

# VOICE RECOGNITION BASED WHEELCHAIR ROBOT

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**Abstract**— Physically challenged and old people those who face many problems in daily life have to be depend on a another person to move from one place to another. Many scientists and researchers have been working for to find out the solution from a long time. The invention of wheel chair is a great boon for them but it still limits their motion. In order to make their life a bit easier, many modification in wheel chairs are came into existing such as electric-powered, gesture based, eye movement, finger movement etc. Speech controlled wheel chair can be made using arduinouno microcontroller and HM2007 speech recognition kit. In that research first we stored the user's voice and then these wheelchair robots will recognition this voice and follow their commands.

**Keywords-** Arduinounomicrocontroller, wheelchair, motors, HM2007 voice recognition kit.

## I. INTRODUCTION

About 15% of people in the world have some form of disability that numbers come from a joint effort by the Health Organization and the World Bank. The goal of this project is to design and develop automatic wheelchair which can be controlled by manually as well as with the help of voice commands. This project will help for the movement of people who are physically disabled or handicapped. The result of this project will help such people to live a life with less dependence on others. It is an electric wheelchair fitted with ultrasonic sensor and voice recognition module. The user can control the movement of chair by sending the voice commands such as Forward, Backward, left, right and stop.

## II. OVERVIEW OF THE INTELLIGENT WHEELCHAIR

The main aim is to construct a automatic system which provides solution for the physically challenged people those who can't move by themselves, using speech commands by interfacing the Speech Recognition mini kit(HM2007) with arduinounocompiler having microcontroller Atmega2560 and wheel chair. The Microphone is provided to the person sitting on the wheelchair.HM2007 speech recognition kit registers the commands and proceed them to the microcontroller. Microcontroller takes commands from speech recognition kit and passes them to the motor drivers L293D. Motor driver receives the commands from arduinoand moves the motors according to their logic. The motors are connected to the wheels of wheelchair. Pairs of two motors are connected in parallel on both sides for proper balancing. In our project, voice recognition system is used as user interface. The block diagram of the intelligent wheelchair with motor drive and control system is shown in figure 1. Here we are making a speech recognition based wheel chair for patient who cannot walk and unable to use a wheelchair manually they can navigate the wheel chair by their voice. Here we are using the micro version of voice recognition kit HM2007.Nowadays mostly speech recognition modules are used in voice based systems instead of using whole computer systems to reduce complexity and size of the whole system. For a successful ASR (automatic speech recognition) system speed, accuracy and high flexibility to handle large variance in speech patterns are essential characteristics. The voice recognition module can identify the commands through microphone. It receives configuration commands through serial port connector.

## III. HARDWARE COMPONENTS USED IN CIRCUIT

### i. Arduino Compiler

Arduino is a tool for making devices that can easily sense and control more of the physical world than desktop computers. It is a microcontroller development board for writing software for the hardware circuitry. It consists of an ATmega2560 microcontroller. The Atmel Atmega2560 is a low-power CMOS 8-bit microcontroller based invar enhanced architecture. By executing powerful instructions in a single clock cycle, the Atmega2560achieves throughputs approaching 1 MIPS per MHz allowing the system designed to optimize power consumption versus processing speed. Fig.1 shows the complete Arduino Board that is used in the proposed hardware.

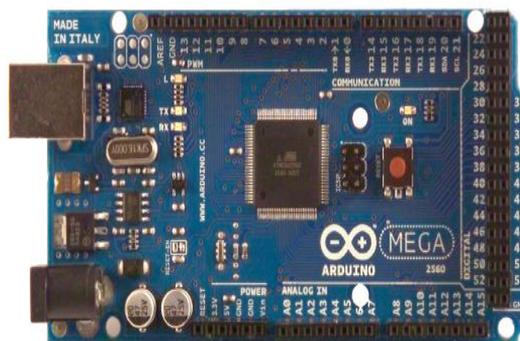


Figure 1 :Arduino compiler

## ii. Voice Recognition Module

The voice recognition module that has been described earlier in this paper can recognize voice commands. With this module, theca or other electrical devices can be controlled by voice command. 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 command. 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 Atmega2560 microcontroller. The microcontroller send control signal in the form of binary logic to drive motors of wheelchair. DC Geared motors are used for controlling the two pairs of wheels of the chair independently.



Figure 2: Voice recognition module

## iii. Motor driver L293D IC

The most common method to drive DC Motors in 2 directions under control of computer is with an H-Bridge motor driver which can be seen in the figure 3 given below. The L293D is an integrated circuit motor driver that can be used for simultaneous, bi-directional control of 2 small motors. It is used to drive two pairs of DC motors simultaneously, both in forward and reverse direction. The motor operations can be controlled by input logic at pins 2 & 7 and 10 & 15.

## vi. DC Geared Motors

It is a simple type of motor which uses electricity and a magnetic field to produce for operation of motor. It consist of 2 magnets of opposite polarity & an electric coil, which acts as an electromagnet. The repellent and attractive electromagnetic forces of the magnets provide the torque that causes the DC motor to turn. They are used them for the wheels of wheelchair.

## IV. WHEELCHAIR OPERATION

When the voice is detected, the wheelchair can be controlled to move in that particular direction by giving commands to the wheelchair. These commands are transferred to the wheelchair using electrical signals which are used the drive the left or right pairs of motor of the wheelchair. There are basically four motors connected to the left and right side of the wheelchair. The electrical signals are transferred to these motors using some hardware ports, called the communication ports. Generally, the communication port is the parallel port. There are some basic predefined pins of this parallel port which accept the commands given to the wheelchair in the form of electrical signals. For the purpose of demonstration of wheelchair movement using voice command, a wheelchair model is designed in this project, which works on batteries.

## V. FUTURE SCOPE

Further advancement in this wheelchair is possible by decreasing the power requirement of wheelchair or finding another way to automatically charge the battery with the help of motion of the wheelchair. Here the wheelchair can control by voice, another proposed method is controlling of wheelchair by the control of mind. By this person can control the motion of the same by just thinking itself. This wheelchair can be modeled in such way that it can be easily turned into a semi sleeper mode in order for the patient to feel more comfortable and thereby reduce the continuous one mode sitting problem. Other already invented method in wheelchair can also be incorporated with this, like step climbing wheelchair and inter communication between devices which is just an upcoming project trying to be implemented on road vehicles. The communication aid with this wheelchair will

help the deaf and dumb to communicate with each other's too. These all are the future works we can propose regarding this voice recognition based wheelchair

## VI. CONCLUSION

The motor drive and control system of the intelligent wheelchair has been presented. The proposed ARM Processor based voice operated intelligent wheelchair would bring more convenience for the disabled people. The technology can also enhance safety for users who use ordinary joystick-controlled powered wheelchair. A headphone with attached microphone can be used to give voice commands. This system provides independent mobility as well as many intelligent facilities to the rising disabled population.

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