Voice Controlled Wheelchair with Home Appliances Control for Physically Handicapped People

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Abstract— The system is designed to control a wheelchair using the voice of consumer. The objective of this project is to facilitate the movement of people who are disabled or handicapped and elderly people who are not able to move well. The result of this design will allow certain people to live a life with less dependence on others. Speech recognition technology is a key which may provide a new way of human interaction with machines or tools. Thus the problem that they are faced can be solved by using speech recognition technology to move the wheelchair. This can be realized with used the microphone as an intermediary

Key words: Wheelchair, Physically Handicapped

I. INTRODUCTION

The power wheelchair control interfaces currently still not enough to provide truly independent mobility for substantial number of person with disabilities. Through research and design wise, the power wheelchair to control development along safe and effective use of the provision independence and self-use mobility. This project will provide disability weight innovative solutions to handle the wheel chairs to use voice interface.

A voice controlled motorized wheelchair with real time is designed and implemented. It enables a disabled person to move around independently, using a voice recognition application which is interfaced with motors. The prototype of the wheelchair is built using a micro-controller, chosen for its low cost, in addition to its versatility and performance in mathematical operations and communication with other electronic devices.

This system also controls the home appliances such as fan, light, frizz etc. Thus the problem that they are faced can be solved by using speech recognition technology to move the wheelchair. This can be realized with using the microphone as an intermediary.

II. SYSTEM DESIGN AND HARDWARE IMPLEMENTATION

A. For Wheelchair Control:

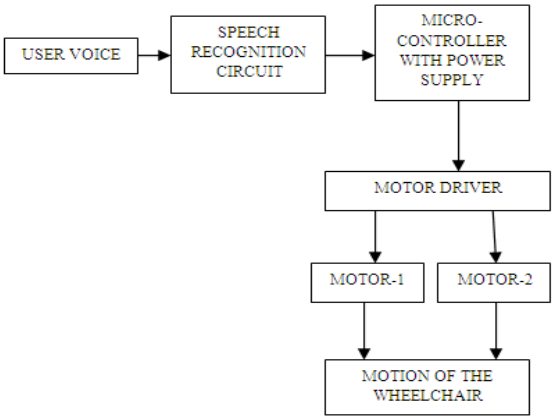

Fig. 1: Block Diagram for Wheelchair Control

Figure 1 schematically shows the main components of the wheelchair system. The implementation of our project was done using the following major components: 1.ATMEGA16 microcontroller to control the speed and direction of the wheelchair. 2. DC motors to drive the wheels of the chair. 3. Batteries to supply the desired power to the motors. 4. A microphone serving as an input device for speech commands.

The microcontroller acts as a master i.e. controls all the activities of our system. It generates correct signals by analyzing the data being fed to it to move the wheelchair in a specific direction.

B. Speech Recognition:

A practical speech recognition System can be constructed using Speech Recognition IC HM2007. The HM2007 is a 48 pin IC which provides speech recognition function. It works in two modes: Manual mode or CPU mode. In both modes, the IC is first trained to recognize words by the user saying each word for corresponding number pressed on the key. The IC stores each word signal in the memory location corresponding to the word. The data output from the IC is interfaced to the Microcontroller from where it is displayed on the LCD.

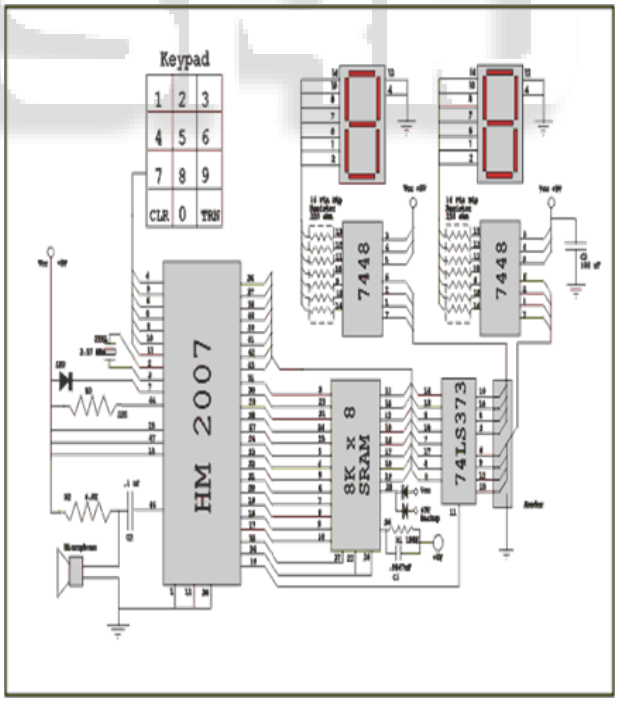

Fig. 2: Speech Recognition Module

C. Motor Driver IC L293D:

This is a motor driver IC that can drive two motor simultaneously .L293D IC is a dual H-bridge motor driver IC. One H-bridge is capable to drive a dc motor in bidirectional. L293D IC is a current enhancing IC as the output from the sensor is not able to drive motors itself so

L293D is used for this purpose. L293D is a 16 pin IC having two enables pins which should always be remain high to enable both the H-bridges. L293B is another IC of L293 series having

1) L293D can run a motor up to 600 mA whereas L293B can run up to 1 A.
2) L293D has protection diode whereas L293B doesn't have any such protection diode. Need to add the protection diode manually.

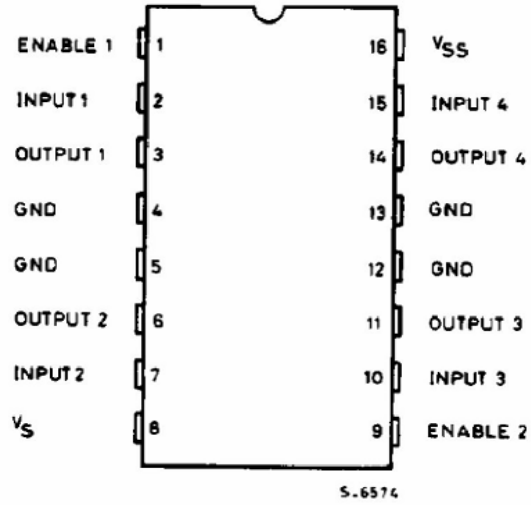

Fig. 3: Motor Driver IC L293D

D. For Home Appliances Control:

1) Transmitter Section:

This section consist Encoder and Antenna. The encoder is used to convert the parallel data which is the output of microcontroller into serial data and transmitted through antenna towards receiver.

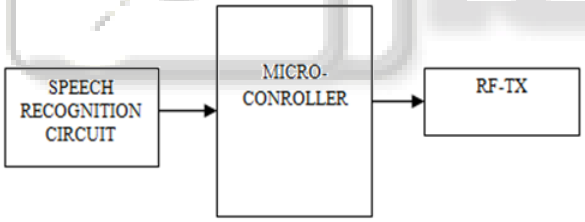

Fig. 4(A): Transmitter Circuit

2) Receiver Section

This section consist Decoder and Antenna. The receiver antenna receives the data which is given to decoder. The decoder is used to convert the serial data which the output of microcontroller into parallel data and it is given to relay board. The relay board switches the home appliances.

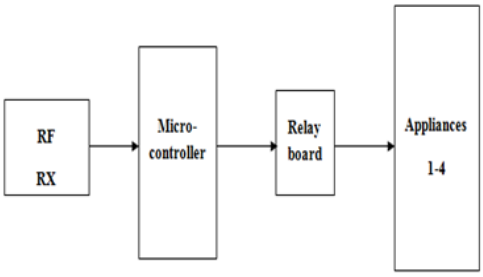

Fig. 4(B): Receiver Circuit

Fig. 4: Block diagram for appliances control

The corresponding frequency range of RF transmitter/receiver varies between 30 kHz & 300 GHz. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz.

An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

E. Working Principle:

The controlling device of the whole system is a Microcontroller. This system makes use of two Microcontrollers, one at wheel chair and other installed in the house. The system with wheel chair has a speech recognition module, RF transmitter and DC motors interfaced to it. The Microcontroller gets the voice based input and judges it whether the command is to control wheel chair or electrical devices. If the command is to control wheel chair, it acts accordingly on the DC motors interfaced to it. If the command is for controlling electrical devices, it sends the data using RF transmitter interfaced to it. This data is received by RF receiver interfaced to the system installed in the house and this data is processed by the controller and acts accordingly on switch Relay interfaced to the controller to which electrical device is attached. The Micro controller is programmed using Embedded C language.

There are five options for basic motions of a wheelchair to be applied by the user. The five conditions of the wheelchair can be described as the following:

1) Moving forward
2) Moving backward
3) Turn to the right
4) Turn to the left
5) Stop condition

For home automation:

1) Device 1 ON-OFF
2) Device 2 ON-OFF
3) Device 3 ON-OFF
4) Device 4 ON-OFF

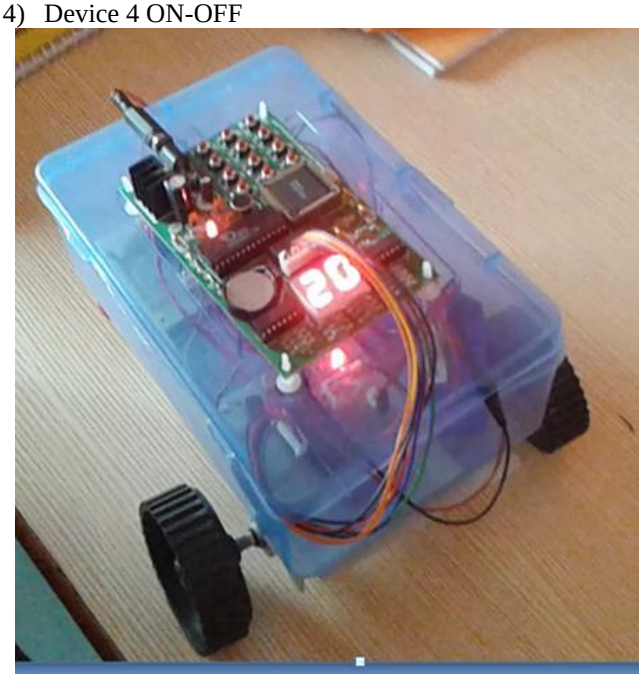

Fig. 5: Prototype of Wheelchair

Fig. 6: Prototype of Home Appliances Control

III. RESULT

The voice recognition system was first tested in a quiet room with a single user. All words were correctly recognized. Next we tested it with a different user on whom the system was not trained. About 5% errors occurred in this case, for example words like "right" were recognized as "write". This was because the recognizer heard a different pronunciation. Next we tested the system in a noisy room by turning on some music in that room. When the music was light there was no problem in correctly recognizing the words but when we turned the volume high the recognizer found it difficult to recognize the user's voice.

IV. CONCLUSION

We have successfully designed and implemented a motorized wheelchair controlled through voice recognition. The voice recognition system worked for most of the commands (over 95%). Only when a word was not properly vocalized, the system did not recognize it. Overall, users reported satisfaction with the system. Further work is needed to better identify small objects.

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