AI POWERED SMART WHEELCHAIR

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***ABSTRACT*: Dozens of people are suffer from temporary or permanent disabilities due to health issues or accidents. For cases of difficult, pain or impossible walking, the use of a power wheelchair is becoming really important. Manual or electrical wheelchairs do perform their work for most of the low and medium level disability cases. Though many disabled people stay satisfied with traditional manual or powered wheelchairs, there is a segment of disabled community which finds it difficult or impossible to use wheelchairs independently without any help. In such cases users often lack independent mobility. Researchers involved in medical industry are aiming at designing smart wheelchairs as viable solutions. Various wheelchairs have been created already. Many other wheelchairs have been created by using brain signals, vision dependence and head gestures. The undermined project is to design a smart wheelchair using voice recognition and an android application. The user can use it with comparatively less effort in an easy, independent and efficient manner.**

***Keywords*: Node MCU esp 82668266 microcontroller, Motor Driver IC L293D, DC motors, Smart Wheelchair, android app controller, Voice Recognition.**

I. INTRODUCTION

There is an ever growing number of people who need to travel around with the help of some or the other artificial means, whether through an accident or illness. In order to improve the quality of life for these people and facilitate their integration into the working world, these means have to be increasingly sophisticated. There are systems already deployed which respond to many of the needs of people with different degrees of handicap (Leifer, 1981; Borenstein&Koren, 1985; Madarasz, 1986; Jin et al., 1993). However, this field still requires a lot of advancements. At the given time numerous research programs which are being carried out justify this; the TIM MAN project (Miller & Grant, 1994; Grant, 1994), the COACH project (Gelin et al., 1993) and the SKIL guide system (Sabbe, 1993). While power wheelchairs can satiate the needs of many such people, some people in the handicap community find it next to impossible to use a standard wheelchair. This project could push forward for an assertive technology. It allows the individual to have a more independent, productive and enjoyable living experience. DC motors are used to move the wheelchair in an Android-based wheelchair controller system. Nowadays, controlling a wheelchair by themselves is a problem faced by handicapped people. Sometimes they need help of others to assist them. A better way will be provided by this project to gain control of the the movement of wheelchair in controlling the four directions . The overall wheelchair construction consists of a DC motor and motor driver module put together with a microcontroller system . Android-based wheelchair controller application consists of android device and a software application that can be latched with standard wheelchairs to control the movement by using a DC motor. WiFi communication protocol is used to communicate information between the android device and the wheelchair. There are 4 basic options for the motions of a wheelchair to be applied by the user. The four options of the wheelchair can be described as the following: a. Moving backward b. Moving forward c. Turning to the left and right

II. PROPOSED METHOD

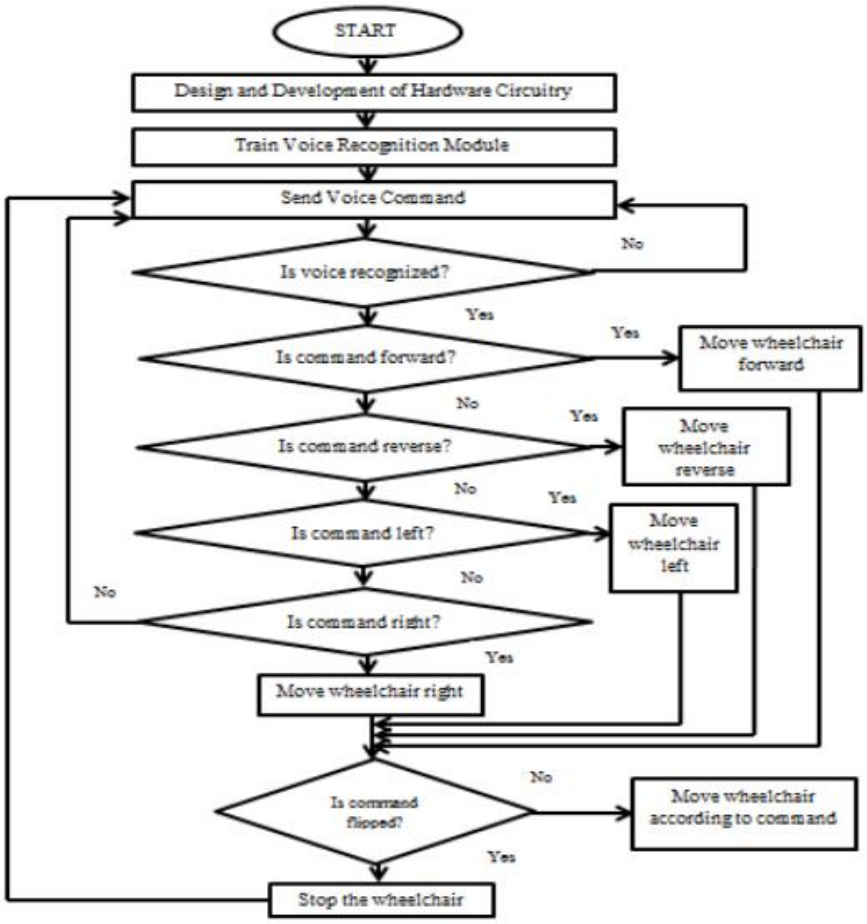
The design of Smart Wheelchair using Voice and Gesture Control system consists of two main parts namely, Hardware & Software. The hardware circuit is used to recognize, digitize and transmit control signal to wheelchair motor driver. The hardware consists of various components which are described below. Here a control unit named as Node MCU microcontroller is used.

Software Implementation

i.Voice Control

The ESP8266 is programmed using LUA language. Programming is done on computer system. Further LUA In system Programming platform is used to upload the code in form of Hex File to the microcontroller. Various steps of the programming for the voice control are performed which are illustrated below with the help of flowchart in Fig.1. Firstly, Voice module is trained with 4 commands. After that the voice command is send by the user. The microcontroller is used to check the signal associated with this command and compare it with the stored commands and performs the task related to this command.

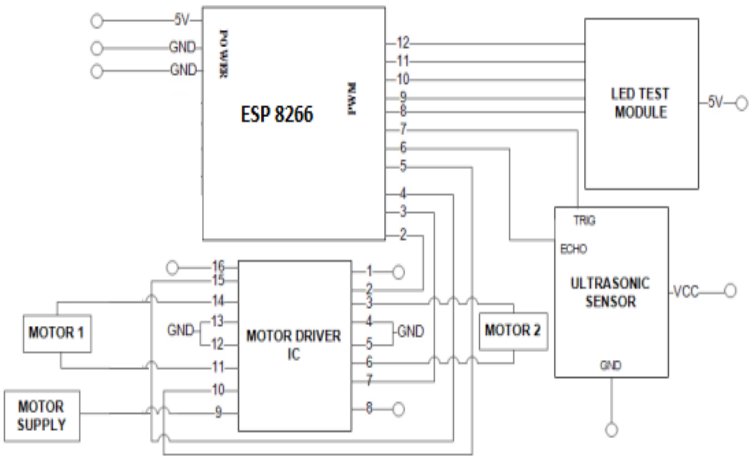
A. Flow Diagram



ii.Virtual Joystick Control

Similarly, the ESP 8266 is programmed using C language for the controlling of wheelchair using virtual analog stick. Firstly, we designed and develop the kind of joystick we want for the wheelchair After that DC supply is provided to the hardware to perform the task. According to the program, the ranges of X and Y axis for accelerometer are used to set the direction of motion of wheelchair according to the joystick. When the joystick is dragged to face the forward direction the wheelchair starts to move forward.

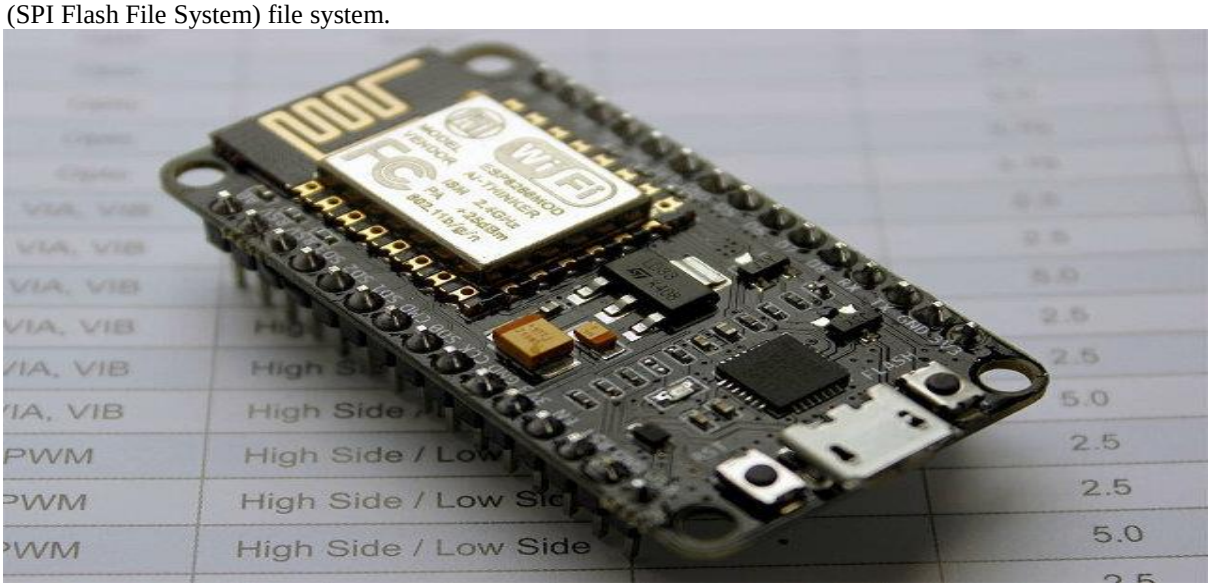
III. SYSTEM ARCHITECTURE DIAGRAM



IV. MODULES

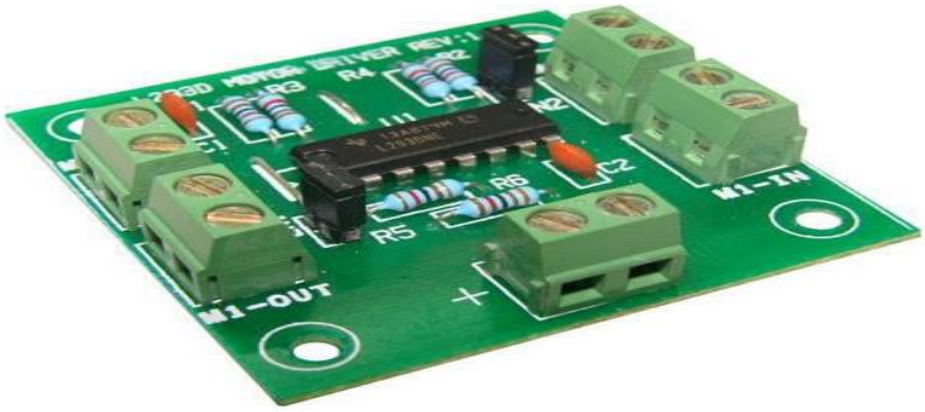
A. Node MCU Microcontroller

Node MCU is a tool for making devices that can sense and control the the behaviour of physical world than desktop computers. It is a microcontroller development board for writing software for the hardware circuitry. It consists of an ESP 8266 microcontroller. Node MCU firmware is build with ESP8266 SDK v.0.9.5, based on Lua 51.4 without debug and OS modules, lua-cjson, and relies on spiffs (SPI Flash File System) file system.



B. Motor driver L293D IC

It is the most common method to drive multiple DC Motors bi-directionally under the control of a computer. It is an H-Bridge motor driver which is depicted in the figure shown below. The L293D is a circuit motor driver which can be used for simultaneous and bi-directional control of 2 small motors. It can drive two DC motors at the same time, both in forward and reverse direction. The input logic pins for this operation are pins 2&7 and 10&15 respectively.



C. Ultrasonic Sensor

Their usage is commonly in the field of distance measuring, non-contact presence, and proximity. These devices typically emit a short burst of ultrasonic sound wave towards a target, which reflects the sound back to the sensors located over it. The whole system then measures the time required for the echo to reflect back and return to the sensor, computes distance from the target using the speed of sound travelling in the medium. Ultrasonic sensors work on the principle similar to Radar or Sonar, which evaluates characteristics of a target by interpreting the echoes from sound waves or echos respectively. It is used as the obstacle detector in the hardware in reverse direction.

D. Dc Motors

It is a simple motor which uses battery provided electricity and a magnetic field to produce revolutions. It comprises of 2 magnets of opposite polarity & a coil, which behaves as an electromagnet. The repellent and attractive electromagnetic forces of the magnets provide the required torque for the DC motor to turn. They are used them for the wheels of wheelchair.

V. RESULT

The proper interfacing of all the mentioned components according to the system architecture and circuit diagram gives us hardware circuitry for prototype wheelchair with voice and joystick control. The prototype wheelchair functions on voice command and a virtual joystick as a Smart Wheelchair. The implementation of hardware and software components is done thoroughly and in a proper manner .In this section all the steps of this work are discussed and their results are also specified. The implemented software is uploaded on the Node MCU board then the prototype is checked using virtual joystick and voice module. The prototype worked properly according to the joystick commands and then voice module is tested on the phone by sending a voice command through the phone mic. The prototype worked successfully by using gesture and voice module.

VI. CONCLUSION & FUTURE ENHANCEMENT

This paper is to design and develop a smart wheelchair using voice and virtual Joystick control is completed. The developed wheelchair is very user friendly and does not contain any computer system with wheelchair for controlling. So it is easy to understand and process. It contains two modules to control the movement of the wheelchair according to user commands. If any patient is unable to move their hands then voice commands can be used for the navigation of the wheelchair independently. A phone mounted on the wheelchair can be used to give voice commands. This system provides independent mobility as well as many intelligent facilities to the rising disabled population.

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