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Voice Operated Wheelchair

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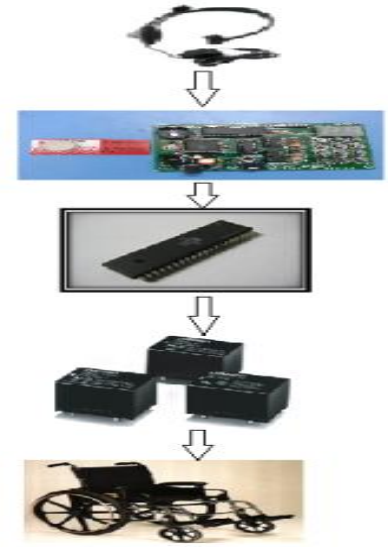
Abstract-: Few patients such as quadraplegics and multiple sclerosis type cannot drive joystick operated powered wheelchair so they are dependent on other people or helpers to move from one place to another and in such a way they don't have the freedom of mobility. So this is the project about developing a powered wheelchair which operates on real analogous voice signal of patient or user on that wheelchair. This powered wheelchair motor control and drive system which consists of microcontroller and DC motors . The voice recognition system is used to detect and recognize the patients voice and its output in the digital form will be sent to microcontroller which then controls the wheelchair according to its program.

Keywords— Quadriplegic ;Multiple Sclerosis,Independent;Voice recognition circuit; Microcontroller.

I. INTRODUCTION

Independent mobility is a dream for every person with some or the other physical disability especially in the case of quadraplegics and multiple sclerosis. These are the patients who are paralyzed below neck. People with disabilities meet barriers of all type. We know that technology is manual wheelchair but as per survey more than 70 percent of manual wheelchair users will develop shoulder pain at some point in their life. But anyways the quadraplegic patients cannot move any of the limbs below the neck. Hence manual and even joystick operated wheelchair are out of question for the quadraplegic patients.So the development of voice operated wheelchair will solve the query about the mobility of quadraplegic patient and make them independent of mobility.

II. METHODOLOGY



The project designed here is a microcontroller based embedded system interfaced with a DSP based voice processor to recognize the words. The voice processor on program mode stores the word string of 1.2 sec length in an EEPROM and the processor can store 10nos of such data string on the EEPROM. The voice processor is connected with a local microphone to accept direct voice. The selector switch can select the mode either from local to wireless. The word strings are also field programmable by the user. The voice processor output is a digital ID for the particular word string and that is feed to an AT89C51 microcontroller and decoded to control the devices connected to the microcontrollers through the specific relay drivers. This is an embedded system designed to process voice and recognize the word string and decode the words to perform the action. The voice communication to the processor can be directly fed using a MIC.

II. HISTORY

Researches in the area of wheelchair control system are still going on. For an example, a wheelchair controlled by using a tongue. It is design especially for the quadriplegics. This is meant to be used by the disabled person who can only move the body parts above the neck. It utilizes an in-mouth position sensor to control the movements. Another examples are a Semi-Autonomous Wheelchair Mobility System (SAWMS) which uses visual tracking technology that utilizes a color camera, sonar, infia-red sensors, contact sensors and a PDA based interface which uses for the wireless communication .Mohamed Fezari et. al. [2] used and implemented a direct voice command wheelchair control system in their design for a disabled people. They used a speech recognition kit which previously had been implemented in the control of Automatic Vehicle Guided (AVG). They used a voice recognition kit 'Voice Direct 364' (VD364) manufactured by Sensory Incorporated, USA. In their design a microphone is directly connected by using wires to the input of the voice processor module. This method might lessen the flexibility and easiness for the user movement compared to the wireless microphone .Richard Simpson, ***et. al. [3]*** developed a prototype of a Smart Wheelchair Component System (SWCS) to be added to a commercial wheelchair with minimal modifications. They adopted a technology which originally developed for mobile robots to create a "smart wheelchair'. Their prototype can provide a navigation assistance on wheelchair using two different input methods which are analog joystick and switch joystick. The Smart Wheelchair Component System is used as a component to be added to a variety of commercial power wheelchairs with a minimal modifications. It is compatible with multiple brands of wheelchair .Several studies have shown that both children and adults benefit substantially from access to a means of independent mobility. While the needs of many individuals with disabilities can be satisfied with manual or powered wheelchairs, a segment of the disabled community finds it difficult or impossible to use wheelchairs independently. To accommodate this population, researchers have used technologies originally developed for mobile robots to create smart wheelchairs.

The history of the ARM processor family is closely related to that of the British personal computer industry, and reflects differences between the development of the British and American computer industries. A number of different manufacturers achieved prominence in this quickly emerging market. In 1985, Acorn Computer Group, one of the leading names in the British personal computer market, manufactured the first commercial RISC microprocessor. Other significant manufacturers were Sinclair, another Cambridge start-up, and to a lesser extent the American companies Apple, Commodore and Tandy, along with a host of smaller British developers producing a wide range of machines targeted at the booming home computer market.

In 1991, the first RISC microprocessor, which can be embedded, ARM6 was invented. From the year 1992 onwards, various companies such as Sharp, Samsung started using ARM processor while in the year 1993 ARM7 the first multimedia processor was developed. In the year 1995, Thumb instruction set was introduced in ARM family. From the year 1996-2000 companies such as Alcatel, Philips, Sony, started using ARM, while in 1999 ARM cooperated with Erickson for the development of Bluetooth. From 2000-2002 ARM‟s share of the 32 – bit embedded RISC microprocessor market was 80% [7].

III. OBJECTIVE AND SPECIFICATION

A. Objective of the system

The objectives of this research are: To equip the present motorized wheelchair control system with a voice command system. By having this features, disabled people especially with a severe disabilities that is unable to move their hand or other parts of a body, are able to move their wheelchair around independently. To simplify the operations of the motorized wheelchair as to make it easier and simpler for the disabled person to operate. With this simplified operation, many disabled people have a chance to use the system with little training on how to use it. To build a wheelchair control module and interface it with the speech recognition board as well as a wireless microphone unit. To build a motor control circuit, and add a motor driving mechanism to an ordinary wheelchair .To integrate all the modules together to produce a wireless controlled motorized wheelchair .

B. Specification of the system

The development board is prepared using glass epoxy Printed Circuit Board (PCB). The power supply to this board is designed in such a way that if the desired voltage is applied to the I.C. then the RELAY will switch on .There are two 12v, 1.3Ah batteries which are interfaced with the wheelchair .One is for electronics circuit and other is for motors. In our project we have used HM2007 voice recognition board for the voice training . The voice command (input)is given to the MIC. The voice command is in the analog form. This analog input is given to voice recognition board. The voice recognition board processes/recognizes the voice and gives the output in digital form. The digital output is given to the port of 89S51 microcontroller (specifically to p1.4,p1.5,p1.6,p1.7)and the remaining pins of the port i.e.,p1.1,p1.2 and p1.3 is given to the LCD along with the port 0.In our project we could have used PIC microcontroller which is having inbuilt ADC. But we do not need ADC for our project. Because of this reason we have used 89S51 microcontroller and 89S51 microcontroller is cheaper than PIC. The LCD will display the commands given to the voice recognition board. The port 2 of the microcontroller is given to the relay driver logic to which motors are connected. We have used four sugarcube relays to drive the two motors. Two relays are used to drive the one motor and other two relays are used to drive the second motor. Microcontroller controls the relay logic as per programmed. For example if input is 0001 i.e., p1.4=1 then display "Moving Forward" and on all the motors(i.e., on all relays). The relay output is given to the

two PMDC motors. These motors are having 75 kg cm torque,75 watts power with 30 RPM..The load capacity of the wheelchair is 100 kg including weight of a patient and weight of motors.

IV. DESIGN OF THE SYSTEM

Hardware Design

Proposed Block Diagram:

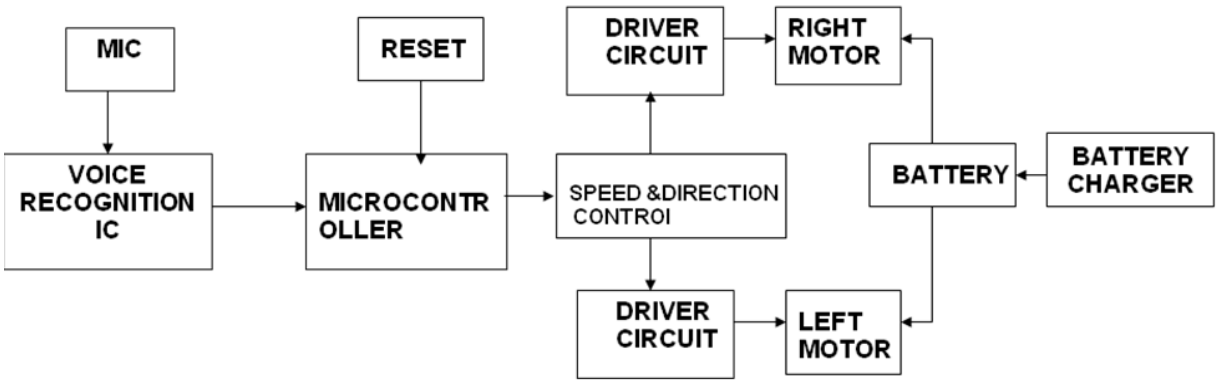


Figure 4.1: Block Diagram

Description of the Block Diagram:.

Voice recognition unit

This unit recognizes the voice command from the voice reception unit. IC HM2007P is the main component of this Voice Recognition circuit. This IC can recognize 20 voice different commands. This VoiceRecognition circuit produces an 8-bit digital output for each voice commands.

Microcontroller:

The 8-bit digital output obtained from the voice recognition circuit is used to drive a microcontroller based control circuit. 89v51 microcontroller is used in this circuit. The microcontroller is program such a way to produce the required outputs for corresponding voice commands.

Relays:

Relays are used to switch ON and OFF the motors of the wheelchair according to the output of motorcontroller unit 8 relays are used.

Motor Drives circuit:

The drives used in the wheelchairs are PMDC motors. Two motors are used to drive the wheelchair. They are 12V, 12A brushed DC motors

Detail Description:

Voice recognition board:

VOICE TRAINING:-

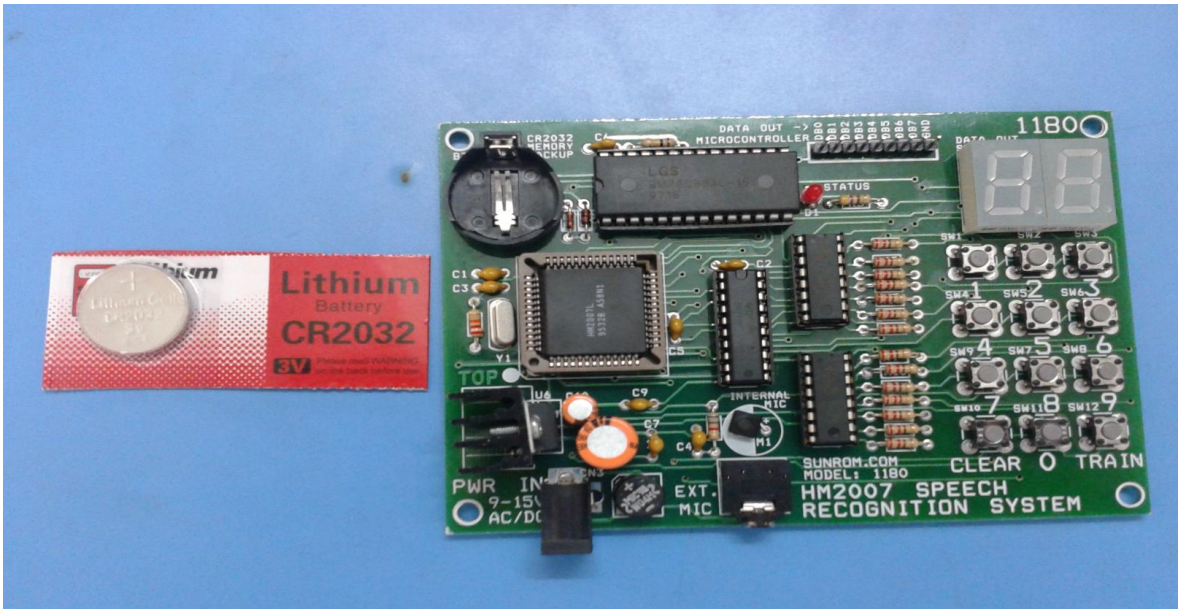
steps:

1. *Make WAIT pin HIGH for training mode.*
2. *Clear the memory by pressing 99 **
3. *.Enter the location number to be trained.*
4. *After entering the number the LED will turn off*
5. *.Number will be displayed on the display*
6. *.Next press # to train.*
7. *The chip will now listen to the voice input and LED will turn ON.*
8. *Now, speak the word you want to train into the microphone.*
9. *The LED should blink momentarily.*
10. *This is the sign that the voice has been accepted*
11. *.Continue doing this for different words*
12. *.Repeat the trained word into the microphone.*
13. *If word is rightly recognized, the correct location is displayed*
14. *The error codes are:*

    55- word too long.

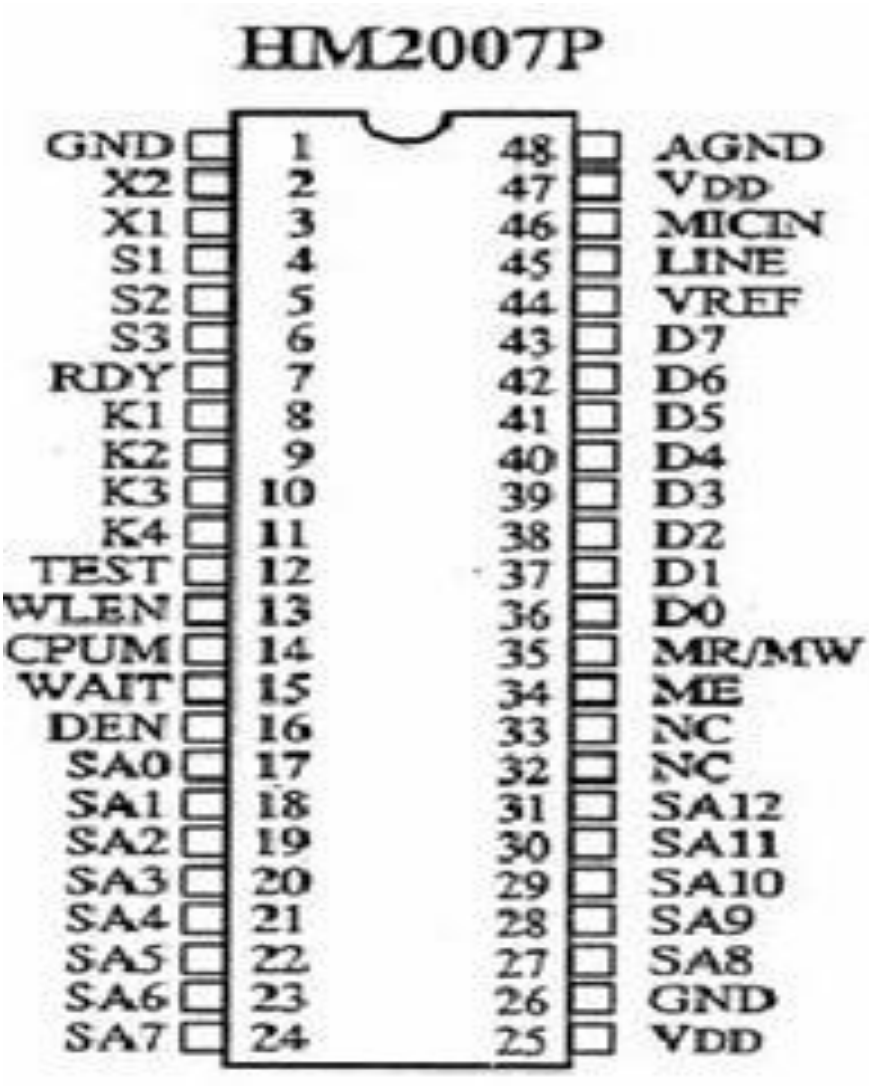
    66-word too short.

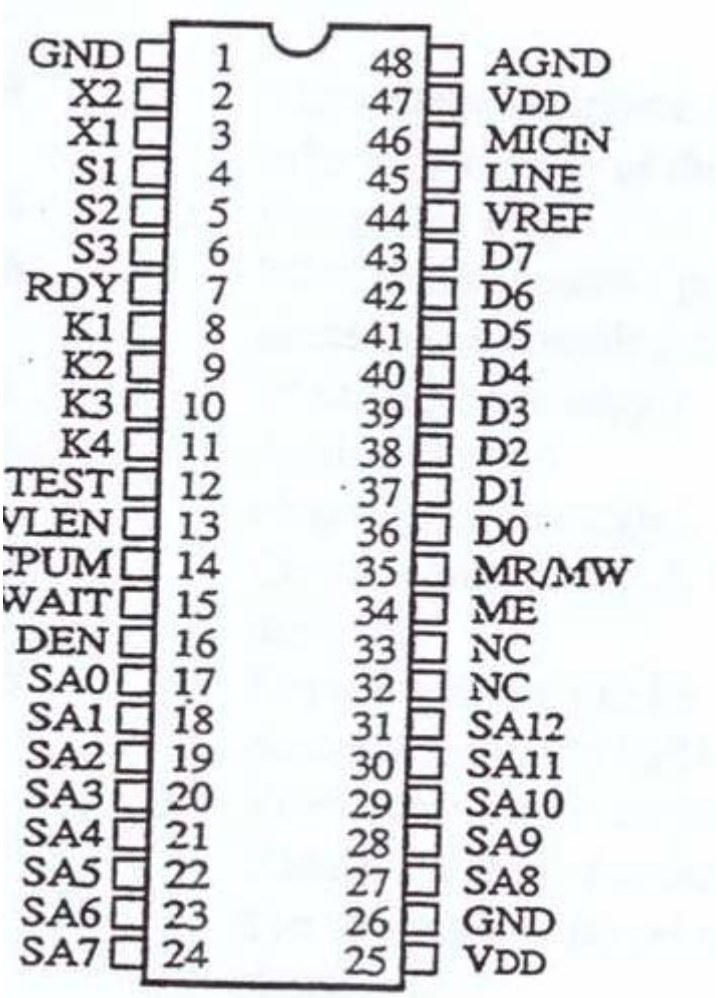
    77-word no match.

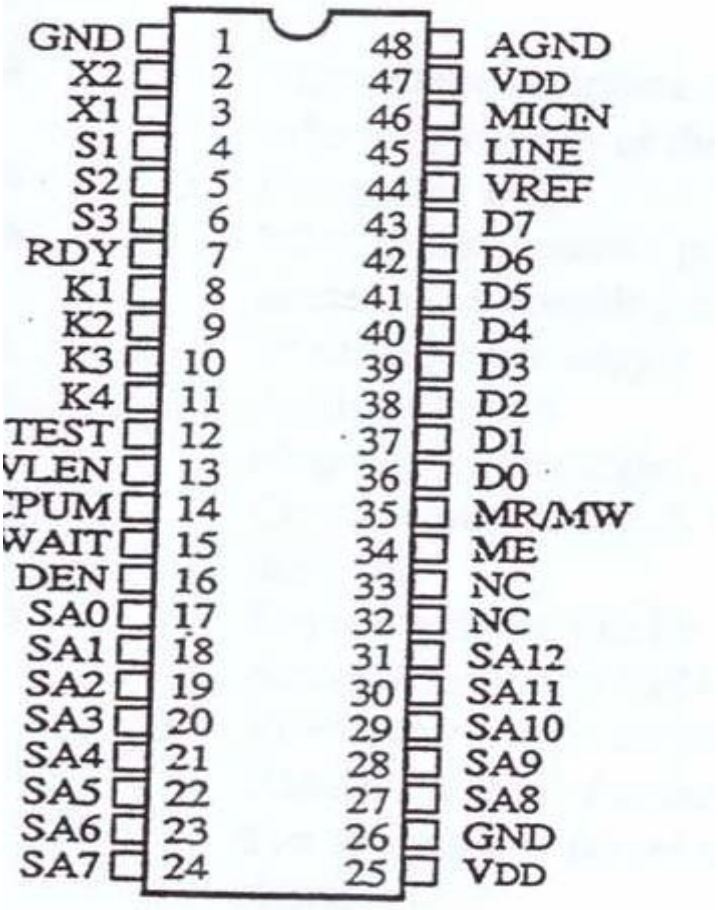


HM2007:
It is a 48 pin DIP IC.Speaker independent mode was used..Maximum of 40 words can be recognized.Each word can be maximum 1.92sec long.Microphone can be connected directly to the analog input.64K SRAM, two 7 segment displays and their drivers were connected.

pin diagram:







V. CONCLUSION AND FUTURE SCOPE

A. Conclusion: Voice operated wheelchair is the modified version of the manual wheelchair.It is operated on the voice of patient (i.e. commands such as forward, left, right, stop,etc).The wheelchair does not require any person to move it as it is automated with motors .Such kind of wheelchair are very less observed in India as compared to the other countries(USA,Europe,China,etc).Hence this wheelchair provides the need of the quadreplagic patients and make them independent for mobility at reasonable rate.

B. Future scope

The current system limits its application in noise free environment. Future studies should aim at making it insensitive to noise by introducing proper noise filter into it. By making advanced and partial modifications, this project can be used in acoustic control of vehicles' braking systems thus reducing risk of accidents. This project can be done by using soft computing on MATLAB for efficient output.We can also add the GSM/GPS system to the present module so that it can help anyone to track if any accident occur as the patiens would not be in a condition to call someone.

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