

VOICE BASED AUTOMATED WHEELCHAIR USING WIFI

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ABSTRACT:

This paper describes an Intelligent Voice Controlled Wheelchair which operates on user's voice commands. The disabled people cannot move from one place to another on their own. They continuously need someone to help them in getting the wheelchair move. So the automated wheelchair makes them more independent. Bluetooth controlled automated wheelchair makes the person move within a confined area. Also the automated wheelchair designed using the touch panel, buttons are not effective for the people who are physically impaired or handicapped. The automated wheelchair is designed based on voice commands rather than gestures and buttons. The wheelchair uses NodeMcu microcontroller which has an inbuilt wifi module to control the wheelchair from anywhere. The voice recognition system used here is through the simple voice commands given by the user through the android phone. The microcontroller through the commands given controls the movement of the motors. An Obstacle Detection unit is present in order to detect and alert the user with the help of a buzzer. The directions are indicated by an LCD.

Keywords: NodeMcu, Voice control, Obstacle Detection, LCD

1. Introduction:

People who are physically disabled or paralyzed or those with hand impairment find it difficult to use a wheelchair as their hands are not capable of operating it in any direction. So, voice controlled wheelchair is

designed for those who cannot use their hands but can overcome using the wheelchair with simple commands. The commands will be given to the nodemcu through the android phone. Based on the commands given the motors starts moving in

that particular direction. These commands are as simple so that any normal user can operate through it. Blynk application is the one in which we create the virtual buttons. This application will give an authentication token to the email associated with it. That token must be used in the Arduino program code for the movement of the motors. Then WIFI id and password through which the wheelchair is to be controlled must be configured. Google voice assistance is used to give the voice commands generally through the phone in which wifi and blynk app are configured. IFTTT-If This Then That, is one of the application through which the apps and devices work together. An applet is created interfacing the app with the device in order to give the command. The command which is created in the applet must be given as the input command to the microcontroller. That command is sensed and the corresponding motor will be moved in that particular direction. An obstacle detection unit is made of infrared sensor which is used to detect the obstacle and to alert the user with the help of a buzzer to stop the wheelchair. For more convenience, an 16*2 lcd display is used to display the direction in which the wheelchair is moving so that it could be easier for the user to remember.

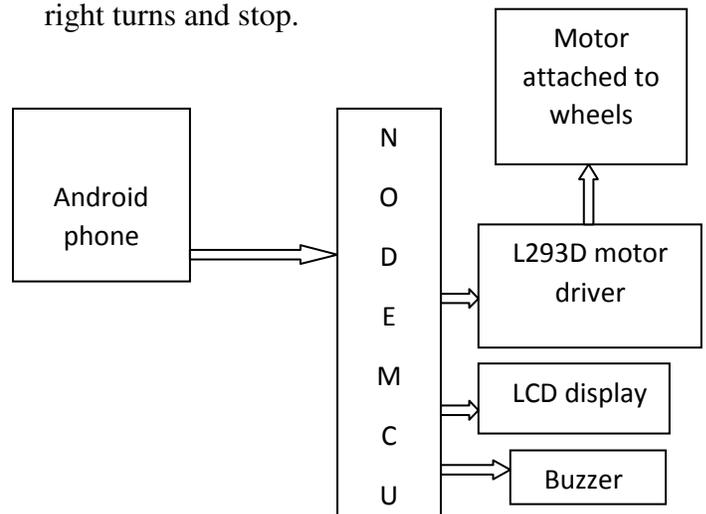
2.Exisitng Method: The present methodologies for the automated wheelchair includes the touchpanel based wheelchair, brain controlled wheelchair, eye controlled wheelchair and Bluetooth controlled voice based wheelchair. But there are several disadvantages that are present in these existing systems.

The touchpanel based automated wheelchair is not efficient in the case where the person cannot move his hands or with physical impairment. The brain controlled wheelchair is the most cost efficient one and cannot be afforded by so many people. The eye controlled wheelchair is the convenient one but when the eye movements gets mismatched, it would become a problem for the user. The conventional Bluetooth module controlled automated wheelchair based on voice recognition is the most widely and effectively used method for shorter distances or when we have to move the wheelchair within a confined area.

3.Proposed method: The purpose of this paper is to develop a wheelchair which will move as per the user's commands. In order to make the existing wheelchair more enhanced and flexible, a new method proposed in this paper uses WIFI connectivity which can be used most

effectively and control the wheelchair from anywhere. This microcontroller used in the method has an inbuilt wifi module through which any person can control the wheelchair. The purpose of this paper is to develop a wheelchair which will move as per the user's commands. This system works on voice commands given by the wheelchair user. The system is fully independent as the user do not need any other person to help him to move the wheelchair. There are basically five commands, which command is given by the user, accordingly the wheelchair will move. The voice commands of the user is recognized in the first step. Once it is recognized, the commands are converted into its equivalent instructions

which drive the system. Motors are responsible for the movement of wheelchair. Hence, motors receives input from the Arduino and depending upon the instruction type, motors moves accordingly. There are basically 5 commands used in order to control the wheelchair. The basic movement functions include forward direction, left and right turns and stop.

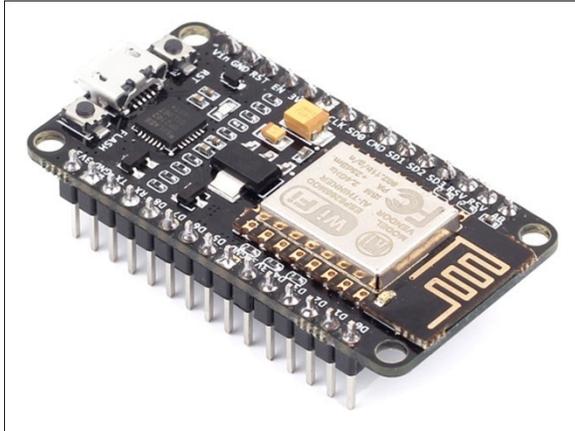


3.1.Component Description:

3.1.1.NodeMCU:

The NodeMcu is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines or 'C' codes. NodeMCU it is like Arduino Hardware with a Input Output built in the Board itself, it has also a Wifi built in to connect directly to internet to control your things online using Nodes' Style network API for digital network applications, which facilitates developers to

code running on the Board, Greatly speed up your Internet of Things application development process. The Development Board base on ESP8266 Chip, integrated GPIO(General Purpose Input Output), PWM (PulsewidthModulation), IIC(Interconnected Integrated Circuit), 1-Wire and ADC all in one board to power up your development board in fastest way combined with the NodeMCU Firmware. Specifications: The Development Kit based on ESP8266, integates GPIO, PWM, IIC, 1-Wire and ADC all in one board.

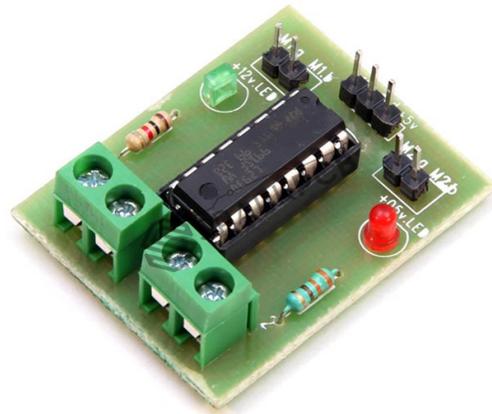
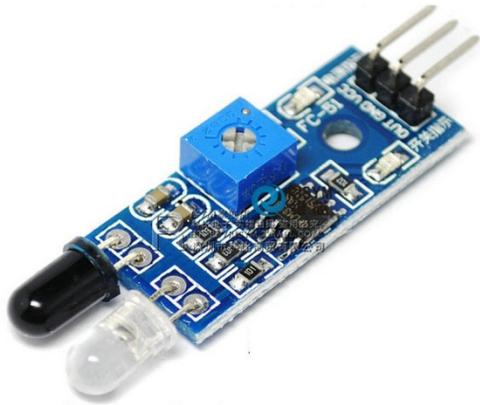


3.1.2 Infrared sensor:

An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures infrared radiation , rather than emitting it that is called as a

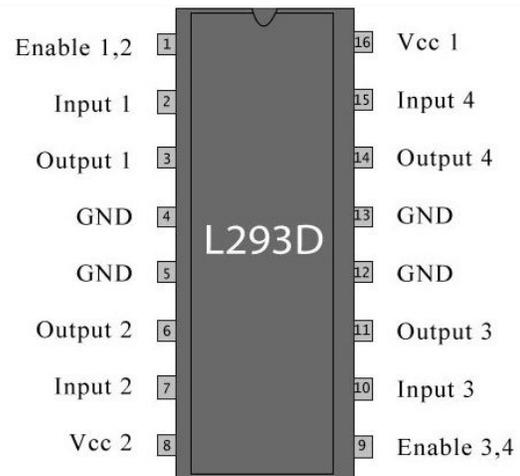
passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. Infrared sensors are broadly classified into two main types:

- **Thermal infrared sensors** – use infrared energy as heat. Their photo sensitivity is independent of the wavelength being detected. Thermal detectors do not require cooling but do have slow response times and low detection capabilities.
- **Quantum infrared sensors** – provide higher detection performance and faster response speed. Their photo sensitivity is dependent on wavelength. Quantum detectors have to be cooled in order to obtain accurate measurements.



3.1.3.L293D motor driver: A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots. Motor driver act as an interface between Arduino and the motors . The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc. These ICs are designed to control 2 DC motors simultaneously. L293D consist of two H-bridge. H-bridge is the simplest circuit for controlling a low current rated motor

We will be referring the motor driver IC as L293D only. L293D has 16 pins.

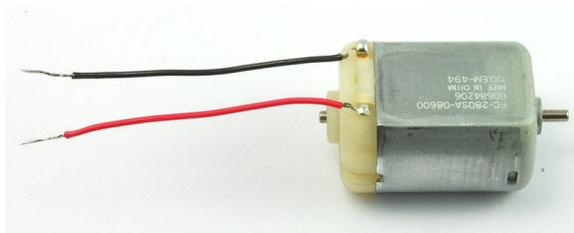


3.1.4.DC Motors:

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal

mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

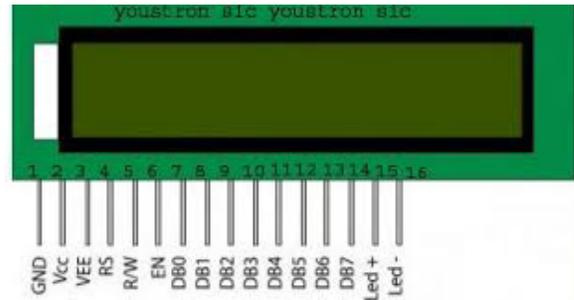
DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills.



3.1.5.16*2 LCD display:

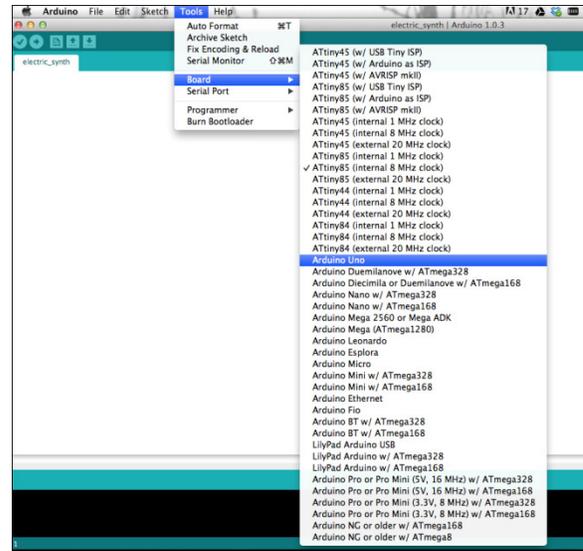
LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very

commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines.



3.1.6. Buzzer:

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.



3.2. Software Description:

3.2.1. Arduino C software:

Arduino is the hardware platform used to teach the C programming language as Arduino boards are available worldwide and contain the popular AVR microcontrollers from Atmel. It is a full-featured integrated development environment (IDE) that uses the GCC C software tools for AVR microcontrollers and is free to download.

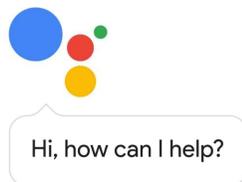
3.2.2. Blynk App:

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. Every time you press a Button in the Blynk app, the message travels to space the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blink of an eye.



3.2.3. Google Voice Assistant:

Google Assistant is a virtual personal assistant developed by Google that is primarily available on mobile and smart home devices. Unlike Google Now, the Google Assistant can engage in two-way conversations.

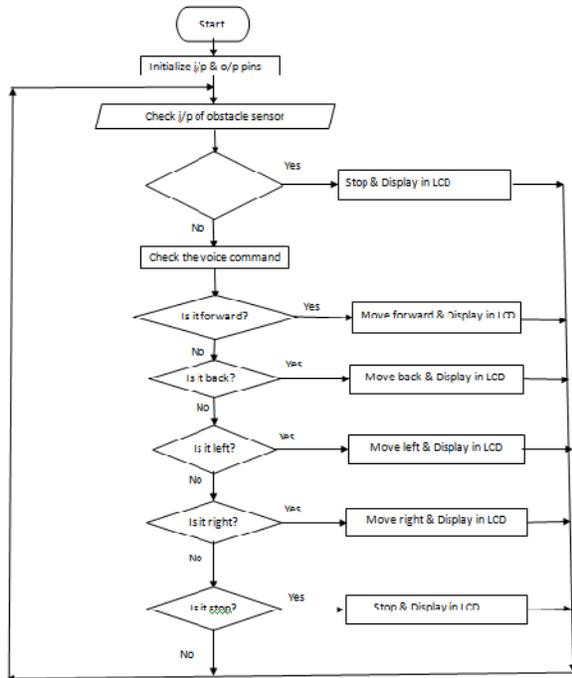


3.2.4. IFTTT:

IFTTT (if this, then that) is the easy, free way to get your apps and devices working together. It is a free web-based service to create chains of simple conditional statements, called applets.

4. Working Description:

The input commands are given through the google voice assistant in the android phone to the NodeMCU. It first checks for the obstacle using the infrared sensor. If there is an obstacle, it alerts the user by a buzzer. If there is no obstacle, then it moves according to the command and it will be displayed on the lcd. The movement of the wheelchair can be simply illustrated by the flowchart below.



5. Conclusion:

This paper finally concludes of the automated wheelchair using the wifi model from which it can be controlled from anywhere. Also the obstacle detection unit is very much useful in the case of any wall or obstacle such that the user can be alerted by a buzzer. So it is very useful for the people who cannot move their hands. It is a cost effective model and can be made of simple components.

6. References:

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