purpose. When this application is opened and speak button is pressed, it gets prepared for voice command. The user can then give particular voice command for choosing the wheelchair directions. The application processes this voice command and changes it into text. This text signal is sent to the wheelchair wirelessly using the Bluetooth present in the phone. This process is clearly explained in the flowchart shown in figure Fig.2.

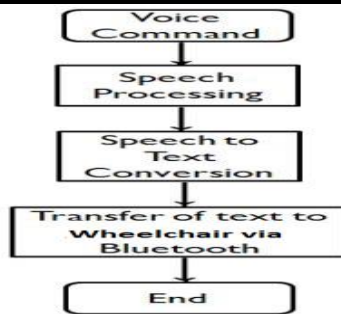


Fig.2 Flow chart of arduino program

### III. WHEEL CHAIR CONTROL

The wheelchair is controlled by using an arduino board consists of the ATmega328 microcontroller. The microcontroller receives the text sent from android phone and compares it with the pre-programmed words. The pre programmed words are 'forward', 'left', 'right', 'back'. and 'stop'. When the command 'forward' is received from the android phone the microcontroller gives the driving signal to both the wheels of the wheel chair for limited period and then stops the signal. When the command 'left' is received from the android phone, the microcontroller gives the driving signal for the right wheel till the wheel chair turns left and then stops the signal. Similarly when the command 'right' is received the left wheel is driven till the wheel chair turns left. When the command 'back' is given both the wheels are driven in the anticlockwise direction i.e. in the reverse direction for a certain period and then stops. When the command 'stop' is given both the wheels are stop the rotation. Powered wheelchair is shown in Fig 3.

- **Forward:** Both the PMDC motors in forward rotation
- **Back:** Both the PMDC motors in backward rotation
- **Left:** Right PMDC motor in forward rotation / Left PMDC motor stopped
- **Right:** Left PMDC motor in forward rotation / Right PMDC motor stopped
- **Stop:** Both PMDC motors stops the rotation.

This process is shown as a flow chart in the figure Fig.4.



Fig 3 Power assisted Wheelchair

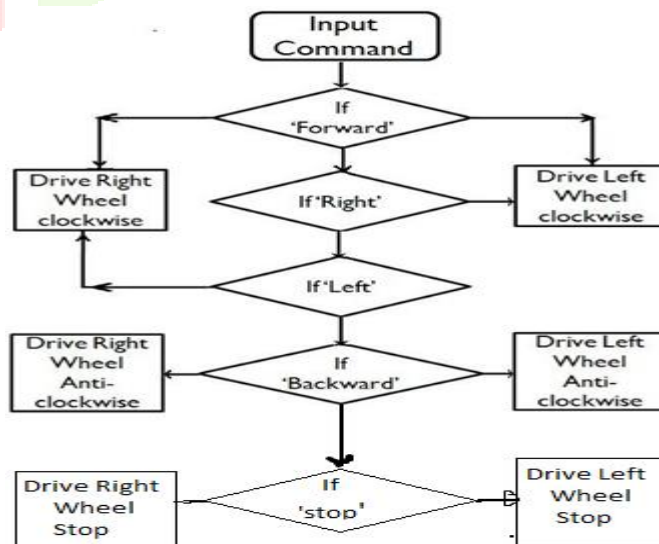


Fig 4: Flow chart of micro controller program

#### IV. BLUETOOTH MODULE

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength radio transmissions in the ISM band from 2400–2480 MHz) from fixed and mobile devices, creating personal area networks (PANs) with high levels of security. It can connect several devices, overcoming problems of synchronization. A Bluetooth module is a hardware component that provides a wireless product to work with the computer; or in some cases, the Bluetooth may be an accessory or peripheral, or a wireless headphone or other product (such as cell phones can use.) In simple words a Bluetooth module is a chip through which wireless Bluetooth communication can be established between two devices.

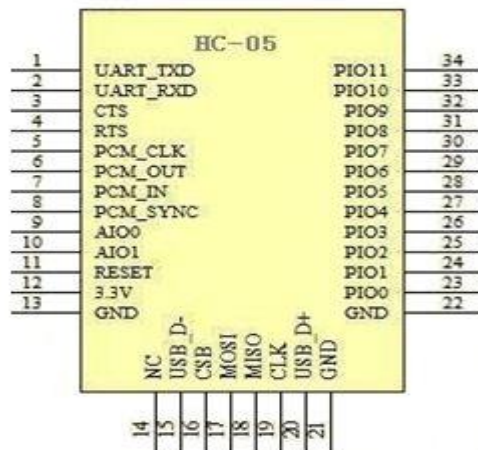


Fig.5 Bluetooth module(HC-05) Pin Configuration

#### V MICROCONTROLLER

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory and I/O peripherals. Microcontrollers are designed for embedded applications, in distinguish to the microprocessors used in personal computers or other common purpose applications. In this model, Atmega328 microcontroller is used. The pin diagram of the ATmega328 is shown in figure Fig.6. The program that controls the wheel chair operation is burned in this microcontroller. According to this program it will give the command signals to wheel chair.

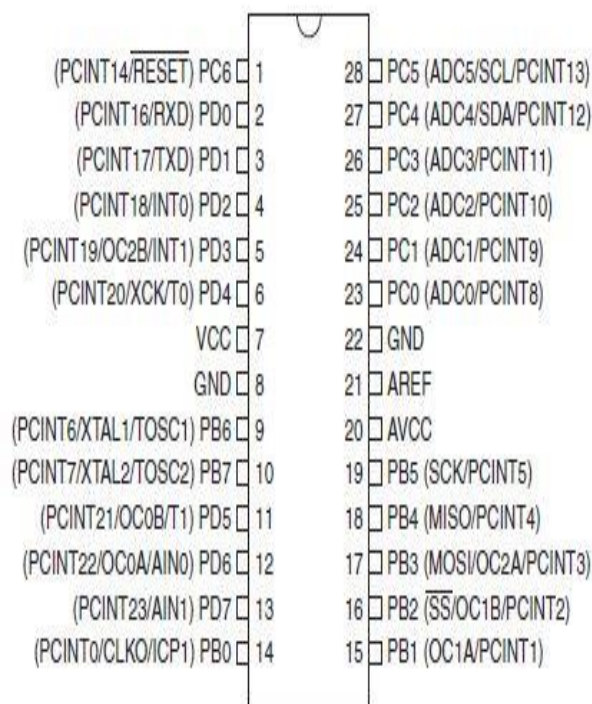


Fig.6 Pin Diagram of ATmega328 Microcontroller

## VI ARDUINO BOARD

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins of which 6 can be used as PWM outputs, 6 analog inputs, a 16 MHz ceramic resonator. Any pin can be used as input or output. This can be programmed according to the user's need. It is reprogrammable device. It is shown in the figure Fig.7.

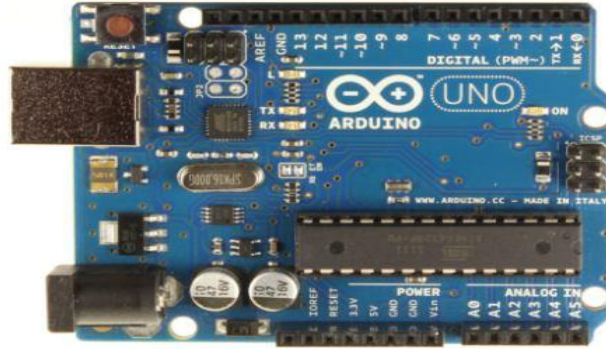


Fig.7 Arduino

## VII MOTOR DRIVE

A RKI-1340 motor drive kit is used to drive the wheels of the wheelchair. The motor driver is driven using 24v DC supply. For precise operation of the wheelchair, it is very important to control the motors effectively. This kit helps to control the motors precisely. Using this kit the motors can be run in both clockwise and anticlockwise direction. It is shown in the figure Fig.8.



Fig.8 RKI-1340 motor driver

## VIII DC MOTOR

The wheelchair moves by two DC motors. The type of DC motors is Permanent magnet. Each one can be started with a maximum of 25kg weight. So the total weight that can be held by these two motors is 50 kg including the wheelchair component. The operating voltage and current are 24Volts and 5 Amps respectively.

## IX RESULTS

The working replica was tested with 5 persons giving all the five command signals. The response was accurate for 99% of the voice commands.

## X CONCLUSION

. The wheelchair is more efficient compared to other methods of control, to help people who have lost the control of their arms. The number of areas in which voice control action can be implemented is wide, like voice controlled wheel chairs, doors, electric appliances, etc. This can be a advantage for the physically challenged people.

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