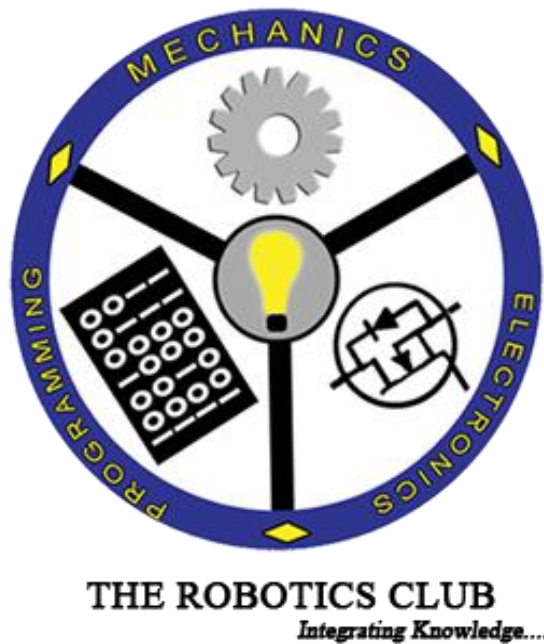**Project Report on**

SEMI AUTONOMOUS STRETCHER TO WHEEL CHAIR CONVERTER

Submission to the THE ROBOTICS CLUB as a part of INDUCTION'20

TEAM 5

THE ROBOTICS CLUB-SNIST

SREENIDHI INSTITUTE OF SCIENCE AND TECHNOLOGY

(AUTONOMOUS)

(Affiliated to JNT University, Hyderabad)

Yamnampet, Ghatkesar, Hyderabad – 501 301.

2020

1

CERTIFICATE

This is the project work titled **'SEMI AUTONOMOUS STRETCHER TO WHEEL CHAIR CONVERTER'** by 'Sathya Priya', 'Bhuvan Pratap', 'V.Srilekha', 'Kiran Varma', 'Nithin', 'Y.Charan Teja', 'Venkat Sai Reddy', 'Rajesh Yadav' under the mentorship of 'T.Bhargav Reddy', 'M. Teja Sai Chandu' for the recruitment into **THE ROBOTICS CLUB-SNIST** and is a record of the project work carried out by them during the year 2019-2020 as part of **INDUCTION** under the guidance and supervision of

M.M. SAI PRAKASH   **DATTA LOHITH**

Technical Head   **Technical Head**

T.V. HARI KRISHNA

The President of THE ROBOTICS CLUB

Dr. A. PURUSHOTHAM

Technical Advisor

Mechanical Department

DECLARATION

The project work reported in the present thesis titled **"SEMI AUTONOMOUS STRETCHER TO WHEEL CHAIR CONVERTER"** is a record work done by **Team "5"** in **THE ROBOTICS CLUB** as a part of **INDUCTION-20.**

No part of the these is copied from books/ journals/ Internet and wherever the portion is taken, the same has been duly referred in the text. The report is based on the project work done entirely by TEAM "5" and not copied from any other source.

Index

Contents

LIST OF FIGURES

ABSTRACT

Wheelchairs and stretchers are the most commonly used mobility aids for the movement of patients. Transferring the patients from wheelchair to stretcher or to the medical bed or vice versa is always an issue for the attendant or nurse. we propose a design of wheelchair convertible stretcher operated easily either by the patient or by the attendant according to the comfort of the patient.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION TO PROJECT: Semi Autonomous wheel chair to stretcher converter helps   by converting the wheel chair into strtcher or vice versa . It reduces no. Of wheel chairs or stretchers in the hospital .It becomes easy for a hospital to count the no. of wheel chairs or stretchers . it makes the movement easy.

1.2 ORGANISATION OF THE PROJECT:

Chapter 1 describes about the aim and the introduction part of the project

Chapter 2 gives the description of the components in detail used in project.

Chapter 3 describes implementation of the project with block diagram and the circuit description.

Chapter 4 shows the results and discussions what had been done is explained in detail.

CHAPTER 2
ARCHITECTURE

2.1 COMPONENTS USED

2.1.1 Hardware

- Jumper wires
- Nuts and bolts
- L angles
- L clamps
- 10*4 tractor wheels
- Wood
- Dummy shafts
- PVC pipes
- Lithium ion cells 2600 mAh 3.7 volts
- 3 cell holder
- Single stand wires
- Elbow pipes
- Side shaft motors

2.1.2 Software

- Stm32 f103,ftdi232 modules
- L298N

2.2 COMPONENTS DESCRIPTION

2.2.1 HARDWARE

● **JUMPER WIRES**

Jumper wires are simply **wires** that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. **Jumper wires** are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

Types of jumper wires

There are different types of jumper wires. Some have the same type of electrical connector at both ends, while others have different connectors. Some common connectors are:

- **Solid tips** – are used to connect on/with a breadboard or female header connector. The arrangement of the elements and ease of insertion on a breadboard allows increasing the mounting density of both components and jump wires without fear of short-circuits. The jump wires vary in size and colour to distinguish the different working signals.
- **Crocodile clips** – are used, among other applications, to temporarily bridge sensors, buttons and other elements of prototypes with components or equipment that have arbitrary connectors, wires, screw terminals, etc.
- **Banana connectors** – are commonly used on test equipment for DC and low-frequency AC signals.
- **Registered jack (RJnn)** – are commonly used in telephone (RJ11) and computer networking (RJ45).
- **RCA connectors** – are often used for audio, low-resolution composite video signals, or other low-frequency applications requiring a shielded cable.
- **RF connectors** – are used to carry radio frequency signals between circuits, test equipment, and antennas.
- **RF jumper cables** - Jumper cables is a smaller and more bendable corrugated cable which is used to connect antennas and other components to network cabling. Jumpers are also used in base stations to connect antennas to radio units. Usually the most bendable jumper cable diameter is 1/2"
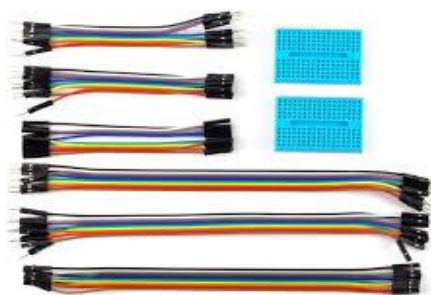
● NUTS AND BOLTS

A **nut** is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction (with slight elastic deformation), a slight stretching of the bolt, and compression of the parts to be held together.

Bolts secure material by applying pressure from the head of the bolt. They fit with corresponding tapped holes and nuts to create bolted joints. Cap screws and hex bolts have heads designed for tightening to exact specifications with ratchets or spanner torque wrenches. Bolts with rounded heads, such as carriage bolts and step bolts, provide a low-profile fit in tight applications. Eye bolts have heads with large, round openings that can connect with hooks or other fasteners for specialty applications such as vertical lifting.

● L ANGLES

They are very light in their weight and are available at different shapes and sizes in the market. The important advantage of these products is that their body is made up of stainless steel which makes them very strong. They don't get affected by corrosion because they have the great tendency to resist against it. The strength of these products is very high.

- **L CLAMPS**

They are very light in their weight and are available at different shapes and sizes in the market. The important advantage of these products is that their body is made up of stainless steel which makes them very strong. They don't get affected by corrosion because they have the great tendency to resist against it. The strength of these products is very high. These clamps are used in inverters and these are of number 7 & 10.

10*4 TRACTOR WHEELS

Material used in wheels is plastic and rubber. wheels are of diameter10 cm and width 4 cm .Shaft bore is about 0.6cm.Reinforced ribs are for higher strength of wheel structure. Grub screw is used for assembling with the motor

WOOD

Wood is a porous and fibrous structural tissue found in the stems and roots of trees and other woody plants. It is an organic material a natural composite of cellulose fibers that are strong in tension and embedded in a matrix of lignin that resists compression. Wood is sometimes defined as only the secondary xylem in the stems of trees, or it is defined more broadly to include the same type of tissue elsewhere such as in the roots of trees or shrubs.

- **DUMMY SHAFTS**

This dummy motor Shaft is used to attach wheel just like a real motor.

- Use them where you don't need powered wheels.
- For example in a four wheel robot you can use two motors at the back which power to the robot while you can attach 2 non-powered wheels on the front using the dummy motor.

PVC PIPES

PVC pipes are used in a wide variety of piping applications, from transportation of drinking water over drainage solutions to advanced fire-sprinkler systems. This popularity owes to a unique combination of properties: safety, durability/cost-efficiency, environmental performance and recyclability. **PVC** pipes are a safe choice for transportation of drinking water. This is due to their high degree of inertness and resistance to corrosion. PVC pipes are therefore free from bio-film contamination that can be a breeding ground for bacteria. By helping provide clean water, PVC pipes are beneficial to public health.

3-CELL HOLDER

This is a Black Plastic Storage Box Case Holder for Battery 3 x 18650 Cell Box, without Cover. The case box can keep your batteries organized and protected. The holder case is designed with leads for easy to solder and connect. This battery holder case is perfect for the devices need an 11.1V external battery.

This Battery Holder is compatible with our 18650 Li-ION Batteries which you need to buy separately.

SINGLE STRAND WIRING

This type of wiring is typically less expensive to manufacture than a multi-stranded wire as it does not require as much processing Single stranded wire is not as flexible as the alternative. This lack of flexibility can increase the likelihood of metal fatigue and the wire snapping as a result. Because of this, single stranded wires are best suited for products that won't encounter much movement. This type of wiring is often only used in smaller gauge wiring applications as it can be difficult to maneuver and utilize a heavy gauge, single conductor wire.

CHiNT 正泰电工

BV-4

- **PIPE ELBOW FITTING**

Pipe elbow fittings is a very important pipe fitting. When we talk about a pipe elbow, it means a length of pipe with a sharp bend in it. Pipe elbows are fitting accessories which are used widely in various industrial sectors in pipe fitting. A pipe elbow is frequently used in pressurized applications and are available in various shapes and sizes for use in different applications. A pipe elbow is a fitting installed between two lengths of pipe or tube allowing a change of direction, usually in the 90° or 45° direction.

SIDE SHAFT

• The **side shaft** establishes the dynamic connection between the gearbox and the drive wheels. It transmits the power during the simultaneous movement of the steering and suspension. With its two constant velocity joints, it functions in parallel as a vibration damper.
1

LITHIUM ION CELL

Single cell Li-Ion battery with 2600mAH capacity. High quality battery with guaranteed 2600mAH performance. 19Standard 18650 battery dimensions. This battery is tested in-house for performance, capacity of the battery is guaranteed as claimed with a tolerance of 5 to 8 percent depending on discharge current. For discharge current of less than 1A this battery will give you full capacity of around 2550mAh, while for discharge current of more than 1.5A, it will give around 2300 to 2400mAh capacity.

2600 mAh Li-ion Cell

Voltage: 3.6 - 4.2 Volts

Battery Size: Diameter- 18mm x Length- 65mm.

Application: Toys, Cordless Phones, Small DRONES, GPS,Mp4 player, ipod, DVD ,Mobiles backup power supply, Power bank ,Tablet PC and other device

2.2.2 SOFTWARE

- **STM32**

STM32 is a family of 32-bit microcontroller integrated circuits by STMicroelectronics. The STM32 chips are grouped into related series that are based around the same 32-bit ARM processor core, such as the Cortex-M33F, Cortex-M7F, Cortex-M4F, Cortex-M3, Cortex-M0+, or Cortex-M0. Internally, each microcontroller consists of the processor core, static RAM, flash memory, debugging interface, and various peripherals.

The STM32 F1-series was the first group of STM32 microcontrollers based on the ARM Cortex-M3 core and considered their mainstream ARM microcontrollers. The F1-series has evolved over time by increasing CPU speed, size of internal memory, variety of peripherals. There are five F1 lines: Connectivity (STM32F105/107), Performance (STM32F103), USB Access (STM32F102), Access (STM32F101), Value (STM32F100).

The bare STM32F103 board only comes with a default USART boot loader. Even though there is a USB port on the board, you cannot use it to program it because it does not have the relevant bootloader.

In the next post we shall see how to upload using USB.

For now connect the USB-TTL module to STM32 .

PA9 TX   —-> Rx of USB-TTL

PA10 RX   —-> TX of USB-TTL

5V —> 5V

GND —> GND

Plug in the USB-TTL module to USB of PC. CP2102 device driver is required so that PC allots a port number to the module.
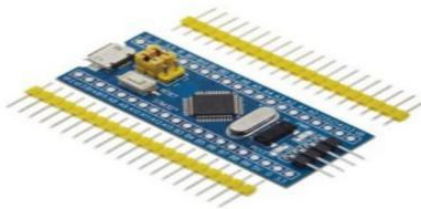
- **L298N**

The L298N is a dual H-Bridge motor driver which allows speed direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V , with a peak current up to 2A . This depends on the voltage used at the motorsVCC.

CHAPTER 3
IMPLIMENTATION AND WORKING

3.1 BLOCK DIAGRAM

```
┌─────────────────────────────────────────────┐
│  ┌────────────┐      ┌────────────┐           │
│  │  Switch1   │      │  Switch2   │           │
│  └────────────┘      └────────────┘           │
└─────────────────────────────────────────────┘
```

- Switch 1 on
- Switch 2on

- Battery 5V → STM32
- Lithium ion battery 2600 mAh 11.1volts → L298N Motor driver
- STM32 → L298N Motor driver
- L298N Motor driver → Side shaft motors 1 & 2
- Side shaft motors 1 & 2 → CLOCKWISE
- Side shaft motors 1 & 2 → ANTI-CLOCKWISE
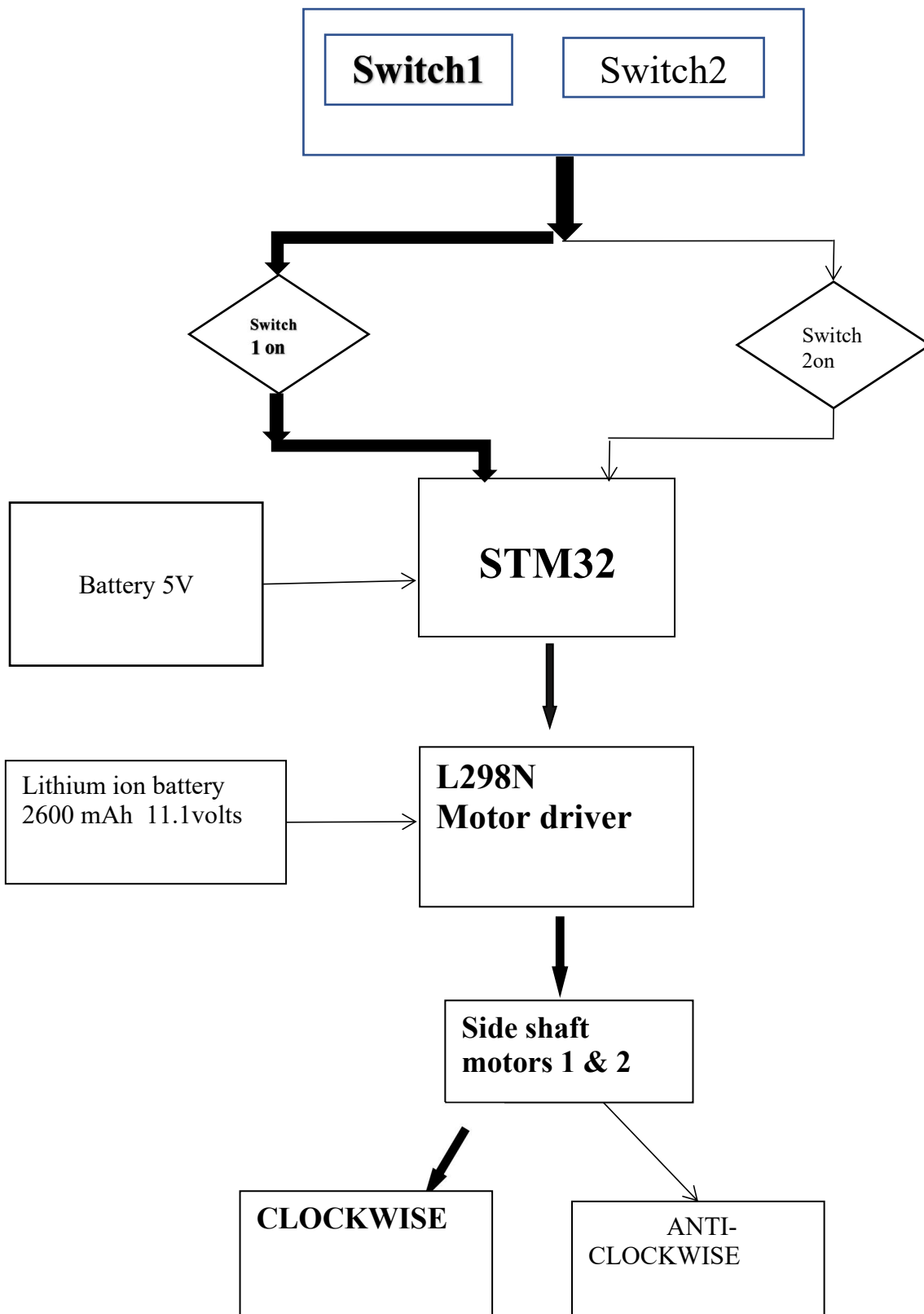
3.2 WORKING

There are three parts of the bot backrest, base and leg rest.To order to convert wheel chair to stretcher or vice versa we have to spst switches. Let two switches be L1 and L2 .If L1 is on the wheel chair converts to stretcher with the help of stm 32 module at this time the back rest of the wheel chair goes down 90 degrees and leg rest goes up 90 degrees with the help of side shaft motors and gears .if L2 is on it converts stretcher to wheel chair. At this time backrest goes up 90 degrees and leg rest goes down 90 degrees.

3.3 ALGORITHM

1.start

2.declare 2 motors

3.attach motors to digital pins

4.if(button 1 state ==1)/it is in stechar position we have to convert it to wheel chair/
{
  4.1 turn motor1 clockwise
  4.2 turn motor 2 clockwise°
}

5.else if(button 2 state ==1)/it is in wheelchair position we have to convert it to stretcher /
{
  5.1 turn motor1 anticlockwise
  5.2 turn motor 2 anticlockwise°
}

6.else
     break;

}

CHAPTER 4
EXPERIMENTAL RESULTS

4.1 RESULTS

The robot is performing conversion of wheel chair to stretcher or vice versa with the help of two switches.

4.2 CONCLUSION

Autonomous wheel chair to stretcher converter helps by converting the wheel chair into strtcher or vice versa . It reduces no. Of wheel chairs or stretchers in the hospital

SOURCE CODES

```
const int buttonPin1= 2;
const int buttonPin2= 4;
int buttonState1= 0;        // variable for reading the pushbutton status
int buttonState2= 0;
const int in1=8;
const int in2=9;
const int in3=12;
const int in4=13;
const int pwm1=3;
const int pwm2=4;

void setup() {
  // put your setup code here, to run once:
pinMode(buttonPin1, INPUT);
pinMode(buttonPin2, INPUT);


pinMode(pwm1,OUTPUT);
pinMode(pwm2,OUTPUT);

pinMode(in1,OUTPUT);
pinMode(in2,OUTPUT);
pinMode(in3,OUTPUT);
pinMode(in4,OUTPUT);

}
void loop() {
  // put your main code here, to run repeatedly:
 if ( buttonState1 == HIGH)
 {
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
delay(10000);
}
else if( buttonState2==HIGH)
  {

digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
digitalWrite(in3,LOW);
digitalWrite(in4,HIGH);
analogWrite(pwm1,255);
delay(10000);
```

```
  }
else
{
digitalWrite(in1,LOW);
digitalWrite(in2,LOW);
digitalWrite(in3,LOW);
digitalWrite(in4,LOW);

analogWrite(pwm2,255);
delay(1000);
}
}
```

RECORD OF EXPENSES

S.NO.	Component name	Quantity	Rate	Cost
1	STM 32 F103 DEV board	1	190	190
2	Jumper wires	120	0.9	108
3	Flux	1	10	10
4	DL platinum 63/37 22G 50GM lead	1	70	70
5	Soldron iron 25watt Spade bit	1	200	200
6	18650 3 cell holder	1	35	35
7	Rocker switch	3	5	15
8	18650 2600mAh Lithium ion cells	3	80	240
9	Nut and bolts	50	1.4	70
10	Side shaft screws	10	1	10
11	L298N	2	125	250
12	Side shaft motors	3	275	825
13	Electric tape	2	10	20
14	FTDI 232 module	1	180	180
15	Single stand connecting wires	1	30	30
16	L clamps SS	3	12	36
17	10x4 tractor wheels	4	100	400
18	L angles	20	3	60
19	L clamps CS	4	25	100
20	Dummy shafts	4	30	120
21	Plastic pipes	5	70	350
22	Elbow pipes	30	8	240
23	Hinges	2	30	60
24	Pvc Pipe	1	350	350
			TOTAL	**3969**