A Smart Wheelchair Control System For The Physically Disabled

Rakshitha S[1],S Tejeswy[2], Rewati Kashyap[3], Prem Brat Kumar[4], Avinash Kumar[5]
[1, 2, 3, 4, 5] Dept of Computer Science and Engineering
[5]Assistant Professor, Dept of Computer Science and Engineering
[1, 2, 3, 4, 5]Atria Institute of Technology

Abstract- *In order to assist the physically challenged people. we developed a voice-controlled wheelchair. It integrates a microcontroller, wireless microphone, voice recognition Processor, control interface board to the wheelchair by using the system the users are ready to operate the wheelchair by simply speak to wheelchair microphone. The basic movement function including forward and reverse direction, left and right turns and stop it utilize a PIC controller microchip to regulate the system operations. It communicates with the voice recognition kit to detect the words spoken then determines the corresponding output command to drive the left and right motors. The objective of this project is to the movement of people who are disable or handicapped and elderly people who are not able to move well. The goal of this technique will allow certain people to measure a life with less dependence on others for his or her movement as a daily need. Speech recognition technology may be a key technology which can provide a replacement way of human interaction with machine. The issues that they face are often solved by using speech recognition technology for the movement of wheel chair.*

Keywords- Arduino UNO microcontroller, DC motor, Physically-challenged, Voice Command, Wheelchair.

I. INTRODUCTION

The main objective of this paper is to implement a voice recognition system onto a wheel chair for controlling its movement. The user will be able to control the wheel chair by speaking instructions into the microphone which will further be processed by the various components and which in return moves the wheelchair. There are two types of commands that can be given to the electronic device which are the voice commands and the gesture commands. To perform functions a handicapped person with locomotive disabilities needs a wheelchair that requires the individual to move around. They can do so manually by pushing the wheelchair with their hand. Many folks have weak upper limbs or find the manual mode of operating to tiring. The it is desirable to provide them with a motorized wheelchair which is controlled by voice commands.

A wheelchair is vital, that it's ready to avoid obstacles automatically in real time, it can move at a good speed. Cost of this motorized wheelchair is affordable for many handicapped people as possible, as well as for organizations that support it. With these requirements in mind we propose an automatic wheelchair with real-time hurdle avoidance capability. The power wheelchair control interfaces currently still not enough to supply mobility for substantial number of persons with disabilities. Through research and design wise, the wheelchair to control development along safe and effective use of the provision independence and mobility. This project will provide innovative solutions to handle the wheel chairs to use voice interface. There are five basic movements of a wheelchair to be applied by the user. The five operations that will be performed by the wheelchair are described as following.

- Moving Backward
- Moving Forward
- Turning to the right
- Turning to the left
- Stop condition

II. LITERATURE SURVEY

H. Rashid, S. B. Osman, N. Hassan, I. U. Ahmed, R. Das, and M. Karim, "A New Design Approach of Home Automation System for Patients with Physical Disability to scale back Water Wastage and Power Consumption using Renewable Energy"[1] in Proceedings of the 2017 4th International Conference on Advances in Electrical Engineering, 2830 September, 2017, Dhaka, Bangladesh, pp. 770-774. The disadvantage of this system is that it is not specifically designed for people with disabilities since they do have direct control of the appliances through the system controls.

Iqbal, M. Arifin, and A. Hossain, "Smart home appliance control system for Physically Disabled People using Kinect and X10", in 2016 5th International Conference on Informatics, Electronics and Vision (ICIEV), pp. 891-896. The

disadvantage of this system is that it only works for people who are unable to speak.[5]

K. V. Sai, B. Vamshi, and V. K. Mittal, "Wireless Voice-Controlled Multi-Functional Secure Home" [3] IEEE Transactions, pp. 2235-2240. The disadvantage of Home is that users have to learn commands in order to control the system and the complexity of the system makes it harder to use especially by people with disabilities.

D Sun and V. Tejaswi, "Implementation of Speech Based Home Automation System using Bluetooth and GSM" [5] in International Conference on Signal Processing, Communication, Power and Embedded System (SCOPES)-2016, pp. 807-813. We contend that this system is complex for a person with disabilities and could also be expensive compared to our solution.

III. PROPOSED SYSTEM

Several studies have concluded that the independent mobility or movement which is included in powered wheelchair, manual wheelchair and walker access the benefit to all or any of the disabled citizenry. Independent mobility increases vocational and academic opportunities, reduces dependence on other members, and promotes feelings of self-reliance and independent mobility plays an important role in building the inspiration for much early learning for young people. The lack of exploration and control often results into a cycle of deprivation and lack of motivation that leads to learned helplessness. For aged people, independent movement is an important aspect of esteem and plays a vital role in "aging in place". Mobility difficulties led to the problem of activities of daily living (ADL) and instrumental ADL disabilities due to the necessity to accomplish many of those activities. The impaired mobility often leads to reduced opportunities to possess socialized policies, which results in social isolation, and lots of mental problems. While the requirements of the many individuals with disabilities are often satisfied with traditional, manual or self-automated wheelchairs, a segment of the disabled community finds it difficult or impossible to use wheelchairs independently. The disabled population includes people with low vision, visual field reduction, spasticity, tremors, or cognitive deficits. These individuals depend on other people for mobility to push them in a manually handled wheelchair. To oblige this population, specialists have utilized diverse technologies originally developed for power wheelchairs- designed of varied ways, like ensuring collision free travel, aiding the performance of specific tasks (e.g., passing through entryways), and independently transporting the user between locations. The idea of using voice base technology for controlling the movement of the wheels of wheelchair is to demonstrate that this project stands one step ahead of other average projects. The use of this new technology in conjunction with a system so as to simplify lifestyle would spark interest within the developing modern society.

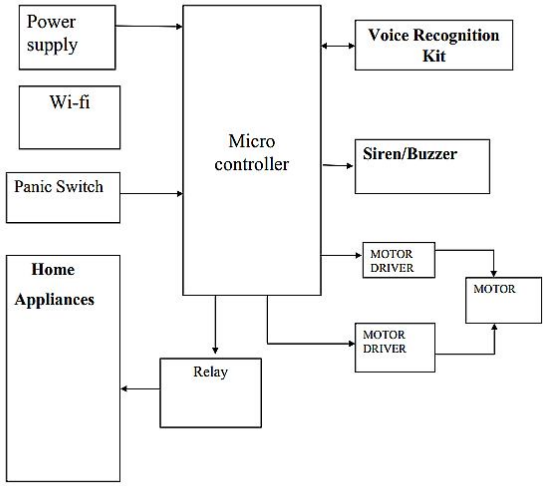

Fig1: Block diagram of the system

IV. IMPLEMENTATION

HARDWARE:

Block diagram of voice operated wheelchair consist of following blocks.

1) Microcontroller
2) Voice Recognition Block
3) Driver IC Block
4) DC Motor Block
5) Battery
6) Battery Charger

The description of blocks is as follows.

1) Microcontroller

This is a 28pin programmable interrupt microcontroller. It is a High-Performance RISC CPU. This is used for controlling the movement and direction of wheel chair by controlling the 2 DC motors. The details of microcontroller are given in the following section.

2) Voice Recognition Block

The voice recognition unit consists of the HM2007 IC. It is an out-sized Scale Integration (LSI) circuit with voice recognition processor and functional system embedded during a single chip Complementary Metal Oxide Semiconductor (CMOS) In this mode, the unit responds only to the current user.

3) Driver IC Block

Metal Oxide Semiconductor (CMOS) In this mode, the unit responds only to the current user.

4) DC Motor Block

The L293D is meant to supply bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads like relays, solenoids, dc and bipolar stepping motors, also as other high current/high-voltage loads in positive applications.

5) Motor (DC)

Two 12V dc motors are used in this experiment.

6) Battery Charger

This section is consisting of a rechargeable battery. This section deals with the power requirements of the wheel chair for DC motors 5V regulator IC by converting 12V into 5V.

SOFTWARE REQUIRED:

MP LAB compiler is used for Programming the Microcontrollers.

Embedded C is the Programming language used.

Proteus 7 is used for simulation of the circuit.

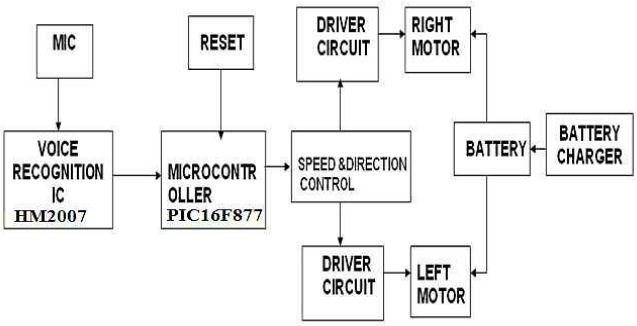

Fig2. User interface of the application to control the wheelchair

The above figure is that the screenshot of the appliance to acknowledge the voice and control the wheel chair using voice commands. User first connects the mobile with the Bluetooth module of the wheel chair. Then, the user can control the wheelchair with the assistance of varied voice commands like Go-ahead, Go-back, Turn-right, Turn-left, Stop.

V. FUTURE ENHANCEMENT

If a person wants to move somewhere, all they have to do is to look in that direction for three seconds. The user interface will trace out the path in which you want to move.

Finding a way of automatically charging the battery with the help of motion of wheel chair.

In this technology person can control the motion of the same by just thinking.

VI. RESULTS

The project was tested for the movement of the wheel chair using trained voice after the planning and development of the self-automated wheel chair with its various interfacing units.

On the idea of two important aspects, firstly, on the accuracy of the voice system and secondly, wheelchair velocity by means of control commands this design is experimented. The voice recognition system was tested in a quiet room with only one single user. Every word was correctly recognized.

We tested it with a different user on whom the system was not trained. This was because the recognizer heard a special pronunciation. However, after the user had to talk the word variety of times the system had enough examples and properly determined what pronunciation the user uses to speak the word.

After this technique was tested in a noisy room by turning on some music. There was no problem in correctly recognizing the words when the music was light but the recognizer found it difficult to recognize the users voice when we turned the volume high.

VII. CONCLUSION

The efficiency to detect voice command and control of the wheel chair is significantly increased. This voice operated wheel chair will assist the handicapped person to be self-dependent for movement that these people are usually

dependent for most of the times. A person with disable legs and arms can use this wheel chair efficiently if he's ready to speak.

The lives of people with disabilities do not have to be hopeless just because of their physical limitations. Technology, for a long time, has not been focused on how it can be used to better their lives so that they can enjoy a better quality of life .When one considers the cost of these smart devices, one quickly realizes that people with disabilities are unable to afford them, especially if they live alone on a fixed budget. The system presented in this paper, is much simpler, easy to use, makes the interaction more natural, and is much less expensive.

REFERENCES

[1] "Voice Operated Intelligent Wheelchair" by Ms. S. D. Suryawanshi,Mr. J. S.Chitode, Ms. S. S. Pethakar, " International Journal of Advanced Research in Computer Science and Software Engineering.

[2] "Voice Based Direction and Speed Control of Wheel Chair for Physically Challenged by M.Prathyusha, K. S.Roy, Mahaboob Ali Shaik, " International Journal of Engineering Trends and Technology (IJETT)" ,

[3] "A Wheelchair Steered through Voice Commands by Gabriel Pires and Urban Nunes "Journal of Intelligent and Robotic.

[4] "Smart Wheelchairs: A literature Survey", by Richard Simpson "Journal of Rehabilitation Research & Development F. Daerden and D. Lefeber, The concept and design of pleated pneumatic artificial muscles. International Journal of Fluid Power,vol.2,no.3,2001,pp.41-45http://msdn.microsoft.com/enus/ library/default.aspxK. R. Castle man, Digital Image Processing, Pearson Education, 1996.

[5] D. Murray and A. Basu, „Motion tracking with an active camera", IEEE Trans. Pattern, Analysis and Machine Intelligence, Vol 16, No. 5, pp.449-459, 1994.http://www.voicerecognition.com/

[6] N. Otsu. A threshold selection method from gray-level histogram, IEEE Trans. System, Man, and Cybernetic. vol. 9, no.1, pp. 62-66, 1979