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On 17th & 18th March 2016

Automated Electric Wheelchair

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ABSTRACT*:* This paper presents the development of a wheel chair which is useful to the physically disabled person with his hand movement or his voice reorganization. With the help of this wheel chair, a physically disabled person would be able to move himself to the desired location with the help of hand movement which controls the movement of the chair. This paper aims to provide a feasible solution to those handicapped people who do not have the ability to move the wheelchair by themselves. PIC is already been programmed for different code combinations, so that the decoded signal gets converted into appropriate movement of wheelchair with the help of relays and DC motor. A 'Motorized Chair' consists of a chair with the two motors and a joystick controller with a voice module also. Voice module accepts the input from mic and its output act as input to PIC which control motion of motor.

KEYWORDS: Electric wheel chair, automated wheel chair, Micro Electro-Mechanical technology, Voice sensor system, Robot control.

I. INTRODUCTION

The proposed Automated Electric Wheel chair enables physically challenged persons like paralytic patients or physically disabled patients or patients having acute diseases like Parkinson's disease. It is useful for the patients where they can move their wheel chair in their own directions, without any third party's help or support. Elders find it tough to move inside the house for day to day activities without help or external aid. The proposed system makes use of a wheelchair that can be used by elderly or physically challenged to move inside the home without difficulty and without external aid. The physically challenged, find difficult to move the wheel chair without help from others. By making use of the system, the elderly and the physically challenged can go to different rooms in the house by joystick movement by hand or voice signal. The aim of this paper is to control a wheel chair and electrical devices by using Micro Electro-Mechanical technology. [1][2]

Electric wheel chair movement can be controlled in Forward, Reverse, Left and Right direction. In this paper , there is a wheel chair model as a ROBOT model, which contain an in-built microcontroller, joystick and voice sensor system, which will do the functions like right, left , forward and reverse operations.. Through this feature the patients can enable movements of their wheel chair as per their desire. In this electric wheel chair mainly consisting of 3 types of modules: first one is t he sensor module, second one is control module and third one is the motor system. The sensors will sense the voice and send the values to control module. Control module is given the processed signal to electric wheelchair. Control module converts analog data into digital and send the values to pic microcontroller. In this research a prototype of an affordable and technologically advanced wheelchair is to be designed and developed. This is to aid the communication of severely disabled people and enhance the man covering of the vehicle with the use of hand movements. Another alternative would be an electric wheelchair controlled by a joystick. Although the electric powered wheelchair is a much improvised vehicle and an easier-to-control device, but it might not help the cause of severely disabled**.** The paper presents a control-method to man motorized wheel chair merely by the movement of fingers. It aims at incorporating the modern ways of wheel chair dynamics and control the security problem with alarm and cost effectively. This system makes use of a micro controller, which is programmed, with the help of embedded C instructions. This microcontroller is capable of communicating with transmitter and receiver modules. Joystick and voice module detects the tilt and provides the information to the microcontroller (on board computer) and the controller judges whether the instruction is right movement or left movement instruction and controls the direction respectively. The controller is interfaced with two dc motors to control the direction of the wheel chair. To perform the task, the controller is loaded with intelligent program written using Embedded C' language.[3]

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II. HARDWARE DESCRIPTION

In this paper, a wheel chair is modeled as a ROBOT model, which will contain an in-built microcontroller, joystick and voice sensor system, which will do the functions like right, left ,forward and reverse operations. It is designed in such a way that it can move freely without external support or dependency. The block diagram of the System ,and design aspect of independent modules are discussed below.

Electric wheel chair Block Diagram

The block diagram of the proposed system is shown in fig1.

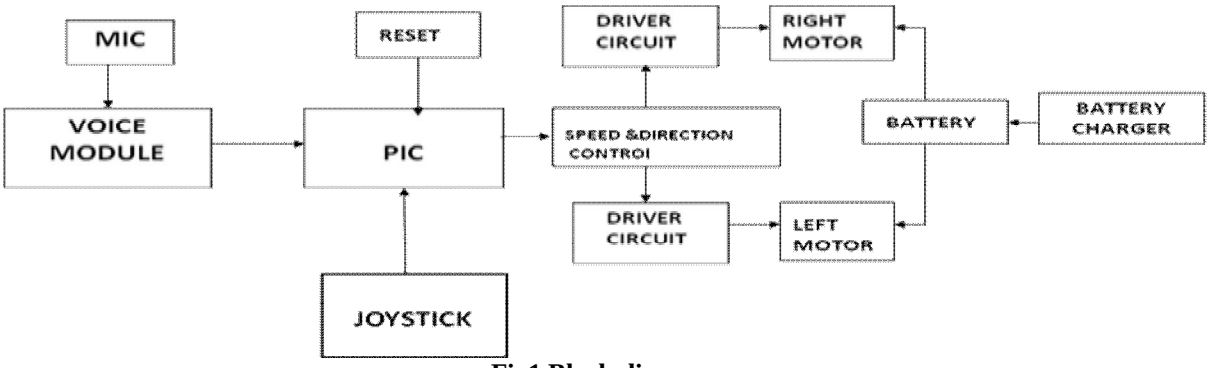

Fig1.Block diagram

The main parts of the System are:

1. Micro controller (16F877A)
2. Reset button
3. Crystal oscillator
4. Regulated power supply (RPS)
5. LCD Display
6. DC Motors
7. DC motors drivers
8. Voice module sensor
9. Joystick

Microcontroller is a programmable device. It has a CPU in addition to a fixed amount of RAM, ROM, I/O ports and a timer embedded all on a single chip. The fixed amount of on-chipROM, RAM and number of I/O ports in microcontrollers makes them ideal for many applications in which cost and space are critical. The microcontroller used in this system is PIC16F877A.

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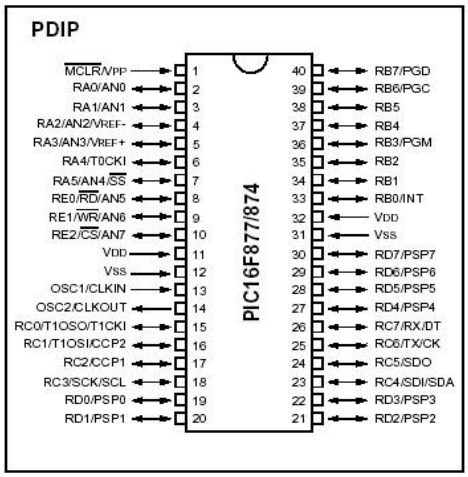

Fig4. Pin diagram of PIC16F877

Fig4. DC Motor

PIC16F877 is a 40 pin microcontroller. It has 5 ports port A, port B, port C, port D, port E. All the pins of the ports are for interfacing input output devices. Port A consists of 6 pins from A0 to A5, Port B consists of 8 pins from B0 to B7 Port C consists of 8 pins from C0 to C7. Port D consists of 8 pins from D0 to D7 and Port E consists of 3 pins from E0 to E2. The rest of the pins are mandatory pins these should not be used to connect input/output devices. Pin 1 is MCLR (master clear pin) pin also referred as reset pin. Pin 13, 14 are used for crystal oscillator to connect to generate a frequency of about 20MHz. Pin 11, 12 and31, 32 are used for voltage supply Vdd(+)and Vss(-)

The DC motor is given in fig4. It has two basic parts: the rotating part that is called the armature and the stationary part that includes coils of wire called the field coils. The stationary part is also called the stator.. The armature is made of coils of wire wrapped around the core, and the core has an extended shaft that rotates on bearings. The ends of each coil of wire on the armature are terminated at one end of the armature. The termination points are called the commutator, and this is where the brushes make electrical contact to bring electrical current from the stationary part to the rotating part of the machine.

DC Motor Driver:

Control the motor in the forward, reverse , left and right direction. It consists of three relays. The relay ON and OFF is controlled by the switching transistors. BC547 transistor is used as switching transistors.12V High quality relays are used.

III. SYSTEM SETUP

Schematic diagram and interfacing of PIC16F877A microcontroller with each module is explained below. The schematic diagram is given in fig 5.

Interfacing crystal oscillator with micro controller. The two pins of oscillator are connected to the 13 and 14 pins of micro controller; the purpose of external crystal oscillator is to speed up the execution part of instructions per cycle and here the crystal oscillator having 20 MHz frequency. The 1 pin of the microcontroller is referred as MCLR ie, master clear pin or reset input pin is connected to reset button or power-on-reset.

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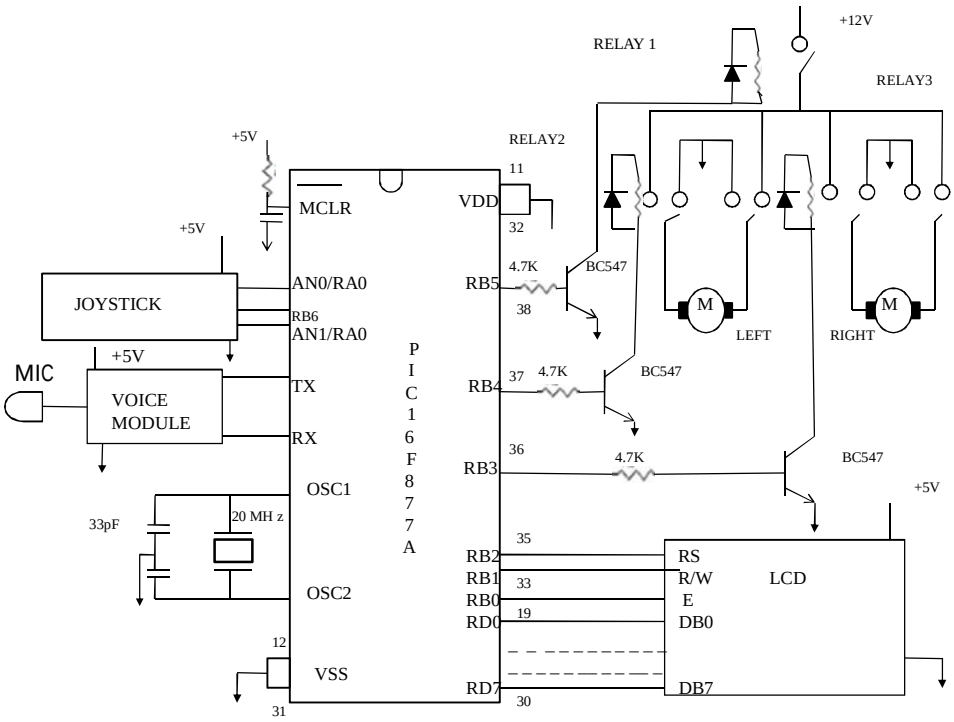

Fig 5. Schematic diagram of Electric wheelchair

CMOS Voice module

It's a single chip CMOS voice recognition module.5 -10 isolated word voice can be recognized It compares the input voice signal with the previously recorded signal Insensitive to environmental sounds. Its output serves as a input to PIC microcontroller. It is given in fig 6.

Analog Joy stick controller:

Controllers are most commonly an arm-rest mounted joystick .Capabilities include turning one drive wheel forward while the other goes backward. Joystick controlled Power chairs may be designed for indoor, outdoor or indoor/outdoor use. It is given in fig 7.

Fig6.CMOS voice module

Fig 7 Axis Analog Joy stick

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Table of operation

RELAY 1 (STOP/START)	RELAY 2 (LEFT)	RELAY 3 (RIGHT)	MOTOR (LEFT)	MOTOR (RIGHT)	DIRECTION OF MOTION
OFF	X	X	X	X	STOP
ON	OFF	OFF	FORWARD	FORWARD	FORWARD
ON	ON	ON	BACKWARD	BACKWARD	BACKWARD
ON	OFF	ON	FORWARD	BACKWARD	RIGHT
ON	ON	OFF	BACKWARD	FORWARD	LEFT

Table 1. Table of operation

IV. RESULT AND DISCUSSION

The Electric wheel chair with joy stick and voice control was designed such that the wheel chair can be operated in response to the joy stick movement done by user and voice produced by user. Electric wheel chair which avoid adverse situation by stopping electric wheel chair using joy stick top button.

Fig 8. Prototype of Electric Wheel chair

Advantages

Automatic innovative electric wheel chair is user friendly,The user can give their commands by voice and joy stick movement.No large number of complex circuit is used and all the components are used are cheap so the system is economic.Simple circuit devices are used so they are easy to implement. Thus, the user can handle without external help.

Applications

In Hospitals for handicapped patients: Some patients that cannot manipulate the wheelchair with their arms due to a lack of force or psychomotor problems in the superior members require electric wheelchair. The wheelchair is operated

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with the help of PIC microcontroller, voice module sensor, joystick control, which in turn controls the wheelchair with the help of hand movement or voice of patient. The wheelchair moves front, back, right and left. Due to which disabled and partially paralysed patient can freely move.

V. CONCLUSION

Integrating features of all the hardware components used have been developed in it. Presence of every module has been reasoned out and placed carefully, thus contributing to the best working of the unit. Secondly, using highly advanced IC's with the help of growing technology, the project has been successfully implemented. Thus the project has been successfully designed and tested. Controlling technique in the proposed system is quite simple and any type of disabled person will be able to operate this wheelchair except those who are unable to move their hand .user can give six command signals to wheelchair which are start, right, left, forward, backward, and stop.

This system can be improved by using Zigbee technology, which increases operating wireless distance. Speed control methods can be employed for acceleration and deceleration of the chair. Technologies which senses eye movement and tongue movement.

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