International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

Automated Voice Based Home Navigation System

Vishal Dalvi[1], Poonam Pathak[2]

[1]Pursuing M.TECH. (Lord Krishna College Of Technology, Indore) India

[2]Assistant Professor, Dept of EC (Lord Krishna College Of Technology, Indore) India

Abstract: ***This project describes the design of a voice controlled wheelchair and home appliances using embedded system. Proposed design supports voice activation system for severely disabled persons incorporating manual operation with switch. PIC Microcontroller (16F877A) and voice recognize processors (HM2007) were used to support the wheel chair and home automation. This is a unique system incorporating both wheel chair control through voice and the home automation which provides reliability, safety and comfort.***

Keywords: Wheel chair, PIC Microcontroller, HM2007, Voice Command, Interfacing Circuits

1. Introduction

The most common image of disability is the people in wheelchairs. Wheelchairs are used by people who find themselves unequipped to move without external aid. The special needs of the elderly may differ from that of a physically challenged person or a large individual but they all have "special needs" and often require some assistance to perform their daily routine as shown in [1]. The idea of using voice activated technology for controlling the motion of the wheelchair and home automation are to prove that it can be a unique concept that would stand apart from the rest of the average projects.

The use of this new technology in conjunction with a mechanical system in order to simplify everyday life and it would spark interest in an ever growing modern society. Many people with disabilities do not have the dexterity necessary to control a switch on an electrical wheelchair. This can be a great for the quadriplegics who is permanently unable to move any of the arms or legs. They can use their wheelchair easier only using voice commands and also they can control home appliances. The aim of this study is to implement an interesting application using small vocabulary word recognition system.

The resulting design is used to control a wheelchair and home appliances for a handicapped person based on the vocal command. In order to gain in time design, tests have shown that it would be better to choose a speech recognition kit and to adapt it to the application [2-3].Research from University of Notre Dame, 2000, suggests that the current power wheelchair control interfaces used may not, be adequate to provide truly independent mobility for substantial number of person with disabilities. The Respondents to the survey reported on average that approximately ten percent of the patients trained to operate a power wheelchair cannot use the chair upon completion of training for activities of daily living or can do so only with extreme difficulty (Linda Fehr, 2000).

The main objective of the project is to design and implement a wheelchair for disabled a person which is controlled by the voice of user or by switch in case voice kit gets fail. There are seven conditions for basic motion of the wheelchair and control of home appliances to be applied by the user. Such as moving forward-backward, turning right-left, static or stop and light on and off.

2. Block Diagram

2.1 .Block Diagram of Voice Controlled Wheel Chair

In fig 1. the operator gives voice as input in order to drive the wheelchair to the desired position. Mic which converts the voice signal to the electric signal and the signal is given to the voice recognition module. The voice recognition module converts the analog signal into digital signal and the signal is transferred to the pic microcontroller. The microcontroller will take the decision to move forward or backward or left or right with help of relay switching unit.

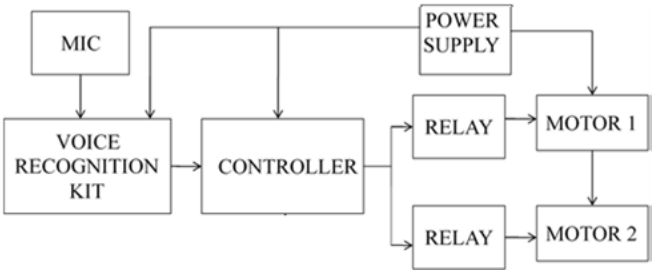

Figure 1: .Block Diagram of Voice Controlled Wheel Chair

2.2 Flow Chart for System Design

A flowchart is used as diagrammatic representation of the problem and also provides a complete solution in analyzing, designing, work process or program. The flowchart for system design is shown in Fig 2

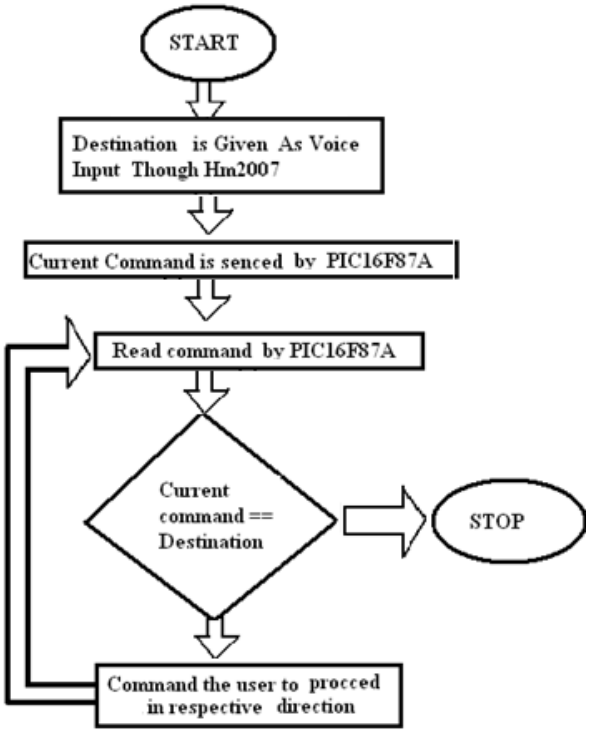

Figure 2: Flow chart of system design

The main part of the design is to control the motion of the wheelchair. There are four condition of motions are considered, moving forward, moving in reverse direction, moving to the left and moving to the right. For the speed, the user may uses low or fast speed command. The system starts by applying the supply voltage to the speech recognition circuit. For fast condition the system will supply higher current to the motors.

If the user does not want the wheelchair move in high speed, the slow speed command can be set by applying low current supply to the motors. The direction and speed of wheelchair depends on the user. Forward command the wheelchair move in forward direction. For the reverse direction the opposite movement of wheel rotation will occur.

2.3 Voice Command

The left command will make right wheel moves forward and left wheel moves backward. The right command makes left wheel moves forward and right wheel rotate backward. In this system, by assigning the word command stop the rotation of both motors will stop. The wheelchair system will go back to the stand by condition or end the whole system by turning off the power supply of the speech recognition board. The voice commands used are as the table 3 shown below.

Table 3: shown below Voice Command

Voice Command	*Conditions*
FORWARD	Moving Straight to the Forward
REVERSE	Moving Straight in the Backward
LEFT	Turning to Left
RIGHT	Turning to Right
STOP	No Motion /Wheelchair Stops
ON	Giving the Supply to the Wheelchair
OFF	Switching Off the Supply

3. Circuit Diagram

3.1 Power Supply

Fig 4 shows Power Supply using 7805 voltage regulator IC. 7805 is a 5V fixed three terminal positive voltage regulator IC.

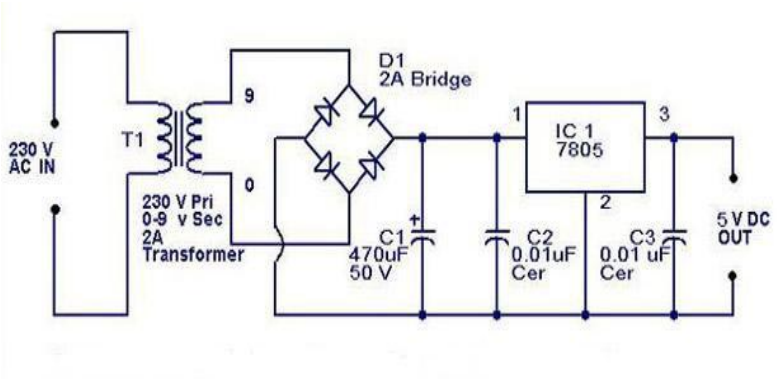

Figure 4: Power Supply

The IC has features such as safe operating area protection, thermal shut down, internal current limiting which makes the IC very rugged. Output currents up to 1A can be drawn from the IC provided that there is a proper heat sink. A 9V transformer steps down the main voltage, 1A Bridge rectifies it and capacitor C1 filters it and 7805 regulates it to produce a steady 5Volt DC. The circuit schematic is given below.

3.2 HM2007 (Voice Recognition Kit)

HM2007 is a single chip CMOS voice recognition LSI circuit with the on-chip analog front end, voice analysis, recognition process and system control functions. A 40 isolated-word voice recognition system can be consists of external microphone, keyboard, 64K SRAM memory combined with the microprocessor. 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 (or vocal utterances) 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 the pic microcontroller for control the motor direction.

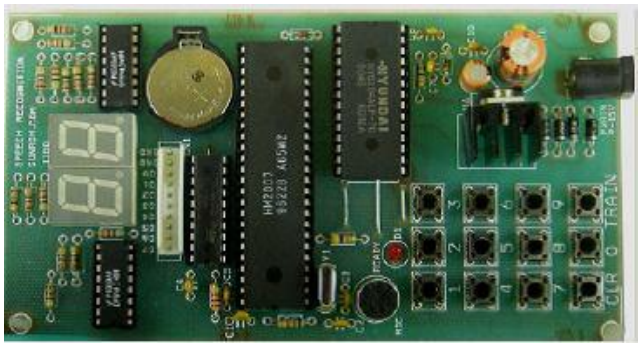

Figure 5: Voice Recognition Kit

3.3 Circuit for Motor Interfaced with PIC Using Relay Driver Ul2003a

In the project the motors are controlled through the relays which as connected through UL2003A. To operate the relay the output current from the microcontroller is not sufficient to actuate the relay so the IC UL2003A is used to amplify the output current of the microcontroller. Thus the relays can be actuated to control the motor. VDD, VSS of the pic microcontroller and GND of ULN2003 are not shown in the circuit diagram. VDD should be connected to +5V and VSS, GND to 0V (GND)

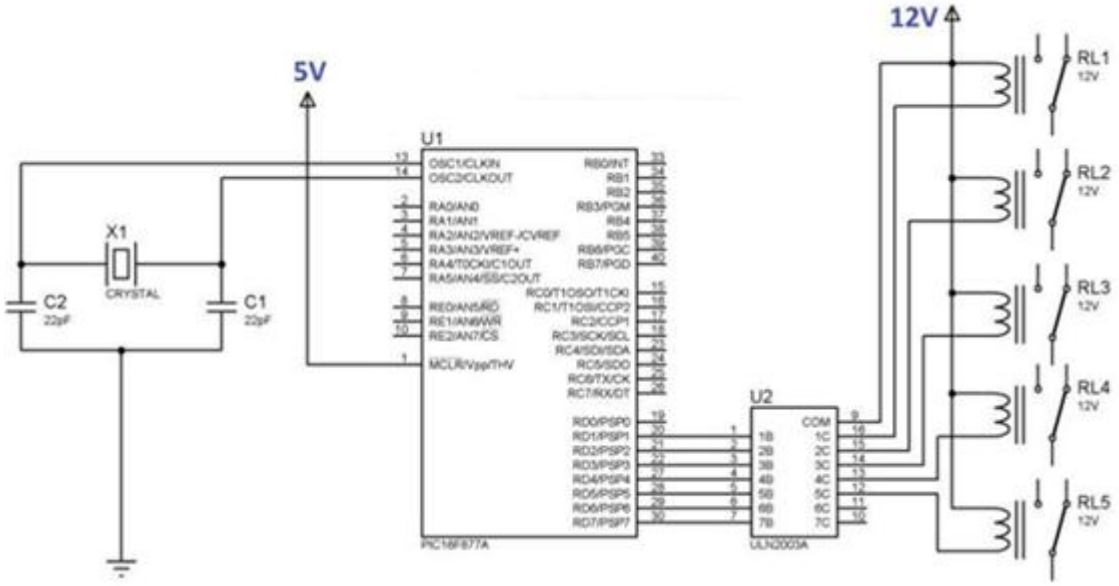

Figure 6: Circuit for Motor Interfaced with PIC

4. Hardware Results

The manual wheel chair has been designed to be an electrical wheelchair with the interfacing circuits. It uses a wheelchair motor which was specially designed for the purpose to move the wheelchair with a load. The wheelchair motors normally have high torque and high revolution per minutes (rpm). The fig 3.6 shows the hardware design of the wheel chair with therequired interfacing circuits.

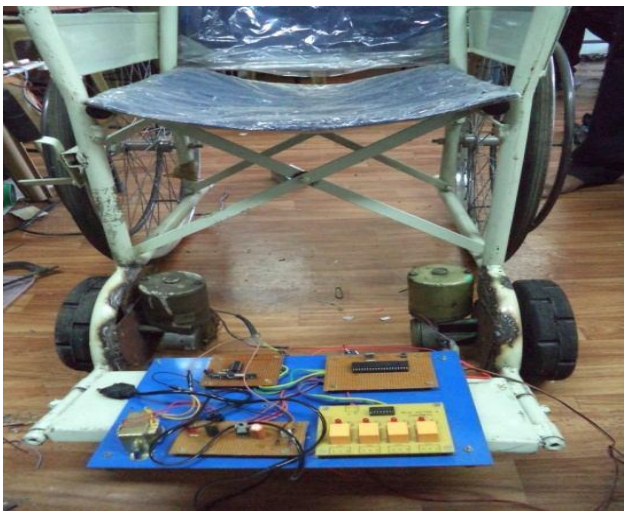

Figure 7: Voice Controlled Wheelchair

5. Conclusion

In this paper the design and implementation of a voice controlled wheelchair for disabled people using voice recognition processor HM2007 as well as switch control for acquiring and distinguishing the command for controlling the motion of a wheelchair & home appliances is shown. The direction of the wheelchair now can be selected using the specified voice commands or switch. The person sitting in the wheel chair can operate the home appliances (ie., Switching ON and off) through voice commands without moving. The design not only reduce the manufacture cost compared with present market but also will give great competitive with other types of electrical wheelchair. This project has many advantages like safety, comfort, energy saving, full automation etc. Thus a trained voice is only needed to ride the wheelchair. The future design can be improved by implementing wireless communication in the wheel chair. By improving this system, we directly enhance the life style of the disabled people in the community.

6. Future Scope

For future technology wheelchair would be fully autonomous that will move automatic based on the user expression and behavior. That should be fully automatic and wireless. In this project firstly we are working on the voice based automatic wheelchair and after that we will combine

upcoming latest Technology like software based that will be controlled by computer and gsm mobile phones. After that we are thinking on putting a biometric feature in it that should be little bit secured for the use.

References

[1] SPECIAL NEEDS AND DAILY LIVING – SPECIAL NEEDS SOLUTIONS FOR ALL.
[2] Cooper, R.A. (2002). Intelligent Control of Power Wheelchair. IEEE Engineering in Medicine and Biology Magazine. 14: 423-431.
[3] Simon P. Levine, David A. Bell, Lincoln A. Jaros, Richard C. Simpson, Yoram Koren, and Johann Borenstein. (1999). The navchair Assistive Wheelchair navigation System. IEEE Transaction on rehabilitationengineering.7
[4] G. Davinder, A. Caleb, C. Michael, H. David, C. Randy.(2003). Remote Access Trainable System. University Of British Columbia: Final Report.
[5] Linda Fehr, MS. W. Edwin Langbein, Steven B. Skaar. (2000). Journal of rehabilitation Research and Development. Adequacy of power Wheelchair control interfaces for persons with severe disabilities: A clinical survey. 37(3):353-360.
[6] Kailash Pati Dutta, *et al.*, Microcontroller Based Voice Activated Wireless Automation System, *VSRD-IJEECE*, 2 (8), 2012, 642-649.