DESIGN OF AN ARDUINO BASED VOICE-CONTROLLED AUTOMATED WHEELCHAIR

A Project Work

Submitted in partial fulfillment of Requirements for the Award of the Degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRICAL & ELECTRONICS ENGINEERING

Submitted By

A.CHANDANA(198T5A0202)

B.SEETA RAM (198T5A0203)

R.VAMSI KRISHNA(198T5A0225)

P.VENKATA SAI KRISHNA(198T5A0221)

P.PRANAY TEJA (198T5A0222)

Under the Esteemed guidance of

Mrs V . BINDU , M.TECH

Assistant Professor

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

GANGURU, VIJAYAWADA - 521 139

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DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY
GANGURU, VIJAYAWADA - 521 139

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE

This is to certify that the project work entitled "***DESIGN OF AN ARDUINO BASED VOICE CONTROLLED AUTOMATED WHEELCHAIR***" is a bonafide record of project work done jointly by **A.CHANDANA (198T5A0202) B.SEETA RAM(198T5A0203) R.VAMSI KRISHNA(198T5A0225) P.VENKATA SAI KRISHNA (198T5A0221) P.PRANAY TEJA(198T5A0222)**Submitted in partial fulfillment of the requirements for the award ***Degree of Bachelor of Technology*** in ***Electrical & Electronics Engineering*** to Jawaharlal Nehru Technological University, Kakinada is carried out under my guidance and supervision during the academic year 2021-2022.

Mrs. V. BINDU, M.TECH — **PROJECT GUIDE**

Dr. I.SAIRAM — **HEAD OF DEPARTMENT**

EXTERNAL EXAMINAR

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We are greatly indebted to **Dr. K. Ravi** principal, **DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY** for making us available with all the required assistance and for his support and inspiration to carry out this project in the institute. We also take privilege to record our thank to **Dr. I .SAIRAM ,** Head of the Department, ELECTRICAL & ELECTRONICS ENGINEERING whose encouragement, cooperation and valuable support crown our success It gives us immense pleasure to thanks our guide **V.BINDU,** for having been a source of constant inspiration, precious guidance and generous assistance during the project work. I deem it as a privilege to have worked under his able guidance. Without his close monitoring and suggestions this work wouldn't have taken this shape. I feel that his un-substitutable and unforgettable.

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PROJECT ASSOCIATES

A.CHANDANA (198T5A0202)

B.SEETA RAM (198T5A0203)

R.VAMSI KRISHNA (198T5A0225)

P.VENKATA SAI KRISHNA (198T5A0221)

P.PRANAY TEJA (198T5A0222)

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PSO 2: Able to design and develop the Green Electrical systems.

Quality Index Assessment

Academic Year: 2021 - 2022

Title of the Project: DESIGN OF AN ARDUINO BASED VOICE-CONTROLLED AUTOMATED WHEELCHAIR

Parameter	Product/ Research	Working Model /Analysis/ Application	Review /Others	Consideration for Cost Effectiveness	Consideration for Environment	Safety Consideration	Standards	Followed Ethics
Level	3	2	1	High – 3 Moderate – 2 Low - 1	High – 3 Moderate – 2 Low - 1	High – 3 Moderate – 2 Low - 1	High – 3 Moderate – 2 Low - 1	High – 3 Moderate – 2 Low - 1
Weightage	50%			10%	10%	10%	10%	10%
Project Level	a =			b =	c =	d =	e =	f =

Quality Index of Project = (a * 0.5) + (b * 0.1) + (c * 0.1) + (d * 0.1) + (e * 0.1) + (f * 0.1)

=

Signature of Guide Signature of Project Coordinator Signature of HOD

ABSTRACT

This paper represents the design of an Arduino based voice controlled automated wheelchair. The design is developed with a voice recognition system, which allows the physically disabled person to control the wheelchair by voice command who have issues in hand movement due to ageing or paralysis for joystick controlled wheelchairs.The design also provide some additional features such obstacle detection a for the as a safe movement and a and sending notifications to increase the usability of the automated wheelchair system.

To implement the design, Arduino Mega2560, Easy VR3 speech recognition module, and relay based motor controller circuits are used along with the wheelchair. The designed wheelchair system does not require any wearable sensors for using other biomedical signals to control wheelchair movement (i.e. EEG, EMG, EOG sensors) as reported in several research studies which require complex signal processing techniques done with an extra bulky computing system attached with the wheelchair.

In the proposed design, the speech processing is done solely with the available integrated speech processing module (Easy VR3) which removes the necessity of any bulky complex extra computing device. Moreover, the proposed technique is relatively simple and cheaper to implement with the widely used available electronic devices in comparison to other existing techniques which will have a great impact on the societies of developing and under developing countries.

Mapping with PO/PSO along with Justification:

Title of Project	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2
An Advanced Security System Integrated With RFID Based Automated Toll Collection System	3	2	3	-	3	-	-	-	3	3	-	2	2	-

Justifications :(Project Outcomes with respect to Mapped PO`s & PSO`s):

- Our project maps strongly to po1 because in order to do a project we need specialization in the area [power systems].
- Our project maps strongly to po2 because in our project we just identify the fault and it does not involve the first principles of mathematics ,natural sciences.
- Our project maps strongly to po3 because our project solution basically satisfy the public needs i.e., continuous power supply.
- Our project maps averagely to po4 because it uses the knowledge and methods according to research for output.
- Our project maps strongly to po5 because it involves modern tools
- Our project maps averagely to po6 because it partly related to the responsibilities of engineering practices.
- Our project maps strongly to po7 as our project is helpful to the society and it does not have any impact on environmental issues.
- Our project maps averagely to po8 i.e., ethics
- Our project maps strongly to po9 because we function effectively as individual or as a team.
- Our project maps strongly to po10 as we communicate effectively about our project
- Our project maps strongly to po11 i.e., project management and finance
- Our project maps averagely to po12 i.e., life long learning.
- Our project maps slightly to pso1 as it do not has any software.
- Our project maps strongly to pso2 because it is able to design green electrical system.

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INTRODUCTION

1.1 Introduction

"World report on disability" (2011) jointly presented by World Health Organization (WHO) and World Bank says that there are 70 million people are handicapped in the world. Unfortunately day by day the number of handicapped people is going on increasing due to road accidents as well as disease like paralysis. Among all the disabilities percentage of physically handicapped person is most. If a person is handicapped he is dependent on other person for his day to day work like transport, food, orientation etc. In This research is conceived as an idea to ease the lives of those among us who are unfortunate enough to have lost the ability to move their legs due to a significant amount of paralysis, accident or due to old age. Man differently abled people usually depend on others in their daily life especially in moving from one place to another. For the wheelchair users, they need continuously someone to help them in getting the wheelchair moving. Their lives are made difficult by the fact that there is lack of an intuitive control system for their wheelchairs that allows moving independently. Using an electrical wheelchair leads to a large amount of independence for persons with a physical disability who can neither walk nor operate a mechanical wheelchair alone as it requires great effort and help of other people. The problem is that in some cases the disability causes someone to lose the ability to use his hands, therefore in this case, the way of controlling a power wheelchair can be done using speech commands for hands-free patients leading to an interesting and promising outcome. But, still the availability of the smart wheelchair solutions is often 2 limited due to the high costs and not-so-friendly operation. By the proposed approach, described in this research, the low-cost, simple and friendly solution for the voice controlled platform will be presented that is user friendly, fully customizable according to the language spoken by the user and will help in enhancement of user's independent mobility. Using a Smartphone as the "brain" of a robot is already an active

research field with several open opportunities and promising possibilities. Another recent and very successful technology, Bluetooth

has changed how people use digital device at home or office, and has transferred traditional wired digital devices into wireless devices [4]. This research is based on Voice-controlled Wheelchair design, by means of Bluetooth technology, design and implementation of wireless remote control solutions. The project also incorporates use of android program and notifies the system and stop the wheelchair till further command. In this work, Smart Wheelchair control using Arduino UNO and Bluetooth Module via android application is presented.

1.2 About voice controlled wheelchair

Voice controlled Wheelchair Project– The application of this project "**Voice Controlled Wheelchair**" is to control the wheelchair through voice commands, sensors and a joystick .As this is a multi-functional Wheelchair so therefore it can also be called as the **smart wheelchair**. The user voice recognition module, ultrasonic sensor, and joystick have been integrated in this wheelchair.

In this way we have obtained a wheelchair which can be driven with voice commands, through joystick and sensors so that to provide the

possibility of avoiding the accidents. This project involves voice recognition module which will recognize the voice of the user and process the command of the user and send it to the Arduino. The user has to save the different voice commands in voice recognition module before use it to control the direction of the wheelchair.

Arduino is a micro controller based board which accepts data. The Arduino board based on the UNO micro controller processes the data and determines which motor will be activated. User can also change the direction of the wheel chair through joystick, while the sensors will automatically avoid the obstacles.

Before, you try to build this project, I highly recommend, first read my getting started article on the Voice Recognition Module, this will help you in understanding how to record voice commands and then how to control LED s. In this tutorial I have explained all the basics.

A few months back I posted an article about "How to make a wireless Tongue controlled Wheelchair". In this project I used the relay based H-bridges. The above two articles will really help you in making your own Wheelchair and how to use the voice recognition module.

1.3 History of wheel chair

Earlier a wheel chair, used by the disabled people to move around while sitting in it, was propelled manually either by others or by the disabled person itself Now a days they are available by a little automated. Here is the brief explanation of the wheel chair history used by the people with illness, injuries or disabilities. The usage of the wheel chair can be observed in European continent from around the times of German Renaissance.

A drawing dated 1595, of the Spain King, King Philips I1, shows him in a wheel chair with foot and armrests. England recorded the usage of wheel chair from 1670's. However, it was not able to be self-propelled. In 1783, Englishman John Dawson built the first wheelchair that was self-propelled by pushing the wheels.

With the invention of Self propulsion push rims, the modern wheel chair have began to take shape since 1881. In 1900 the wooden spiked wheels are replaced by the wire spiked wheels. The first motorized wheelchair was invented in 1918. The wheel chair with voice activation had used by

a Norwegian law student where he used it for attending the classes without an attendant help.

1.4 Problem Statement

- Many disabled people require wheelchair for mobility.
- They are not always able to control it themselves.
- Caretakers not always able to actively monitor disabled individuals.
- Disabled people need a way to control their wheelchair that meets their specific needs.

The wheelchairs available in market are too expensive and are beyond the reach of poor and middle class families. Most of the Wheelchairs are single functioned either it will be operated with voice or joystick. We are designing a wheelchair that will be a low cost and multi function.

This project aims to make life easier for the disabled and elderly people who cannot move properly it will enable them to lead better lives without any problem.

1.5 Objectives

The objective of this research project is to equip the present motorized wheelchair control system with a voice command system at low-price and friendly operation 3 and to facilitate the movement of the disabled people and elderly people who cannot move properly then enable them to lead better lives without any problem.

1.6 Methodology

The system has two parts, namely; hardware and software. The hardware architecture consists of an embedded system that is based on Arduino UNO board, a Bluetooth Module, DC Motor and an Android phone. The Bluetooth Module provides the communication media between the user through the android phone and the system by means of voice command given to the android phone.

The user speaks the desired command to the “Voice Control for Arduino voice (Voice Application)” software application installed in the android phone that is connected through Bluetooth. The voice command is converted to an array of string and the string is passed to Arduino UNO connected to it.

Once the Bluetooth Module receives the message, the command sent will be extracted and executed by the arduino attached to it and depending on the commands fed to the Motor Driver, the motors will function accordingly. The system will interpret the commands and control the Wheelchair accordingly via android application.

CHAPTER 2
LITERATURE REVIEW

CHAPTER 2

LITERATURE REVIEW

2.1 Studies Background

Shraddha Uddhav khadilkar and Narendra Wagdarikar stated the wheelchairs are used by the people who cannot walk due to physical illness, injury or other disability. Now a day's development promises a wide scope in developing smart wheelchair. This paper is to describe an intelligent wheelchair using smart phone is develop to control the rotation of wheel chair based upon voice and gesture movement for the physically challenged persons. In build voice and gesture function are used to control the wheelchair as well as by using smart phone reading SMS, Email, News.

The sensor used are 8 in which 2 of them are IR sensors the remaining are for temperature, smoke detection, and light detection sensors. This system that allows the user to robustly interact with the wheelchair at different levels of the control and sensing. The system is divided into 3 main units Voice recognition through Android, Gesture recognition through Android, Motor control through signal conditioning. The system is based on grouping an android phone with an AVR micro-controller and sensors. Rahul Jiwane, Priyanka Mahamunkar, and Ritu Notani stated the proposed system describes the design of a smart, motorized and voice-controlled wheelchair using an embedded system.

The system design depicts the "Smart Wheelchair" that supports voice activation system for physically disabled and old aged people by incorporating voice commands which would control the movement of the wheelchair. The voice command is given through a cellular device such as cell phone having Bluetooth and the command is transferred and converted to the string for Adriano and is transferred to the Bluetooth Module SR-4.0 connected to the Adriano board for the control of the Wheelchair.

When the user says “Go” the chair will move in the forward direction, the chair would move in the backward direction for “Back” and similarly “Left”, “Right” for rotating it in left and right directions respectively and “Stop” to stop the wheelchair. This system is designed and developed to save cost, time, energy and dependence on the others for the movements of wheel chair using physically handicapped person.

Riya Ravi, Berly Paul, Sirin K.L and Varun Kumar4 stated the voice controlled wheel chair is a mobile wheel chair whose motions can be controlled by the user by giving specific voice commands. The speech recognition software running on a PC is capable of identifying the 5 voice commands ‘Run’, ‘Stop’, ‘Left’, ’Right’ and ‘Back’ issued by a particular User.

This system controls the wheel chair as well as read the parameters of patient. M.Prathyusha, K. S. Roy and Mahaboob Ali Shaik stated to describe an intelligent motorized wheel chair for handicapped person using voice and touch screen technology. It enables a disabled person to move around independently using a touch screen and a voice recognition application which is interfaced with motors through micro controller. When we want to change the direction, the touch screen sensor is modeled to direct the user to required destination using direction keys on the screen and that values are given to micro controller.

Depending on the direction selected on the touch screen, micro controller controls the wheel chair directions. This can also be controlled through simple voice commands using voice controller. The speech recognition system is easy to use programmable speech recognition circuit that is the system to be trained the words (or vocal utterances) the user wants the circuit to recognize. The speed controller works by varying the average voltage sent to the motor.

This is done by switching the motors supply on and off very quickly using PWM technique. The methodology adopted is based on grouping a micro controller with a speech recognition system and touch screen. Omair Babri, Saqlain Malik, Talal Ibrahim and Zeeshan Ahmed stated a

voice controlled motorized wheelchair with real time obstacle avoidance is designed and implemented. It enables a disabled person to move around independently, using a joystick and 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. A camera is mounted on the chair for real time obstacle avoidance.

The system has been designed and implemented in a cost-effective way so that if our project is commercialized the needy users in developing countries will benefit 60from it. M.AL-Rousan and K.Assaleh stated a Power wheelchairs provide unique mobility for the disabled and the elderly with motor impairments.

However, it is extremely difficult for people suffering from severe motor impairments, such as tremors, to control standard power wheelchairs. In this paper, we present a design of an automated powered wheelchair system that integrates the latest technologies to assist users with motor disability in moving around and sending help messages to four distinct destinations using SMS messages.

A user can move the wheelchair using one of the three techniques integrated in the wheelchair: a joystick, direction buttons, or voice. Moreover, the speed of the wheelchair can be controlled using two buttons (slow and fast). For the recognition of the voice commands, the system uses wavelets and neural networks for feature extraction and classification, respectively.

2.2 Theoretical Background

Here input is taken from the android mobile, speech signal is converted into the text with the help of an android application. This text is transfer to the Arduino UNO which controls the movement and direction of wheel chair via a Bluetooth module wireless. Arduino UNO decides the operation of the two DC motors depending on the text received.

L293D is a dual full bridge driver IC which is used for driving purpose of DC motors. The wheel chair directions and movement possible are as given below

Forward: Both motors are in forward direction. Back: Both motors are in back direction.

Left: Left motor stopped and right motor in forward direction.

Right: Right motor stopped and left motor in forward direction.

Stop: Both motors are stopped.

CHAPTER 3

HARDWARE COMPONENT DESCRIPTION

CHAPTER 3

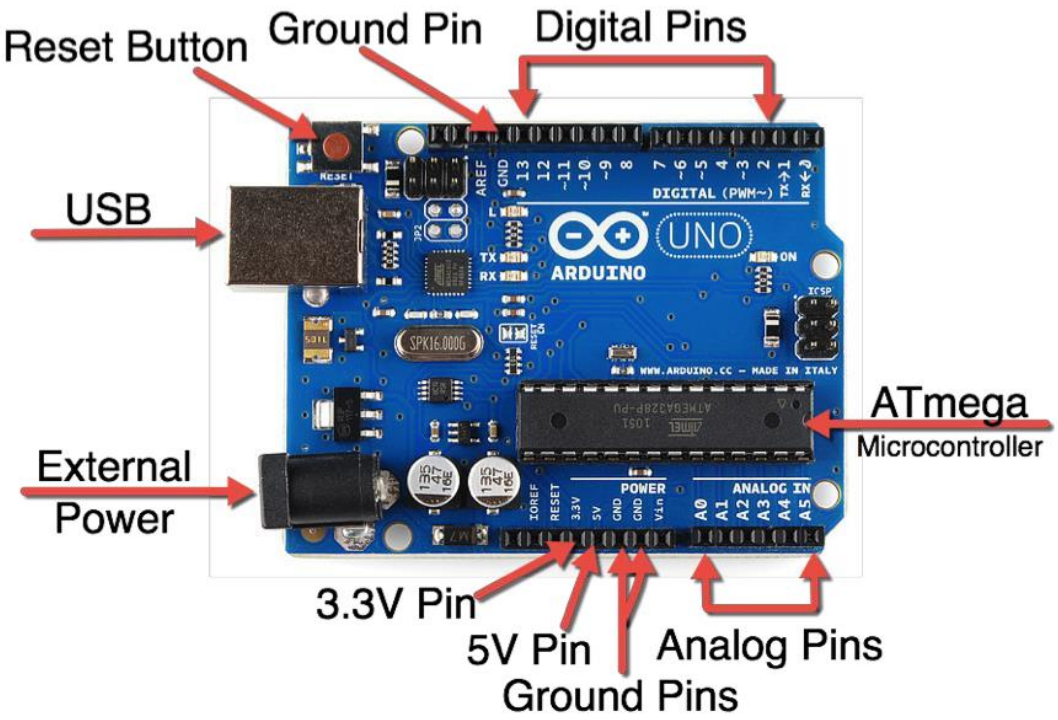
HARDWARE COMPONENT DESCRIPTION

3.1 Arduino UNO

A micro-controller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals The important part for us is that a micro-controller contains the processor (which all computers have) and memory, and some input/output pins that you can control. Arduino UNO is a micro controller board based on the ATmega328P.

It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the micro controller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again. “UNO" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The UNO board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The UNO board is the first in a series of USB Arduino boards.



Technical specifications of arduino

Micro controller	ATmega328
Operation voltage	5V
In put voltage	7-12V
Input Voltage	6-20V
Digital I/O Pins	14
Analogue Input Pins	6
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50MA

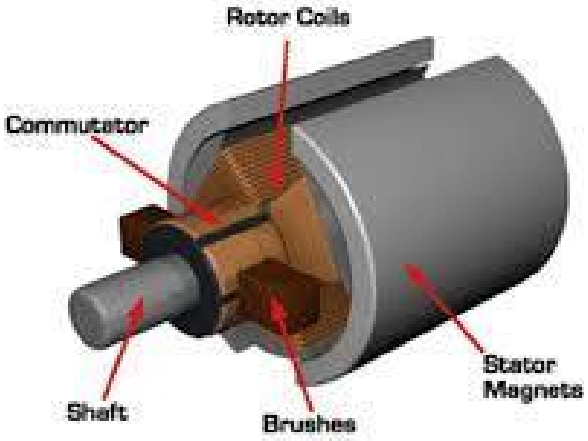
Flash Memory	32 KB of which 0.5 KB used by boot Loader
SRAM	2KB
EEPROM	1KB
Clock Speed	16 MHz

3.2 DC Motors

Motor is a device which transforms the electrical energy into mechanical energy. The working principle of the motor is the interaction between the magnetic field and the current to produce a force within the motor which helps the motor to do work.The motor principle is basically based on Faraday's Law, which states that, it is the conservation of electrical and mechanical energy.

DC motor is one type of motor that uses the DC current to convert electrical energy into mechanical energy. When the electric current passes through a coil in a magnetic field, a magnetic force will be generated, which produces a torque in the DC motor.

A DC motor contains the following parts:
- Rotor
- Stator
- Air gap
- Winding
- Commutator

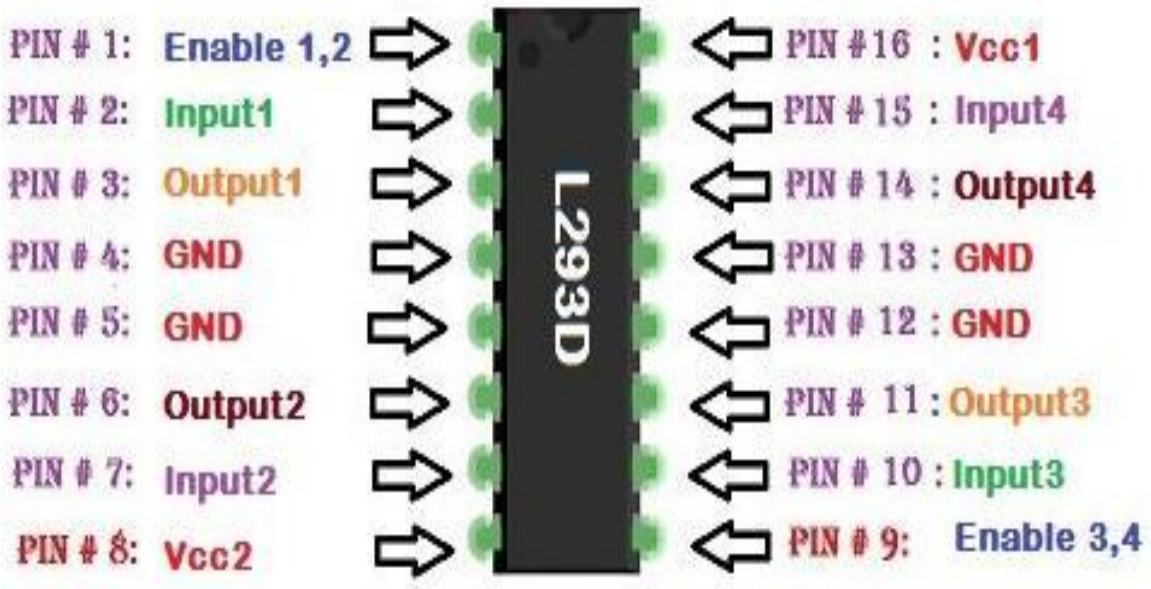


3.3 Motor Driver

L293D is basically a motor driver or controller. It has two builtin H-bridge circuits which are able to control two DC motors simultaneously in both clockwise and counter clockwise direction. It acts as an current high amplifier because it take low current signal at its input and provides higher current signal at the output in order to drives different load e.g. stepper motor & DC motors.

Its features include large input voltage supply range, large output current high noise immunity input signals etc. Its common real life applications include stepping motor drivers, relay drivers, DC motor drivers etc.

3.3.1 Pin Diagram



3.3.2 Pin Functions

L293D Pins Functions	
Pin Name	Pin Function
Enable 1,2	Enable pin for motor 1- active high
Input 1	Input 1 for motor 1
Output 1	Output 1 for motor 1
GND	Ground (0V)
GND	Ground (0V)
Output 2	Output 2 for motor 1
Input 2	Input 2 for motor 1
V_{CC2}	Supply voltage (12V)
Enable 3,4	Enable pin for motor 2- active high
Input 3	Input 1 for motor 2
Output 3	Output 1 for motor 2
GND	Ground (0V)
GND	Ground (0V)
Output put 4	Output 2 for motor 2
Input 4	Input 2 for motor 2
V_{CC1}	Supply voltage (5V)

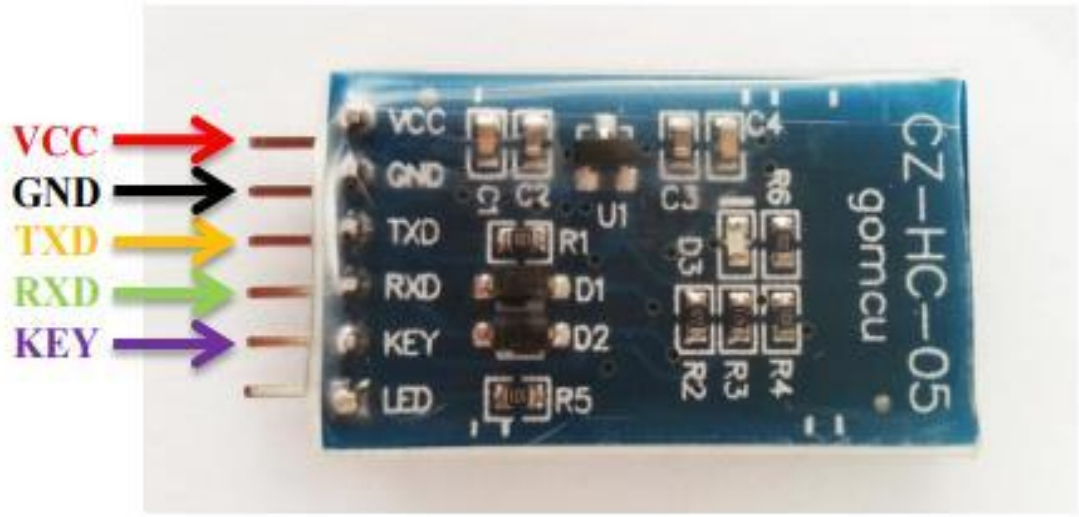
3.4 Bluetooth Module HC-05

HC-05 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-05 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data.

3.4.1 Specifications

- Model: HC-05
- Input Voltage: DC 5V
- Communication Method: Serial Communication
- Master and slave mode can be switched.

3.4.2 Pin Diagram



3.4.3 Pin Description

Pin	Description	Function
VCC	+5V	Connect to +5V
GND	Ground	Connect to Ground
TXD	UART_TXD, Bluetooth serial signal sending PIN	Connect with the MCU's (Microcontroller and etc) RXD PIN.
RXD	UART_RXD, Bluetooth serial signal receiving PIN	Connect with the MCU's (Microcontroller and etc) TXD PIN.
KEY	Mode switch input	If it is input low level or connect to the air, the module is at paired or communication mode. If it's input high level, the module will enter to AT mode.

3.5 voice controlled wheel chair driving circuit

The motor driving circuit is the main part of our project that is used to drive low control direction as well as the speed of the motors. There are three main types of motor driving circuits as listed below:

- The mechanical switch-based motor driving circuit
- Relay logic-based motor driving circuit
- MOSFET based motor driving circuit

The current required to drive each motor is four amperes and twenty-four volt, and total 8-ampere current and 24 volts are required to drive both motors. As the result shows practically batteries provide ampere per hour timing as mentioned by the company.

In our case, we have required 8-ampere current and 24 volts for this purpose we have used two forty ampere batteries to provide smart wheelchair at least two and half hour backup timing. To design a driving circuit for these high volts and amperes is really a difficult task.

3.6 Mechanical switch based motor driving circuit

By using toggle switches and implementing simple logical operation both motors can be driven in both directions. It is the simplest way to design a motor driving circuit, but there are a number of issues that restrict us to not use the mechanical switch. They are listed below:

- Enormous current losses
- Automatic switching not possible
- No speed control
- Low torque

3.7 Relay logic-based motor driving circuit

By using simple two relays we can drive one motor in both directions. By using relay logic automatic switching is possible, the switching time is round about ten milliseconds. But in relay-based motor driving circuitry are a number of issues listed below:

- No fast switching
- No speed control only two levels high and low

3.8 MOSFET based motor driving circuit

Motor drive circuit can be made by using MOSFET s, very fast, and automatic switching is possible, speed can be controlled by applying required PWM, response time is round about 31microseconds but it is very complex.

Serials no	Components	Functions
1	Schmitt 74HC14	Provide level triggering
2	IR 2110	Gate Driver IC
3	MOSFET s IRF 1010	Four MOSFET to drive motor in both directions
4	P(817) OPTOCOUPLER	Provide isolation between Micro controller and H- Bridge

Our requirement is that h bridge can bear forty amperes or more current and voltage at least thirty volts. For this purpose, we have used the following component (not including resistors, capacitors, diodes).

To control reverse leakage current and on-off switching of MOSFET is one of the major tasks while designing h bridges. To manage on-off delays we have implemented low pass filters too. The MOSFET motor drive circuit can work smoothly on PWM with no compromise on torque. Advantages of MOSFET are listed below:

- Speed can be controlled by using required PWM
- Provide full torque
- Fast switching

- Automatic switching
- Can bear eighty-ampere current and voltage up to sixty volts

Driving circuit is the main part of the project that is used to control the motors and other components used in the project such as sensors and joystick. Driving circuit is either from the relay or from transistors.

R1	R2	L1	L2	Result
1	0	1	0	Forward
0	1	0	1	Reverse
1	0	0	1	Right
0	1	1	0	Left

We make the driving circuit from the transistors because its response is very quick as compare to relays as in relays the switching process is slow as compare to transistors.The direction of the motors are control through the H bridge.

We used it in such a way that it gives four types of direction Forward, Reverse, Left, and Right.

We make two H-Bridges one for each motors. Making H-Bridges were very difficult task because the integrating circuit using in it are very sensitive which very quickly damage on over current.

Four BJT transistors were used as switches for the H-Bridge. They take their signals from the micro controller through resistors and

transmit it to the four relays that control the power supply of the motors thus in this way direction of motors are controlled.

3.9 Voice Recognition Kit

In this project Voice Recognition Module V2 is used.

3.9.1 Voice Recognition

Input voice is based on the signals which are given to the voice recognition module and accordingly coding is done. This module converts the voice signals to electrical signals.

As pitch of each human's voice is different from other so this module works on that basic difference. If you programmed the module with person A's voice, then it will never operate with person B's voice.

3.9.2 Voice Module V2

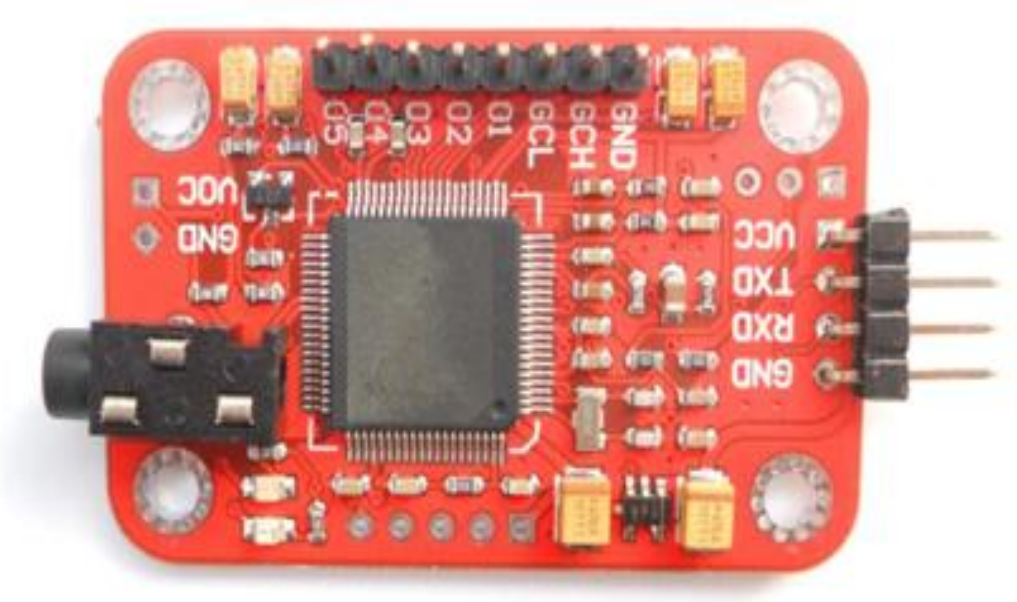
This module is used to recognize your voice. It receives your voice commands or give input through serial port interface. Using this module, control of the car or other electrical devices by voice is being done.

15 voice instructions are stored in V2. 15 pieces are divided into 3 groups, with 5 in each group. First train the V2 with voice instructions and serial commands group by group.

After this, we import one group it could recognize the 5 voice instructions within that group. For the implement instructions in other groups, import the group first using serial command.

It is a speaker dependent module. On the voice of only one person it will work, the person who train it.

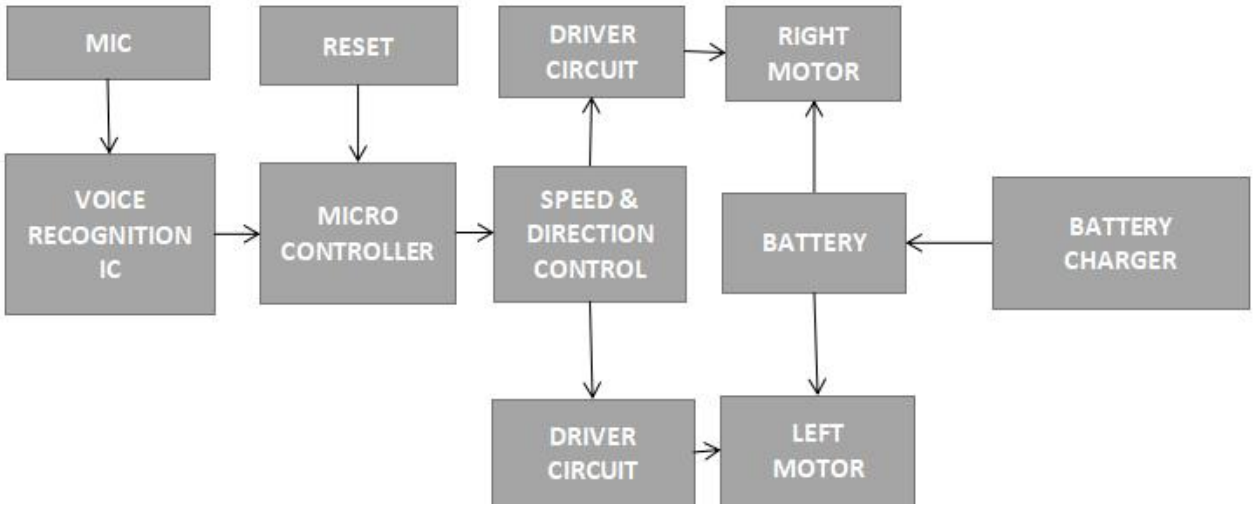
Once the module is train, the voice instruction save in it. Its work on 5V TTL. The serial data is in form of 8 data bits, zero parity, one stop bit. 9600 is default baud rate.



CHAPTER 4
ANALYSIS AND RESULTS

CHAPTER 4
ANALYSIS AND RESULTS

4.1 Block Diagram



Micro controller (AVR ATmega328) is the heart of this smart wheel chair system. All the different types of module used in the smart system are controlled by the controller. ATmega328 is a high performance, low power ATmel 8-bit Advanced RISC micro controller.

a. Line follower section:

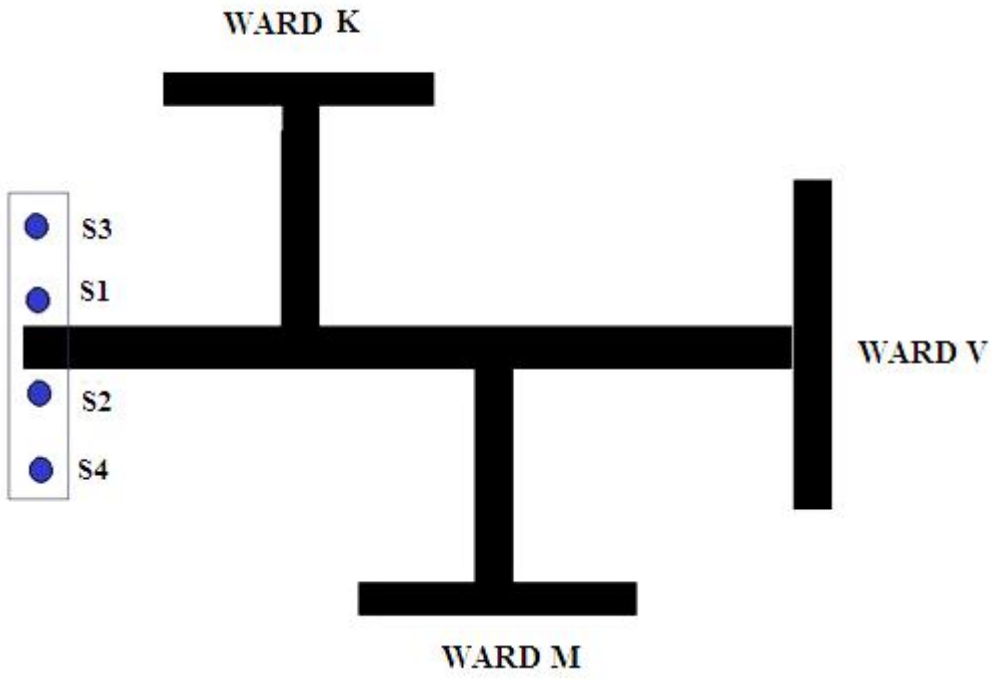
Line follower section is used to reach the specific section of hospital. This whole section also follows the same control procedure i.e. the use of BT Voice Control application which is installed in an android mobile .The patient has to speak the name the particular section which are K, M and V.Line follower section consists of four pair of IR sensors and one pair ultrasonic sensor.

IR sensors are the main triggers of the whole line following action mechanism. IR sensor is basically a transceiver. It consists of one IR LED as transmitter and one Photo diode as receiver.The transmitter section

of IR sensor emits infrared light which will be received by receiver diode and according to the intensity or pulse width of receiving light the decision of the movement has been taken by the wheel chair.

There are two types of strips in line following path which are black strip and white strip. There is no reflection from Black strip, low or (‘0’) logic will reach to micro controller and when there is white or reflective

surface there is high reflection and a high or (‘1’) reaches to micro controller is depicting line follower path with respective position of IR sensors.



b. Obstacle detection:

To avoid collision and obstracles obstacle, the ultrasonic sensor is used.Here we have used HC-SR04 Ultrasonic sensor. Whenever the wheel chair is going on the desired path the ultrasonic sensor transmits the ultrasonic waves without interruption.

When obstracle comes into the path, the sensor’s wave is reflected by the object and the discontinuity in the reception of ultrasonic wave information is passed to the micro controller. The distance of obstacle is continuously display on LCD.

If any obstacle distant away less than 100 cm, wheelchair will stop and will not move till the obstacle is passed or went away greater than 100 cm from wheelchair.

c. Motor Driver controller circuit:

Motor driver circuit MD10C is used to run motors. MD10C is PWM enable motor driver controller. The PWM output pins of micro controller are connected to motor driver circuit. Motor driver controller has one PWM pin and one direction (DIR) pin.

Speed of motor is controlled by PWM and direction pin is used to run the motor in clockwise or anticlockwise direction. Permanent Magnet DC motors are connected to motor drive circuit.

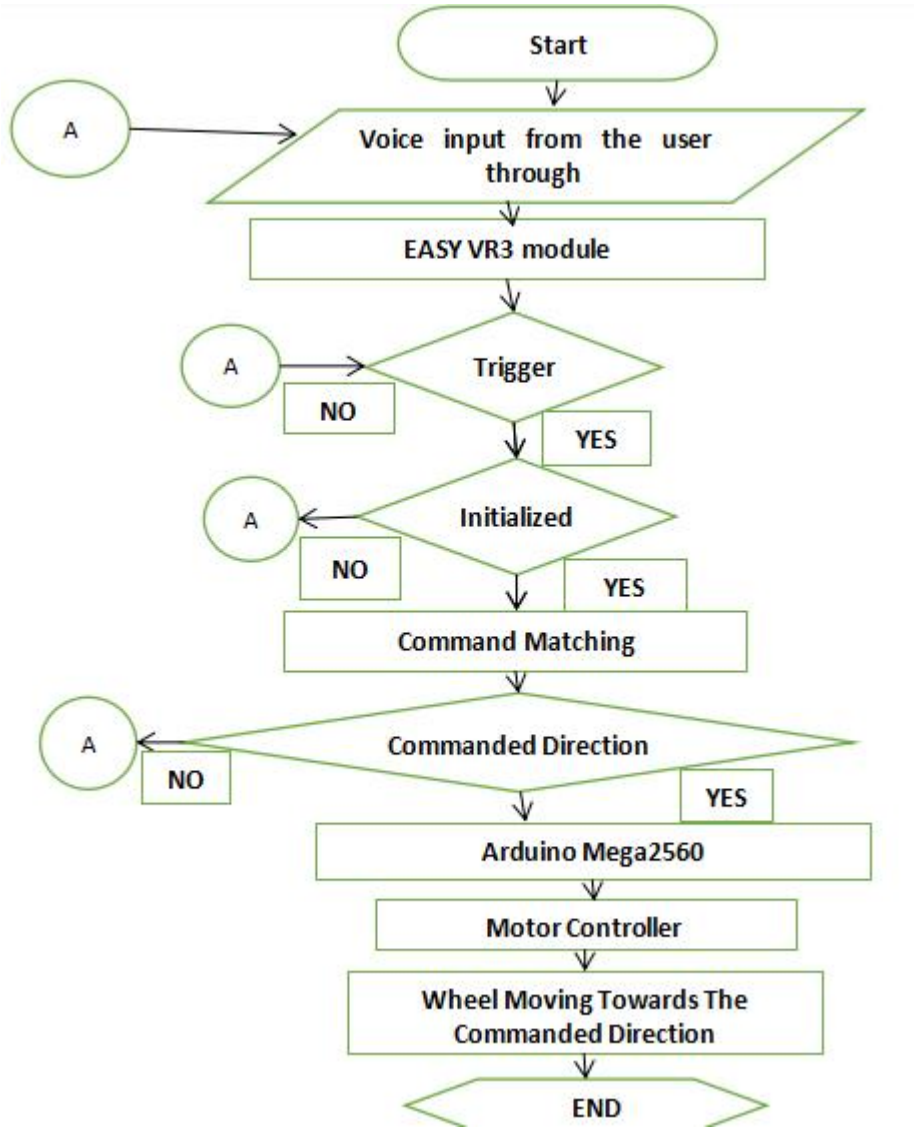
d. Motor:

In this design, 24V 250watt brushed DC motor has been chosen as it is widely used in industrial applications where the load is heavy. The chosen motor's higher rotational speed measured in RPM can be reduced using gear mechanism to provide more staring torque. The motor has a starting torque of around 50Kg-cm operated at 12V.

e. Battery:

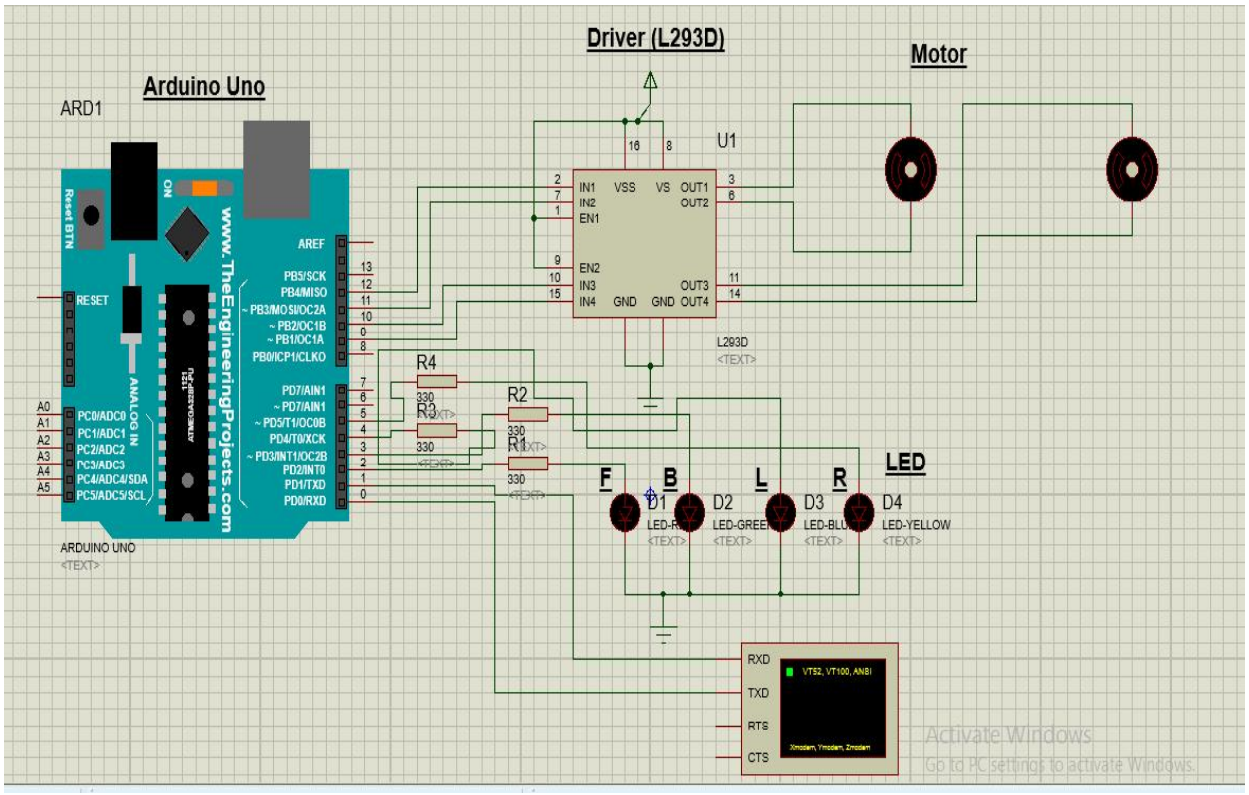
Two 12V 30Ah(Ampere hour) sealed lead acid rechargeable batteries were used to provide power of the whole system. They were connected in series to have 24V to supply the power to the motor.. Although this battery is little bit heavy weighted, this battery is used due to its availability and comparatively lower cost.

4.1.1 Flow Chart



4.2 Circuit Simulation

Above designed by prouteus 8 software simulation program which shows the general circuit components were connected to Arduino UNO input/output such as Bluetooth module and the driver L293d which control the DC motors and make interface between the Arduino UNO and motor .



4.3 Implementation

As after train the voice module, connect it with Arduino. Depending on the voice command the voice module send some code to the Arduino, Arduino work on the program that is written by User that at what command which task should be perform depending on the condition. The PWM signal is sent to the driving Circuit of motor. If the signal to move Wheelchair forward is sent than according to condition 24v will be provided to both motors.

The Sensor in front of wheelchair are connected to avoid the accident. Sensor input is connected to Arduino Interrupt pin. Interrupt pin function is that it will stop the execution of program and run the specific portion of code which is attach to that interrupt pin. That portion is consisting of how to stop the wheelchair to avoid that accident.

Joystick option also available, to used Joystick first disable the voice command so that it will not perform any action on your voice. Only action will now be performing through Joystick. In that Option, the programming option is simple the same task will be perform as which was being perform through voice command. The only change is input command which is now Joystick

Motors which are being used in this project have built-in breaking system. When Excite breaking wire the break is release and when connection disconnected it will stop automatically. To utilize that option a special Emergency Button on the wheelchair so that to stop in case of any Emergency like damage of any sensor or circuit fault.

Three Levels of speed is provided to the user. Speed is control through PWM.

4.4 Results

This work elaborates the design and construction of wheelchair with voice recognition module to control all the movements of the wheelchair. The wheelchair can also be operated by the help of an android application which can easily be downloaded in smartphones.

When the user says “forward” android Voice application sends the data in form of string “forward” to Bluetooth module connected to the circuit. When Arduino detects “forward”, the motor attached to the wheelchair moves forward.

When the user says “back” android Voice application sends the data in form of string “back” to Bluetooth module connected to the circuit. When Arduino detects “back”, the motor attached to the wheelchair moves back.

When the user says “left” android Voice application sends the data in form of string “left” to Bluetooth module connected to the circuit. When Arduino detects “left” the moves the motor attached to the wheelchair left side.

When the user says “right” android Voice application sends the data in form of string “right” to Bluetooth module connected to the circuit. When Arduino detects “right” the moves the motor attached to the wheelchair right side.

4.5 Voice module output

On different serial commands the behavior/output of the voice module changes. Some of key serial commands are as follow

Command	Descriptions
0x01	Delete Group1
0x02	Delete Group2
0x03	Delete Group3
0x4	Delete Group4
0x11	Record Group1
0x12	Record Group2
0x13	Record Group3
0x14	Record Group4
0x21	Import Group1
0x22	Import Group2
0x23	Import Group3
0x24	Import Group4
0x31	Set baud Rate 2400bps
0x32	Set baud Rate 4800bps
0x3	Set baud Rate 9600bps

CHAPTER 5
ADVANTAGES AND APPLICATIONS FUTURE SCOPE

CHAPTER 5
Advantages and Limitations

5.1 Advantages

- ✓ To implement and use the voice based system so that users voice as an input to control the mobility of wheelchair.
- ✓ Helps to implement movement for disabled people and aged people who can‟t move properly.
- ✓ Easy to drive with negligible efforts.
- ✓ Less Complexity and Hardware to mount.
- ✓ Can be mounted on the existing wheelchair.
- ✓ Wireless control helps to monitor the wheelchair.
- ✓ Reduces manpower and dependency on other human drive.
- ✓ Wheelchair is compact and economical.
- ✓ Provides easy movement for physically challenged people.
- ✓ Low power consuming and easy to operate the wheelchair.

5.2 Limitations

- ◆ It has an operating range of 10 meters.
- ◆ Even the best speech recognition system sometimes make errors.
- ◆ It causes problem during noisy environment.
- ◆ One of the common anode 7-sement drivers was damaged.

5.3 Future Scope

- Voice recognition module is used to develop the voice recognition system. Voice recognition issues a Command to control the movement of wheelchair. For movement of wheelchair Micro controller Atmega328 and DC motor circuit were built. For not to occur disorder during recognize the user voice, this system works in a quiet environment. Furthermore, the pronunciations accuracy must be ensured and the word-related (voice) the users voice must clear in short distance on microphone was essential in this innovation.
- Using gear box we can produce high speed moving wheelchair.
- PWM modulation can also increase speed.
- Solar Panel can also be used to charge the battery for power supply to the components required to drive the wheelchair.
- The wheelchair can also include the gesture feature to operate the wheelchair.
- Wheelchair only can function properly when the weight of the load for this system must be below 50 kilogram. Obstacle avoidance sensors are used.
- By designing and implementing a faster voice recognition system and a faster controller on the wheelchair, the voice controlled wheelchair may be safer to use by users.
- Work is in progress on voice recognition now voice recognition system are also using in vehicles, mobile apps are also introduced that do voice recognition and jets.
- Future scope of the project includes the ability to control various household devices through voice recognition like TV, air-condition, microwave oven etc.

CHAPTER 6
CONCLUSION

CHAPTER 6
CONCLUSION

6.1 Conclusion

This project elaborates the design and construction of Smart Electronic Wheelchair with the help of Bluetooth Module. The circuit works properly to move as the command given by the user .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. After designing this the circuit enables physically disabled to control their wheel using an android application in their smartphones. This project contributes to the self dependency of differently abled and older people.

Our proposed smart wheel chair provides a safe and reliable system with the presence of line follower and obstacle detector. It provides an easily accessible and a variety of functionalities.

In this paper, we developed a wheel chair system which includes ultrasonic and infrared sensors to automatically track the paths provided and also detects the obstacles in between the track along with a little intelligence of taking proper care to avoid the accidental mishaps, where we got the desired results.

Thus, the disabled persons can be self reliable, safe and independent with the help of this easily controllable wheel chair.Further improvement to the above implemented system can be done by providing additional sensors make the system more user friendly and avoid accidents by self learning.

Also security can be incorporated for accessing with the help of biometric authentication, or including more control commands to pass through different types of doorways.

The wheelchair is controlled by the commands from the user as well as by the using a smartphone which is connected through the Wi-Fi module.

This helps the disabled or the elderly people to move independently and thus eliminating the enslavement.

Alerts are given if the person falls down from the wheelchair and stops when an obstacle is detected. The wheelchair also provides vibration therapy for faster recovery of the patient. The efficiency of voice command-based wheelchair can be improved by neural based algorithm.

CHAPTER 7
REFERENCES

CHAPTER 7

REFERENCES

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