



Wheelchair Control Using Voice Recognition

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Abstract— The main objective of our project is to design a wheel chair for physically disabled persons, controlled by voice input. The entire system is controlled by the PIC (16F877A) microcontroller and the voice recognition IC (HM 2007) is used, which is capable of storing voice signals, and generating good recognition performance on highly disordered speech. The voice IC consists of non-volatile memory back-up with 3V battery onboard, which will store the speech recognition data in RAM after the power off condition. Whenever a voice is given as input in the Mic the received voice is compared against the stored voices. On successful matching of the voice the HM2007 IC will send the corresponding codes to the controller. The controller interprets the command and activates the I/O ports accordingly. The Wheelchair rotation will be based on the motor connected to it. The motor is controlled by the I/O of the controller.

Index Terms— voice recognition IC (HM 2007).

I. INTRODUCTION

WHO estimates that in 2002 in the USA there were 2.7 million wheelchair users in the ages of 15 years and older and 121,000 wheelchair users under 15 years of age. This is a total of over 2.8 million U.S. wheelchair users. From a population of 300 million this is just under 1%. England's population being around 50 million and the UK being around 61 million, this would put the percentage of wheelchair users 1%. Developed countries are the usual market for wheelchairs and wheelchair related products. World banks says that there are 70 million people are handicapped persons. In India there are 120 million people are disabled, in that 41.32% are physically disabled. Unfortunately, the physical disability increases due to accidents or some disasters. Since the disability factor increases the wheelchair usage increases in the world.

Therefore, it will not be easy for the handicapped people to do their daily works. They have to depend on others to do their works.

So a wheelchair which can be operated automatically by the user itself will be more than easy for them. Hence voice operated wheelchair has been introduced for the handicapped people which can be operated by the user voice. This voice operated wheelchair will work on the input given by the user. Already the voice command will be stored by the user. If the input matches the already stored command the wheelchair will be operated as per the command given to it. In this PIC controller and HM 2007 voice IC is used for processing the commands.

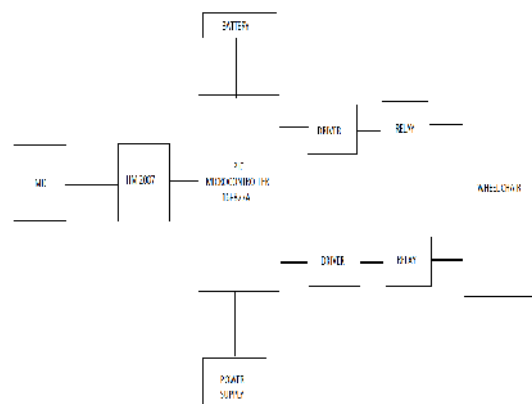
With a population of developed countries in excess of 1 billion and an estimated 1% of the population being wheelchair users, the number of wheelchair users in developed countries would be in excess of 10 million people. If a person is handicapped he is dependent on others for his day to day works. So a voice operated wheel chair is developed which will operate automatically on the commands from the handicapped user.

II. LITERATURE SURVEY:

The voice recognition system exists with accuracy of 67%. The trial highlighted some issues with limited performance and usability of device when applied in real usage situation. The exiting paper uses of window mobile pocket for PC operating system. This may causes of increase in cost, so in our paper we use of voice IC (HM-2007) for recognition purpose and PIC control to process the system. This may reduce the cost and easy to operate, it also has high performance in real time usage than in the existing concept.

III. HARDWARE REQUIREMENT AND WORKING PRINCIPLE

BLOCK DIAGRAM:



A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. The program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM.



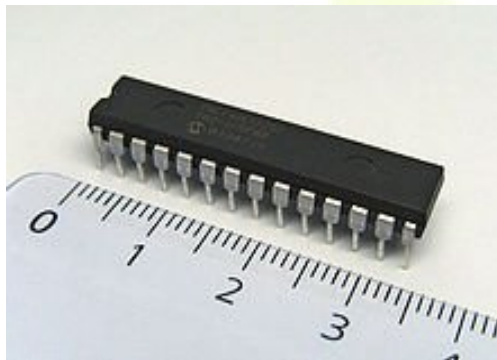
Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

The voice input from the subject is stored in the HM2007 voice recognition IC. Whenever a voice is given as input in the mic the received voice is compared against the stored voices. On successful matching of the voice the HM2007 module will send the corresponding codes to the controller. The controller interprets the command and activates the I/O ports accordingly. The Wheelchair control will be based on the motor connected to it. The controller sends the electrical pulses to the relay board, which in turn controls the motor by switching it on or off

REQUIREMENTS:

Structure	Specification
Gesture	Voice recognition
Communication	Input as speech signal Frequency range-2.4
Processor	PIC 16F877A
Voice IC	HM 2007

PIC CONTROLLER:



PIC 16F877 is one of the most advanced microcontroller from Microchip. This controller is widely used for experimental and modern applications because of its low price, wide range of applications, high quality, and ease of availability.

FEATURES:

- Maximum operating frequency is 20MHz.
- Flash program memory (14 bit words), 8KB.
- Data memory (bytes) is 368.
- EEPROM data memory (bytes) is 256.
- 5 input/output ports.
- 3 timers.
- 2 serial communication ports (MSSP, USART).
- PSP parallel communication port
- 10bit A/D module (8 channels)

This is easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC architecture into a 40- or 44-pin package and is upwards compatible with the PIC16C5X, PIC12CXXX and PIC16C7X devices. The PIC16F877A features 256 bytes of EEPROM data memory, self-programming.

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. In this we use of PIC controller, which is referred to as Peripheral Interface Controller. PIC devices are popular with both industrial developers and hobbyists due to their low cost, wide availability, large user base, extensive collection of application notes, availability of low cost, serial programming, and re-programmable Flash-memory capability. In this system we use of 16 bit, 40 pins PIC and it has of 5 I/O ports.

VOICE IC [HM 2007]:

The speech recognition system is a completely assembled and easy to use programmable speech recognition circuit. Programmable, in the sense that you train the words you want the circuit to recognize. This board allows you to experiment with many facets of speech recognition technology. It has 8 bit data out which can be interfaced with any microcontroller for further development. Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies, Speech to text translation, and many more.

And it is used to store the voice signal and to recognize the input with that stored signal, if it matches then it will send the command or the codes to the controller, the voice IC [HM 2007] used consists of 40 pins in it, which is capable of recognize voice at quicker rate.

The chip provides the following error codes.

55 = word to long

66 = word to short

77 = no match

The circuit must be designed to recognize error codes 55, 66 and 77 are not confuse them with word spaces 5, 6 and 7.





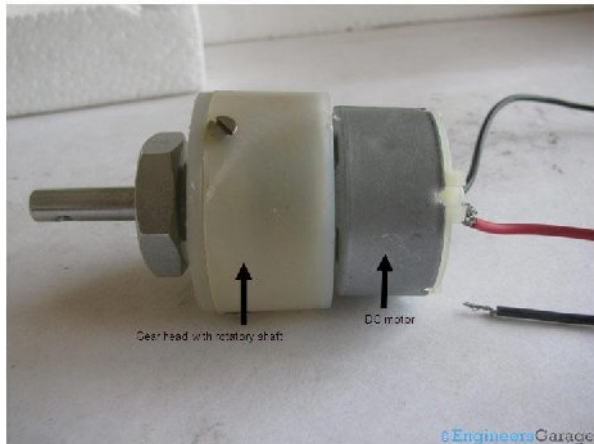
In this voice IC, we can store of different voice signals. It can store upto 40 words in it. This voice IC has of maximum word length 1.92 seconds. It also has of response time less than 300 milliseconds.

SPECIFICATIONS

Structure	Specification
Input voltage	9 to 15 V DC Use a commonly available 12V 500ma DC Adapter
Output data	8 bits at 5V Logic Level
Interface	PIC 16F877A
Word capacity	Upto 20 words

GEAR MOTOR:

Geared DC motors can be defined as an extension of DC motor. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.



The motor is an electrical device which is used to rotate or to move the objects. In this we use of Gear motor which has of less torque and pulling capacity. And also the power consumption of the gear motor is low. Two gear motors has been used in order to pull the two wheels of the wheel chair.

RELAY& DRIVER:

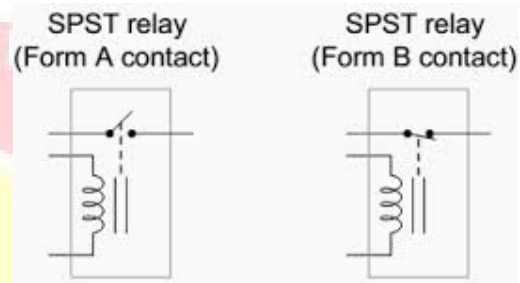
A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a low-power signal (with complete

electrical isolation between control and controlled circuits), or where several circuits must be controlled by one signal.

Driver operates on 12V power supply. It provides DC current up to 4A. The operating supply voltage is up to 46V. It is a high voltage and high current dual full bridge driver IC having 15 pin. This is used to drive the DC motors.

ADVANTAGES:

- A handicapped person even with legs and hand can use this and become independent.
- Less Hardware require i.e. compact.
- Economical.
- Reduce manpower.
- User friendly.



POWER SUPPLY AND BATTERY:

The power supply is to give supply to the circuits for functioning. The power supply consists of a step down transformer which reduces the voltage supply to 12v. Then, the AC supply is rectified into DC supply using the rectifier. Further, they are regulated at 12v/5v using voltage regulators. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies.

RESULT:

COMMAND	RESULT
Move forward	Wheel chair moves forward direction
Move reverse	Wheel chair moves backward direction
Left	Wheel chair moves left side direction
right	Wheel chair moves right side direction

IV. CONCLUSION:

This paper has described the development of portable, voice communication is controllable by automatic speech recognition. The voice IC is used in order to recognize the voice efficiently and to operate the wheelchair in a significant manner. It will help the physically disabled people to do their



works without depending on others. And also this voice operated wheelchair will be more useful in hospitals and orphanages. The device can be configured to enable the user to create either simple or complex messages using a combination of a relatively small set of input “words.” Evaluation with a group of potential users showed that they can make use of the device to produce intelligible speech output. A person with disabled with legs and arms can use this wheel chair efficiently if he is able to speak.

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