# VOICE RECOGNIZATION WHEELCHAIR

RANJITHA A/P KANNAN
10DEP15F1050

GAYATRI A/P SARAWANAN
10DEP15F1065

VISHAALINIE A/P INGRAN
10DEP15F1110

ELECTRICAL ENGINEERING DEPARTMENT
SEBERANG PERAI POLYTECHNIC

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# ABSTRACT

This project is related to the Voice Recognization Wheelchair System by using speech recognition module. The system is designed to control a wheelchair using the voice of consumer. The objective of this project is to facilitate the movement of people who are disabled or handicapped and elderly people who are not able to move well. The result of this design will allow certain people to live a life with less dependence on others. Speech recognition technology is a key which may provide a new way of human interaction with machines or tools. Thus the problem that they are faced can be solved by using speech recognition technology to move the wheelchair. This can be realized with used the microphone as an intermediary. In this project, interface is designed therefore to develop the program for recognizes a voice in turn controls the movement of wheelchairs. This project uses Arduino Uno and Direct Current Motor to create the movement of wheelchair. The result and analysis of this innovation will describe in this report. The results of this project show that this project can be used for future research works and to design excellence innovation that meets market need and public interest.

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# CHAPTER 1 : INTRODUCTION

## 1.1 INTRODUCTION

While the needs of many individuals with disabilities can be satisfied with power wheelchairs, some members of the disabled community find it is difficult or impossible to operate a standard power wheelchair. This project could be part of an assistive technology. It is for more independent, productive and enjoyable living. The background, objectives, problem statement and scopes of the project will be discussed in this chapter.

## 1.2 PURPOSE

This project aims at controlling a wheelchair by means of human voice. It enables a disabled person to move around independently, using a voice recognition application which is interfaced with motors. The prototype of the wheelchair is built using a arduino uno, chosen for its low cost, in addition to its versatility and performance in mathematical operations and communication with other electronic devices. 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 from it.

## 1.3 PROBLEM STATEMENTS

A handicapped person with locomotive disabilities needs a wheelchair to perform functions that require him or her to move around. He can do so manually by pushing the wheelchair with his hands. However many individuals have weak upper limbs or find the manual mode of operating too tiring. Hence it is desirable to provide them with a motorized wheelchair that can be controlled by moving voice commands. Since the motorized wheelchair can move at a fair speed, it is important that it be able to avoid obstacles automatically in real time. All this should be achieved at a cost that is affordable for as many handicapped people as possible, as well as for organizations that support them. With these requirements in mind we propose an automated wheelchair with real-time obstacle avoidance capability.

The power wheelchair control interfaces currently still not enough to provide truly independent mobility for substantial number of person with disabilities. Through research and design wise, the power wheelchair to control development along safe and effective use of the provision independence and self-use mobility. This project will provide disability weight innovative solutions to handle the wheelchairs to use voice interface.

This project describe a wheelchair which can be controlled only by using the user's voice. This project aims 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. Speech recognition technology is a key technology which can provide a new way of human interaction with machines or tools for controlling a wheelchair. This project consists of two

parts which is software and hardware. It is realized by using the microphone as an intermediary which is used as the input of human voice. In this project, Arduino Uno is used as a switch to control the movement of the wheelchair based on the human voice as an input with installing two DC motor as the driving force.

There are five options for basic motions of a wheelchair to be applied by user. The five conditions of the wheelchair can be described as the following:

i. Moving forward ( up )
ii. Moving backward ( down )
iii. Turning to the right ( right )
iv. Turning to the left ( left )
v. Stop condition ( stop )

This project describes the design and development of the motion control using voice recognition for a wheelchair application.

## 1.4 OBJECTIVES OF PROJECTS

This paper projects an android based voice controlled wheelchair for handicapped/elderly people to help them. This wheelchair is battery powered controlling two D.C motors. The chair functions on the accelerometer sensor in built in modern day smart phones. Tilt of the smartphone is given as an input command to the microcontroller via Bluetooth module the movement of the D.C motors. Depending on the directions of tilt of the smart phone, the arduino uno controls the wheelchair directions. Thus making handicapped person independent for movement.

## 1.5 RESEARCH QUESTIONS

i. Wheelchair stability is an issue in motorised wheelchairs. This issue creates a problem in handling?
ii. Automatic braking system which is used for stopping and controlling the wheelchair is missing from many present day wheelchair?
iii. Cost effective wheelchair is an issue?
iv. Charging the battery after it gets discharged is an issue?

## 1.6 SCOPE OF THE PROJECT

Develop the voice recognition system by using Voice recognition module. Voice recognition issues a command to control the movement of wheelchair. Arduino Uno and DC motor circuit were built for movement of wheelchair. This system works in a quiet environment so that no disorder during recognize the user voice. Furthermore, the user voice must clear in short distance on microphone to ensure the accuracy of the pronunciations of the word-related (voice) was essential in this innovation. The weight of the load for this system must be below 50 kilogram so that wheelchair only can function properly. Home appliance control circuit can interfaced along with wheelchair control.

## 1.7 THE IMPORTANCE AND IMPACT OF THE PROJECT

To make the handicapped person life easier and feel comfortable to live among the normal people. This project will help the handicapped person to be independent. By doing this project we would learn a lot of things such as:

1. Voice recognition module operation.
2. DC motors working and need for motor driver.
3. Interfacing Speech recognition module to Microcontroller (Arduino Uno).
4. Interfacing RF transmitter and Receiver to Microcontroller (Bluetooth).
5. Relay working principle.

## 1.8 THE DEFINITION OF THE TERM / SURGERY

There are many scientists and researchers who develop computer software that can recognize human voice commands in so many languages such as English, Japanese and Thai. There are many techniques that are used to recognize voice commands which are: 1) Neural Network Method 2) Fuzzy Logic Technique 3) Hidden Markov Model 4) Gaussian Mixture Model etc. Researchers transform sound wave into digital wave by a computer. After that they use digital signal to manage different electronic equipment's, for example 1) controlling robot arm movement 2) helping the handicapped to move a wheelchair etc.

In the paper on "VOICE OPERATED WHEELCHAIR" voice command input is taken from android mobile and converted into text and this text is given to the microcontroller via Bluetooth module to control the operation of D.C motors.

In the paper "VOICE AND TOUCH SCREEN BASED AND SPEED CONTROL OF WHEELCHAIR FOR PHYSICALLY CHALLENGED USING" input to in two ways I.E via voice command or touch command I.E HM 2007 is used as a voice recognition device. Input method is switched through switches and input is given by any two methods. Two D.C motors are used to provide motion.

In the paper "A WHEELCHAIR STEERED THROUGH VOICE COMMANDS AND ASSISTED BY A REACTIVE FUZZY-LOGIC CONTROLLER", voice command controlled and a fuzzy logic controller is used along with a sensor network to avoid collision of the wheelchair. Fuzzy logic controller is used to rectify problem caused due to low voice command input from the user.

# CHAPTER 2 : LITERATURE REVIEW

## 2.1 INTRODUCTION

The aim of this research is the development of intelligent solutions for controlling electrical wheelchairs without joystick. This type of user has increased rapidly in the recent years due to the increasing of accidents, wars, physically handicapped and an aging population. We use Android phone for sharing voice recognition through Bluetooth and operate the wheelchair with the help of the Arduino Uno. This is a dual input type operated wheelchair that is made to work based on voice and button module commands. In particular, robotic wheelchairs may help in manoeuvring a wheelchair and planning motion. Recently, research of assistant robots is also emerging field of robotic applications.

## 2.2 LITERATURE REVIEW

Several studies have shown that the independent mobility; which is included power wheelchair, manual wheelchair and walker access the benefit to both children and adults Independent mobility increases vocational and educational opportunities, reduces dependence on care givers and family members, and promotes feelings of self-reliance.

For young children, independent mobility serves as the foundation for much early learning. Non ambulatory children lack access to the wealth of stimuli afforded self-ambulating children. This lack of exploration and control often produces a cycle of deprivation and reduced motivation that leads to learned helplessness.

For adults, independent mobility is an important aspect of self-esteem and plays a pivotal role in "aging in place". For example, if older people find it increasingly difficult to walk or wheel themselves to the commode, they may do so less often or they may drink less fluid to reduce the frequency of urination. If they become unable to walk or wheel themselves to the commode and help is not routinely available in the home when needed, a move to a more enabling environment (e.g., assisted living) may be necessary.

Mobility limitations are the leading cause of functional limitations among adults, with an estimated prevalence of 40 per 1,000 persons age 18 to 44 and 188 per 1,000 at age 85 and older. Mobility difficulties are also strong predictors of activities of daily living (ADL) and instrumental ADL disabilities because of the need to move to accomplish many of these activities.

In addition, impaired mobility often results in decreased opportunities to socialize, which leads to social isolation, anxiety, and depression. While the needs of many individuals with disabilities can be satisfied with traditional manual or power wheelchairs, a segment of the disabled community finds it difficult or impossible to use wheelchairs independently. This population includes, but is not limited to, individuals with low vision, visual field reduction, spasticity, tremors, or cognitive deficits. These individuals often lack independent mobility and rely on a care giver to push them in a manual wheelchair. To accommodate this population, several researchers have used technologies originally developed for power wheelchairs have been designed of different ways, such as assuring collision-free travel, aiding the performance of specific tasks (e.g., passing through doorways), and autonomously transporting the user between locations.

The idea of using voice activated technology for controlling the motion of the wheelchair is to prove that it can be a unique concept that would stand apart from the rest of the average projects. The use of this new technology in conjunction with a mechanical system in order to simplify everyday life would spark interest in an ever growing modern society. Many people with disabilities do not have the dexterity necessary to control a joystick on an electrical wheelchair. This can be a great for the quadriplegics who is permanently unable to move any of the arms or legs. They can use their wheelchair easier only using voice commands.

## 2.3 REFERENCES


i. "VOICE OPERATED INTELLIGENT WHEELCHAIR"
by Ms. S. D. Suryawanshi, Mr. J. S. Chitode, Ms. S. S. Pethakar,
"International Journal of Advanced Research in Computer Science and Software Engineering"

ii. "VOICE BASED DIRECTION AND SPEED CONTROL OF WHEELCHAIR FOR PHYSICALLY CHALLENGED"
by M.Prathyusha, K. S. Roy, Mahaboob Ali Shaik,
"International Journal of Engineering Trends and Technology (IJETT)"

iii. "A WHEELCHAIR STEERED THROUGH VOICE COMMANDS"
by Gabriel Pires and Urbano Nunes,
"Journal of Intelligent and Robotic"

iv. "SMART WHEELCHAIRS: A LITERATURE SURVEY"
by Richard Simpson,
"Journal of Rehabilitation Research & Development"

v. Chin-Tuan Tan and Brian C.J.Moore,
Perception of nonlinear distortion by hearing-impaired people,
International Journal of Ideology 2008, Vol. 47, No.5, Pages 246-256.

vi. Oberle, S., and Kaelin, A.
"Recognition of acoustical alarm signals for the profoundly deaf using hidden Markov models," in IEEE.
International symposium on Circuits and System (Hong Kong), pp. 2285-2288., 1995.

vii. A.Shawki and Z.J., A
Smart reconfigurable visual system for the blind,

Proceedings of the Tunisian-German Conference on: Smart System and Devices, 2001.

viii. C. M. Higgins and V. Pant,
Biomimetic VLSI sensor for visual tracking of small moving targets,
IEEE Transactions on Circuits an Systems, vol. 51, pp. 2384-2394, 2004.

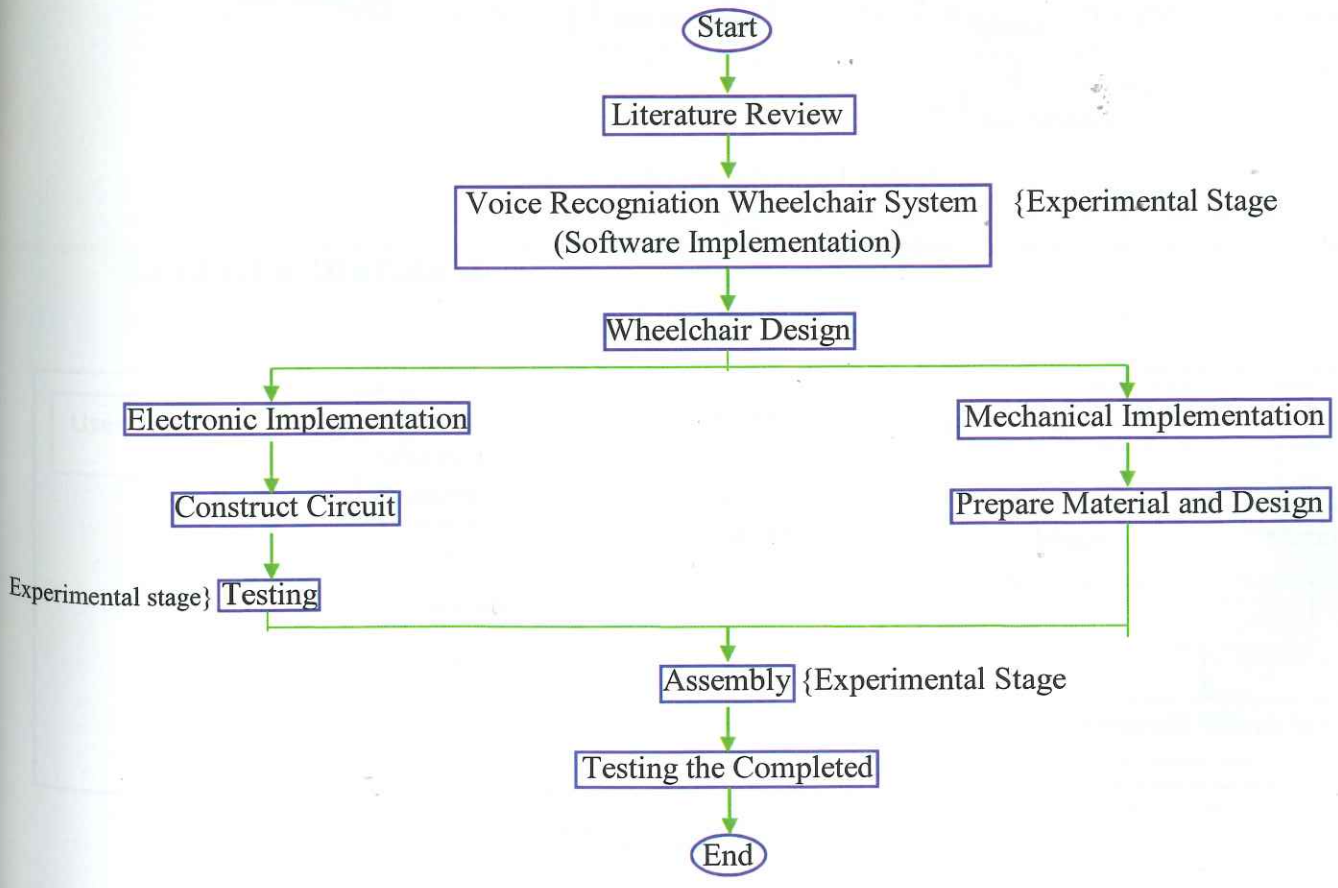
# CHAPTER 3 : METHODOLOGY

## 3.1 INTRODUCTION

Methodologies are methods or procedures used to implement the project in detail. These steps are very important to ensure the project is successfully completed at the same time and that has been fixed. In addition, there are ways to test the fabricated circuit.

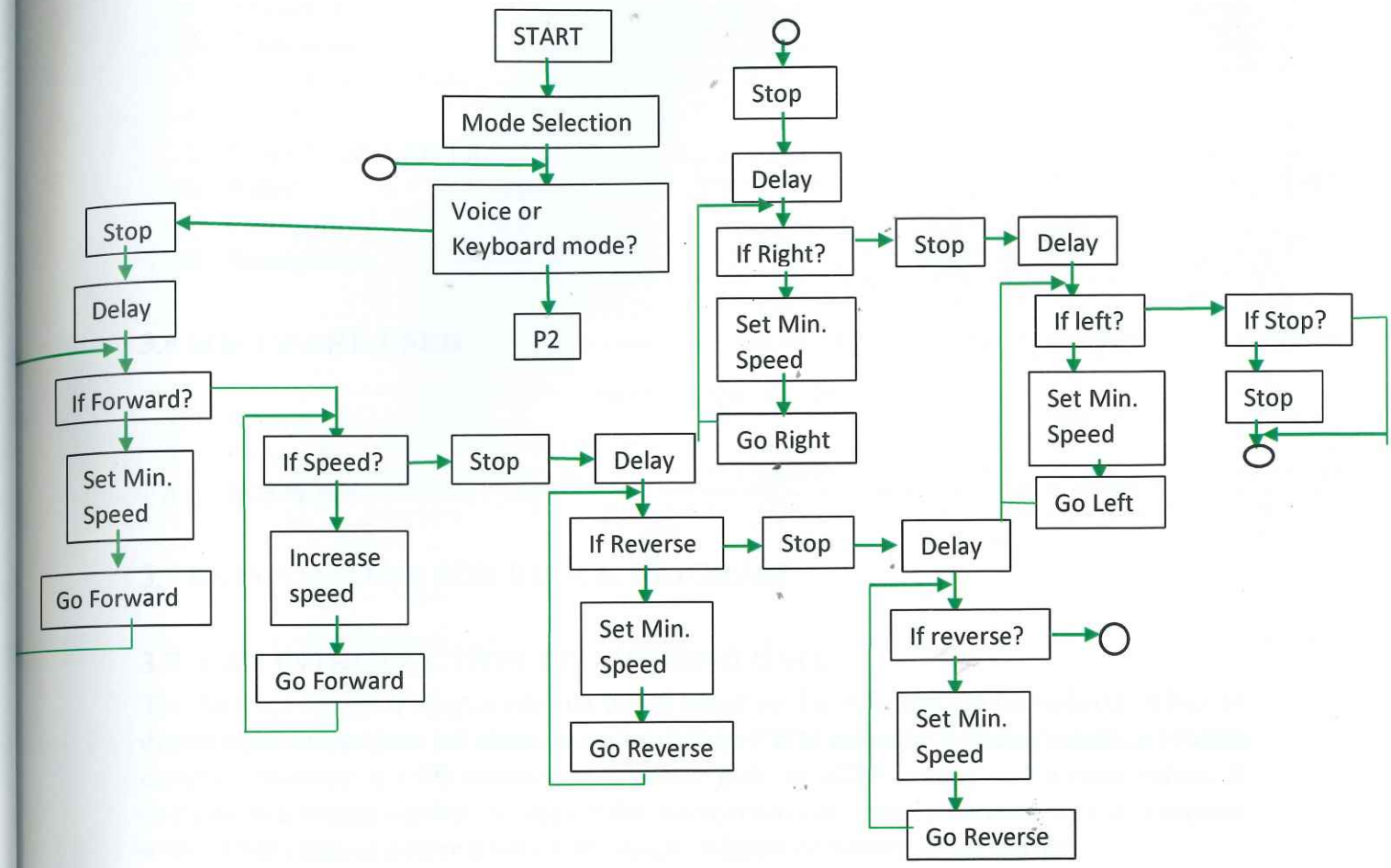
When producing the project, a number of steps that need to be gone through before the project is completed. These steps should be done with utmost care so as to produce a quality project and quality. Further explanation will explain step methodology.

## 3.2 FLOW CHART



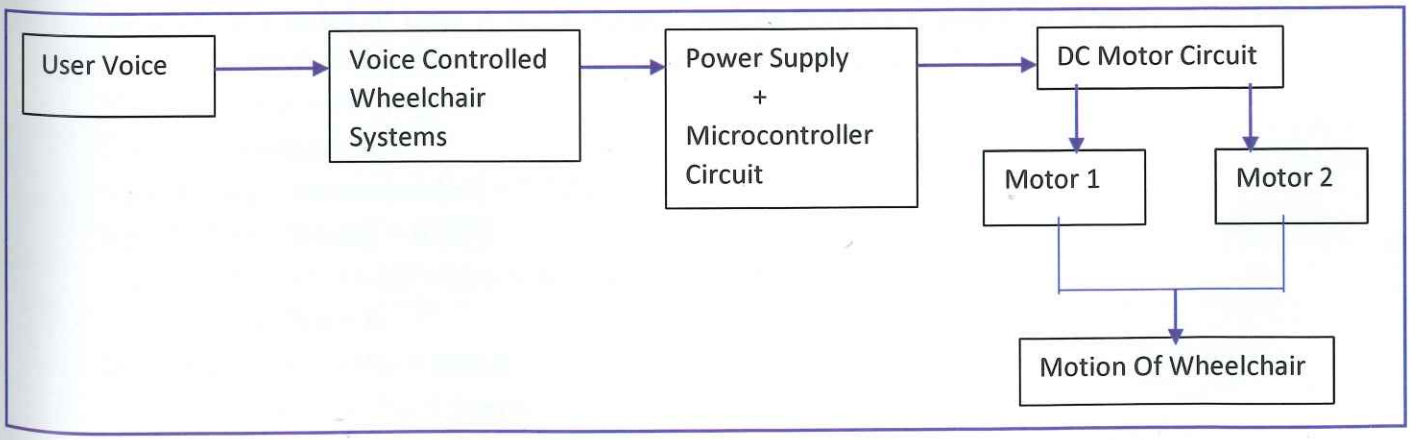

1.1 Flow chart for implementation of project

## 3.3 FLOWCHART FOR VOICE CONTROL




1.2 Flowchart For Voice Control

## 3.4 BLOCK DIAGRAM




1.3 Wheelchair block diagram

## 3.5 HARDWARE USED

1. Arduino Uno.
2. Wheelchair
3. Wheels, DC motors.
4. Battery.
5. Voice Control Module
6. Relay
7. Bluetooth
8. Smartphone

## 3.6 SOFTWARE USED

i. Arduino 1.8
ii. Proteus 8
iii. PCB Wizard

## 3.7 EXPLANATION FOR BLOCK DIAGRAM

### 3.7. 1 AN INTRODUCTION TO ARDUINO UNO:

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the ATmega16U2 (ATmega8U2 up to version R2) programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0 The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

Microcontroller = ATmega328
Operating Voltage = 5V
Input Voltage (recommended) = 7-12V
Input Voltage (limits) = 6-20V
Digital I/O Pins = 14 (of which 6 provide PWM output)
Analog Input Pins = 6
DC Current per I/O Pin = 40mA
DC Current for 3.3V Pin = 50mA
Flash Memory = 32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM = 2 KB (ATmega328)
EEPROM = 1 KB (ATmega328)
Clock Speed = 16 MHz

## 3.8 WHEELCHAIR BATTERY

The battery used in this work is wet type. Wet batteries use the chemical reaction between lead and sulphuric acid create electrical energy. As the batteries need filling with distilled water, they do have a higher maintenance rate, but are lighter than Gel or AGM (Absorbed Glass Mat) batteries.

## 3.9 WHEELS

Wheelchair has four wheels, two rear wheels and two castor wheels, the two wheel are fixated in wheelchair base in front all wheels have the same diameter. The driver wheels are in rear on either side of the base, allowing the chair to turn according to voice command, wheels engages directly to a gear train that transmit torque form motor to wheels by two grooves in each wheel and nut.

## 3.10 MOTORS

Motors are arguably one of the most important parts of a mobile robotics platform. Over powered motors cause inefficiency and waste the already limited supply of power from the on-board batteries, while undersized motors could be short on torque at critical times. The optimal rotation speed and the available speed range of the motor must also be taken into consideration. Too high of an output rpm from the motor shaft will not be able to attain a suitable speed to meet the user's needs. The torque output of the motor also plays a role in the performance because if the torque is not sufficient, locomotion may not occur in certain situations. Therefore, much consideration was put into the selection of the proper motor for the platform.

Motors come in many shapes and sizes. There are electromagnetic direct current (DC) motors and electromagnetic alternating current (AC) motors and a number of variations of each. AC motors are typically used for large applications, such as machine tools, washers, dryers, etc., and are powered by an AC power line. Since the typical power supply for mobile robotic is a DC battery, and technology for transforming DC to AC is very expensive in both terms of monetary cost and power cost, AC motors where ruled out as an option for the robot.

DC motors are commonly used for small jobs and suited purposed of the platform very well. Figure shows the 12V DC motor use in wheelchair.

## 3.11 HARDWARE COMPONENTS ADDED TO ORIGINAL WHEELCHAIR

The modification that adds to original wheelchair with removing joystick that designs before (to modifying wheelchair function according to person injury especially for the injuries who suffer from spasms and paralysis of extremities) makes its physical design very effective. It is a combination of various physical (hardware) and computational (software) elements that integrate the subsystems of the wheelchair to work in one unit. In terms of hardware components the main components that added to wheelchair are interfacing circuit, microphone (headset microphone) and notebook computer (host computer).

## 3.12 MICROPHONE

A quality microphone is the key when utilizing automatic speech recognition (ASR). On most cases, a desktop microphone just will not do the job. They tend to pick up more ambient noise that gives ASR programs a hard time. Hand held microphones are also not the best choice as they can be cumbersome to pick up all the time. While they do limit the amount of ambient noise, they are most useful in applications that require changing speakers often, or when speaking to the recognizer is not done frequently (when wearing a headset is not an option).

The best choice and by far the most common is the headset style. It allows the ambient noise to be minimized, while allowing you to have the microphone at the tip of your tongue all the time [Cook, 2002]. Headsets are available without earphones and with earphones (mono or stereo) in this work the headphone type (FANCONG FC-340) is employed.

## 3.13 RELAY DRIVER INTERFACING CIRCUIT

A relay can be used to switch higher power devices such as motors and solenoids. If desired, the relay can be powered by a separate power supply, so, for instance, 12V motors can be controlled by the parallel port of notebook computer. Free welling diode can be used to protect the relay contact and prevent damage to the transistor when the relay switches off.

An intermediate stage between control signal (output of parallel port) and motors consists of a combination of component relays, transistors, diodes, capacitors, resistors and buffer 74ABT245, it uses to protect parallel port against any expected damage. The 74ABT245 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output driver.

## 3.14 COMPONENT TESTING AND CIRCUIT

The second step is to get the components associated with circuit that involved with the project. Once all the components are found, these components need to be tested which is it is in good condition or otherwise. This is to ensure that is no problems will occur when testing up circuits that are ready done.

## 3.15 COMPONENT TESTING

Before the components are installed and be soldering on the PCB, it must necessarily be tested. The testing process is done to make sure that component are in good condition or not.

For diode components, the way of testing is to determine polarity which one is anode and cathode, by refer on the reading on the multimeter. If the 'probe' feet placed under normal circumstances, the probe red is placed on cathode and black on anode to give readings on the meter. This applies to the range of obstacles because using battery negative terminal on the 'probe' red, and vice versa for the 'probe' black. Component testing process is done by using various meter (multimeter) on Ohm range. For exquisite barrier component value must necessarily close to the value that has been printed on the body.

## 3.16 TESTS CIRCUIT

For the test circuits, it is done by installing all of the components on the test board (project board) and use a multimeter. It is performed for ensuring circuits and components are in good condition. It is important to obtain and ensure the components that will be used later does not cause any problems.

## 3.17 PRODUCE PCB (Printed Circuit Board)

Printed circuit board produced refer to circuit was constructed. There is several measures to ensure printed circuit board produced function and look tidy:

1. Printed circuit produced guided to circuit was constructed.
2. Get component that will be used.
3. Test circuit built use "board bread".
4. Identify component actual size.
5. Component layout so that seen tidy and attractive. At same time it is give minimise where circuit size circuit that is good is circuit that is tidy, attractive and small.
6. Trailed circuit to determine extension.
7. After trace made, it will be transferred to circuit board.
8. Do process "etching".
9. Punch component foot hole.
10. Install component in circuit board and consequently make soldering.

## 3.18 STEPS PRODUCE PRINTED CIRCUIT BOARD

1. Get whole component needed to build project circuit.
2. With the existence of component, circuit built necessary tested at "board bread". This is because to know whether the circuit can function or otherwise. At this stage too, we able to see any problems and can do the correction.
3. If no problem, process further can be done by taking component size and physical size.
4. Component arranged according to suitability so that seen tidy. Component arrangement that is correct can minimize size a printed circuit board.
5. Then trace done at component foot lower part because circuit extension done at "PCB" lower part. Easy means is by reversing component arrangement position just now.
6. After extension made completed, check one extension made just now. Simplest method is by calculating and trace extension total of certain component. This to ensure every extension needed to the component done.
7. From the sketch were made, it can move into circuit board. There is various ways that can make to evacuate sketch made to circuit board according to maker creativity.
8. Before "etching" process made, sketch made necessary revised to ensure no extension that left.

9. Process "etching" requires acid mixed with hot water. Total acid that a lot cause erosion process in metal layer "PCB" becomes faster. But total acid that too also many is adverse. Hot water used so that this acid solution is more active compared to if use cold water.
10. Acid solution that mix hot water just now should be placed into former which can accommodate circuit board. Then include circuit board into former just now and sake the containers to produce erosion that is regular.
11. After all divisions that does not require eroded, board washed by using clear waters.
12. Further is process punch component foot hole in board.
13. Then component foot drilled by using drill bit that suitable according to component foot.
14. Then, circuit just now should be brushed by using fine sand paper for dirt and "lettering" layer just now can be taken off.
15. Lastly, components assembly carried out and process soldering made.

## 3.19 ETCHING PROCESS

### 3.19.1 STEPS FOR ETCHING PCB

1. Design the PCB circuit.
2. Print out the design using the tracing paper.
3. Place the design paper onto the copper of the PCB.
4. Place the board into the UV imaging frame machine for a few seconds.
5. Gently brush the PCB.
6. Put the board in the acid tank for about a few minutes until the copper traces are completely etched. It is finished when board turns from opaque pink to transparent yellow.

## 3.20 PREPARATION HOLES PROCESS/ DRILLING

Punch a hole before the process is done, the source terminal or point hole marked with centre punch. This is done to simplify the process of drilling.
Equipment needed to drill a hole on the PCB board:

i. Mini drill
ii. A hole punch
iii. Iron hammer

## 3.21 STEPS FOR PREPARATION THE HOLES ON PCB

To complete the PCB production, fix the board to a piece of wood, drill holes (holes should be at least 0.1mm bigger than pins/wires). The correct way for drilling is the drill but should be situated angular 90 degrees from PCB surface. Remember, let the drill do its job and don't give force pressure from your hand. It is to prevent drill bit from being broken.

## 3.22 INSTALL COMPONENTS ON PCB

During the installation process components, several steps before and after installation to be done to produce a perfect installation components. These steps are very important and should be done with great caution and careful. Steps should also be carried out on the circuit that is ready for etching.

## 3.23 TESTING CIRCUIT

Set the multimeter. Make the probe touched the tip or two connecting each track tested. The test is performed after the PCB has been prepared for etching. Performed it by using a mulitmeter. Range on the multimeter is $^{x}10$.

If the pointer indicates the zero barrier, then track it is located in a contiguous state. Had the needle on the multimeter does not move, then track it is disconnected or not continued. Circuits and components which been ready to be tested will be mounted on the PCB and will be soldering.

## 3.24 SOLDERING PROCESS

1. Put solder iron in solder iron holder, "ON" electrical switch to warm solder iron five long or ten minutes.
2. Touch solder iron end in "paste soldering" or by feeling in wiper sponge to really sure solder iron end already hot to be applied.
3. Solder iron position that already hot and tin used must be inclined 45° condition, of which to get soldering that is good.
4. Scrub solder iron end with "paste soldering" and put again solder iron in the holder.
5. Once overdo soldering works, make sure electricity supply in soldering iron have been laid off.

## 3.25 REMOVE THE LEG OF THE COMPONENT

After soldering process is carried out, the extra components legs should be cut. This will make the PCB board neat. Cutting should be done with a sharp cutter. Students are encouraged to cut with a knife. Cutting should be done with particular suitability.

## 3.26 TESTING AFTER SOLDERING

The last process is the testing circuit. It is to ensure that the project can be controlled with a good and prefect. For this process multimeter is required to measure and ensure no current is flowing. Prior to the testing process is done projects examined first. Legs components are inspected to ensure no legs who shorted and installed with the correct polarity. Before this circuit is used, it must be tested to ensure that circuit really works well after undergoing the process of soldering.

## 3.27 SUMMARY

We have presented a novel technique to help the handicapped peoples. We are using both voice and sensor. In case of any malware process we can switch the module.

# CHAPTER 4: IMPLEMENTATION

## 4.1 INTRODUCTION

In this chapter, we will explain about the implementation plan, program simulation of project output and the estimated cost to implement for this project. In addition, it has to be explain about the results that we get after doing the project whether it functioning or not.

### 4.2 IMPLEMENTATION PLAN:

- ❖ Hardware Requirements

- ✓ Voice Recognition Module
- ✓ Arduino Uno
- ✓ Wheelchair
- ✓ Relay
- ✓ Bluetooth controller-HC05
- ✓ Battery
- ✓ Jumper wire

- ❖ Software Requirements

- ✓ Arduino software for programming
- ✓ ARES 7 for PCB Design
- ✓ Android Studio

### 4.2.1 IMPLEMENTATION

In the process of creating a project, the first and important need to concern is measure and regulation is the most important to produce a perfect and neat project. There are some steps that need to following:

1. The process in the circuit PCB mounting
2. The process of developer
3. The process of etching

4. The installation process components
5. The process of soldering

1. Process in the circuit PCB mounting

Cut off the printed "artwork" circuit design according to the size and affix the printed design to the PCB board. Put the board inside the Ultra Violet machine and make sure the surface is clean, then design side facing the bulb and close the UV emitter tightly for about 105 seconds or 4 minutes. After the UV light circuit, do not exposed the PCB in the sun because this will cause the circuit at the trace has been lost from the surface of the PCB. We recommend that after the process of UV light just go on doing the circuit because to prevent developer damaged.

2. The process of developer

After complete the process on the Ultra violet machine. Take it and was it with a clean water. Cleanse the board by emerging the board inside a tube filled with sodium solution to clear the excess board. Then, ensure that the circuit has circuit has to be ironed correctly on the PCB, attached to the PCB. Developer is used to build a circuit that has been in the trace on the PCB that can be seen more clearly circuit. There is a fluid called developer which aims to produce the circuit trace on the PCB. This process may takes around 10 minutes to 15 minutes.

3. Process of etching

Different machines and chemicals can be used for etching process because it will affect the comfort, duration and a quality of the result there two types of ACID that can be used for etching, which is ferric chloride ( Eisen -3- Chloride ) and Sodium Persulfate. Etching also is used in microfabrication to chemically remove the layers from the surface of a wafer during manufacturing. Etching process is critically important process module, and every wafer undergoes many etching steps before it is complete.

Although etching can also be done in simple plastic boxes, the quality of the results will improve dramatically when using a machine that control the temperature and constantly keeps the fluids in motion. There are small etching tanks with heating and air pump and there are small spray etching machine which also handle bigger PCBs and development and cleaning process are involved too. Then the spray also will decrease the etching time and the amount of acid needed.

Steps to get rid of all unwanted copper for etching process:

1. Put the board in the acid tank and set it up about 6 minutes until the copper traces are completely etched.

2. When the board from opaque pink to transparent yellow, move the board in to the rinse tank for a few seconds.

3. After making sure that the board is completely etched, wash the excess etching solution with a warm water.

- Drill the board according to the holes as shown in the design.
- When drilling holes, points drill should penetrate completely into the back of the PCB.
- Eye drill is used dependent on the size of the heat of the component and use the appropriate size so that the resulting hole is not too big or small.
- Before starting the process of drilling, holes is not too big or too small.
- After complete of the hole being drilled, test the PCB board by using the "multimeter" to check whether there has a connection on the circuit or not.

## 4. Process of soldering the components

Soldering components process is important process of completing a good project. Soldering is the process of joining two metals together with soldering iron by using solder to form a dependable electrical joint. But before carry out the soldering process, beware and take note the steps. If did not follow the techniques correctly, it will damage the process on the circuit board or the components itself. There are several techniques and steps that need to take note:

1. Switch ON the soldering iron and wait until it becomes hot.

2. PCB and feet should be cleaned and soldering tool should be cleaned on a damp sponge.

3. Soldering tool should be heated. Bit soldering tool also should be ascertained exactly warm to simplify the process of melting the tin.

4. Wear with a little bit of tin on the tip to facilitate good heat conduction.

5. The tin placed on a heated without lifting a soldering tool bits.

6. Soldering is done securely so it does not need to spill over into other areas.

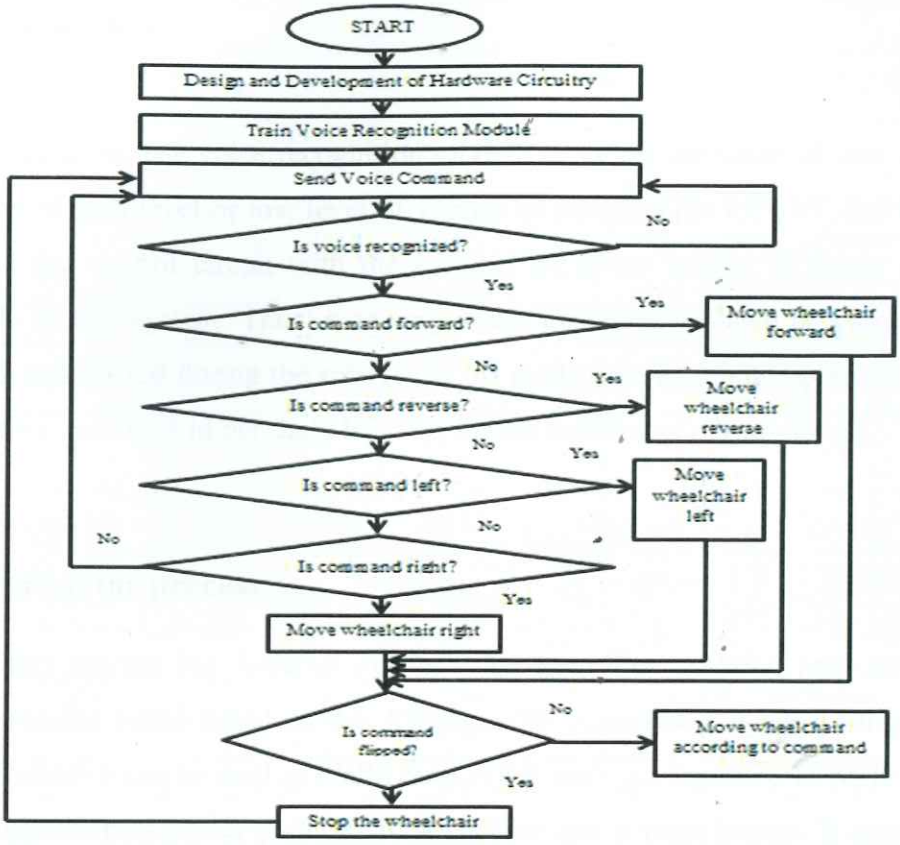
7. When finished using the soldering, clean that bit of excess solder adhering to preserve a bit of solder.

Figure 1 shows the etching board heated by using high voltage lamp

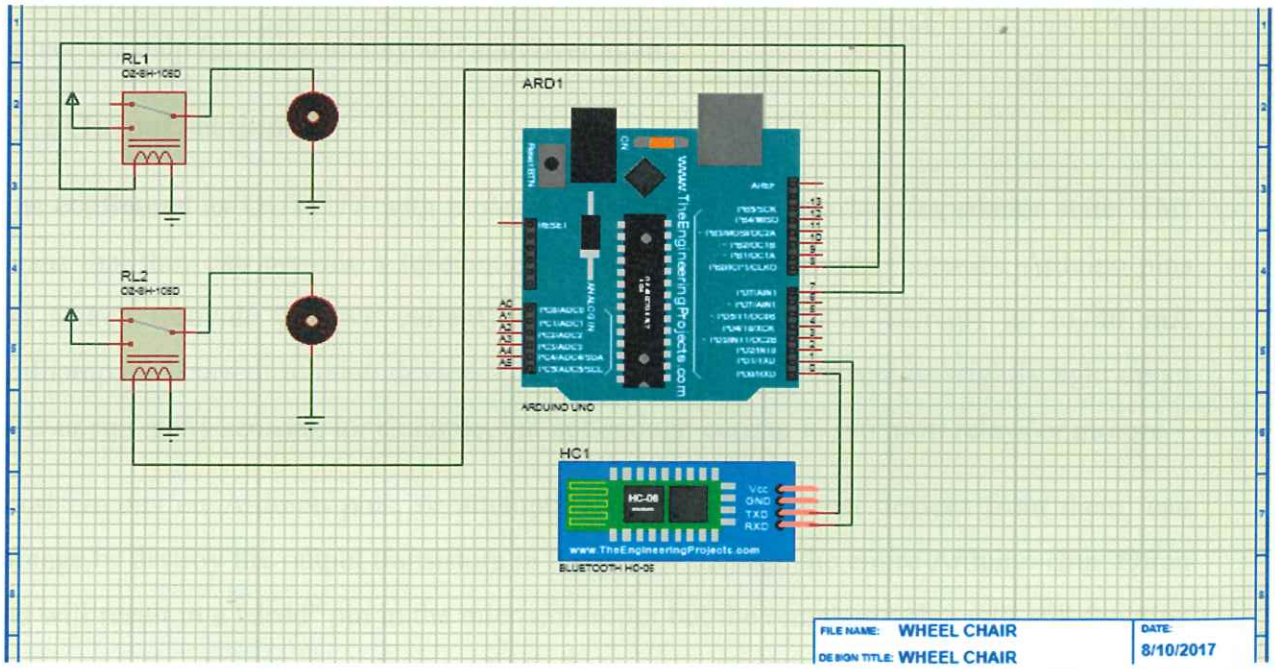
Figure 2 shows the etching board is soaked with the chemical liquid

## 4.3 ANALYSIS

Software analysis are content about the program simulation that we have run to test the functioning output of this project. The program have been through analysis line by line to get the functional output correctly. Besides that, we also done on hardware analysis which was on the bread board and test our circuit to get the output we wanted to.




1.4 Diagram of voice recognition module




1.5 Schematic diagram

## 4.4 Input section

In the project we use voice recognition module to detect the voice of user .NAND gate for detection of high level or low level of voltage to energize the RELAY coil which is used to interface the control circuit with the external dc motor source. Wastage of power is not desirable in any system. Thus, it is very much economic to have this arrangement so that power is not wasted during the robot is in off mode where manual operation is not possible. Though we can use it in our daily life also for the betterment of our system.

### 4.4.1 Part of the process

Part of this process has Arduino Uno as microcontroller. Arduino uno circuit functions as microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analogue 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 microcontroller; simply connect it to a computer with a USB cable or power it with a 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 money and start over again.

### 4.4.2 Output section

Pins configured as OUTPUT with pinMode() are said to be in a low-impedance state. This means that they can provide a substantial amount of current to other circuits. Arduino pins can source (provide positive current) or sink (provide negative current) up to 40 mA (milliamps) of current to other devices/circuits. This is enough current to brightly light up an LED or run many sensors, for example, but not enough current to run most relays or motors.

Short circuits on Arduino pins, or attempting to run high current devices from them, can damage or destroy the output transistors in the pin, or damage the entire Arduino chip. Often this will result in a "dead" pin in the microcontroller but the remaining chip will still function adequately. For this reason it is a good idea to connect OUTPUT pins to other devices with 470Ω or 1k resistors, unless maximum current draw from the pins is required for a particular application.

## 4.5 Coding for Arduino

```
int motor1Port1 = 3;
int motor1Port2 = 4;

int motor2Port1 = 8;
int motor2Port2 = 10;


int state;
int flag=0;
int stateStop=0;
void setup() {

pinMode(motor1Port1, OUTPUT);
pinMode(motor1Port2, OUTPUT);


pinMode(motor2Port1, OUTPUT);
pinMode(motor2Port2, OUTPUT);



Serial.begin(9600);
}

void loop() {


if(Serial.available() > 0){
state = Serial.read();
flag=0;
}
```