# Global Academy of Technology

**Department Of Electronics and Communication Engineering**

# Report On

# ROBO CAR

## V Semester
## Academic Year: 2019-2020

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# Acknowledgement:

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# ABSTRACT:

The project aim is to design an android interface, Arduino bot and write program in to the Arduino microprocessor. Arduino car contains Arduino microcontroller with basic mobility features. Arduino programs contains instructions mediating between android controller and Arduino car. Android mobile controller uses different mobile sensors to supervise motion.

An appropriate program in the Arduino microprocessor to interact with the android controller has to be created. The program has been successfully complied through Arduino IDE to the Arduino microprocessor & loaded in to it after proper checking of logic to decrease any loss/damage of hardware.

We have to create an android application using MIT app inventor that will provide user an interface to interact with the Arduino powered car. The interface is easy to use and provide feedback from the Arduino microprocessor through the Bluetooth after giving instruction to Arduino for various actions through interface via Bluetooth module.

The Chassis was designed using Solid Edge and this layout was then laser cut on to an acrylic sheet

The main objective of this project was to compete in the Technoxian Event and specifically designed to climb ramps, move in muddy and off-road areas without any difficulties and to complete the given track efficiently.

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# INTRODUCTION:

**Purpose of Plan**

As most of the work in this area has been done regarding the Arduino & its application, what left out most of the time is the design of the car. In this project we are trying to exploit the most efficient design possible.

**Project objectives**

a) meet the dimension criteria (20cm x 15cm x 15cm)
b) Long range (flysky fs-16) and short-range (Bluetooth) Connectivity to the Arduino Chip.
c) Increasing the efficiency in controlling of Bot.
d) Pass the hurdles.

**Project Goals**

- Our goal was to fulfill the criteria given by the event.
- To create an android application which could communicate with the bot.
- To design in such a way that it climbs the given ramp and also muddy track.
- To create a multifunctionality in controlling the bot for both long range and short range.
- The car design should not be copied and must be completely unique.

# LIST OF COMPONENTS AND MATERIALS:

## 1. POWER SUPPLY

•The main purpose of the battery is to provide the power to the detector / Circuit.

## 2. ORANGE DC MOTOR

This is an alternative to the Johnson motor considering the cost to performance index, this motor is a high torque less rpm motor (200rpm) driven at 12V optimally and it can be boosted upto 24V for high rpm.

## 3. POWER DISTRIBUTION BOARD

A **distribution board** (also known as panelboard, breaker panel, or electric panel) is a component of an **electricity** supply system that divides an **electrical power** feed into subsidiary circuits, while providing a protective fuse or circuit breaker for each circuit in a common enclosure. This component was selected by considering the need to supply 5V to Arduino Nano and 12V for motor driver and 3.3V for Bluetooth module uniformly.

## 4. Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline.

## 5. MOTOR DRIVER (LN298N)

Double H driver module uses ST L298N dual full-bridge driver, an integrated monolithic circuit in a 15- lead Multi-watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device

independently of the input signals. The emitters of the lower transistors of each bridge are connected together and the corresponding external terminal can be used for the connection of an external sensing resistor. An additional supply input is provided so that the logic works at a lower voltage.

## 6. BLUETOOTH MODULE

**HC-05 module** is an easy to use **Bluetooth SPP (Serial Port Protocol) module**, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. It works at a baud rate of 38400bits/per second. This serial port Bluetooth module is fully qualified **Bluetooth V2.0+EDR (Enhanced Data Rate)** 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

## 7. LITHIUM POLYMER BATTERY

A lithium polymer battery, (12V, 2200mAH) or more correctly lithium-ion polymer battery (abbreviated as LiPo, LIP, Li-poly, lithium-poly and others), is a rechargeable battery of lithium-ion technology using a polymer electrolyte instead of a liquid electrolyte. High conductivity semisolid (gel) polymers form this electrolyte.

**Acrylic Sheet:** Two Acrylic Sheets of different thickness (5*mm-Body,3mm-Top*)

**Nut, Bolt & Spacer:** Size-3mm

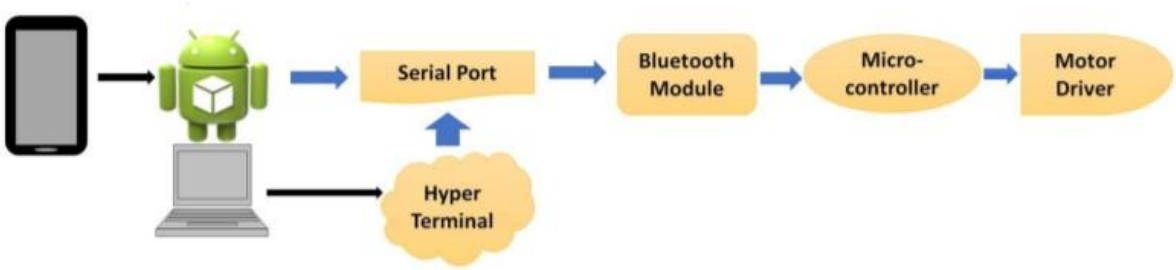
**Wire:** 29-Gauge(.2mm),10-Gauge(2.5mm)

**PCB:** 5cmx7cm

**Header Pins:** Female Header Pins

**Wheels:** Spike Wheels (dia-5cm, width-2cm)

# Working Principle:




**The vehicle can be controlled in three different modes:**
1) From Bluetooth through android app (Short Range)
2) From Flyski-Remote controller (Long Range)

**The basic working principle in all the three methods are almost same. The process is done in two major steps:**

i) Connection (Over Bluetooth)

a) With Computer

For Communication test we used a Bluetooth Module (Module HC05). when we connect a New serial device with computer a com port is assigned for that particular device. we connect the module through that port.

b) With Android

Every Bluetooth device has a mac address. We provided the mac Address into our android application code. so, the application search and connects the HC-05 module automatically. We have to connect the Rx & Tx pin of the module to the Tx & Rx of microcontroller (for AVR the pins are Tx(pin-0) and Rx(pin-1)).

ii) Serial Communication

a) Sending Data

For sending data from android phone we used an application created using MIT app inventor developed by our group. Both the terminal programs convert the data into hexadecimal according to ascii table and send over by Bluetooth.

b) Receiving Data to microcontroller

While receiving data sent from the mobile application it is necessary to work with BAUD Rate. In short, baud rate is how fast data is being transmitted and received. 9600 is the standard rate. all the links in your chain of communication have to be "speaking" at the same speed, otherwise data will be misinterpreted on one end or the other.

c) Differential Drive

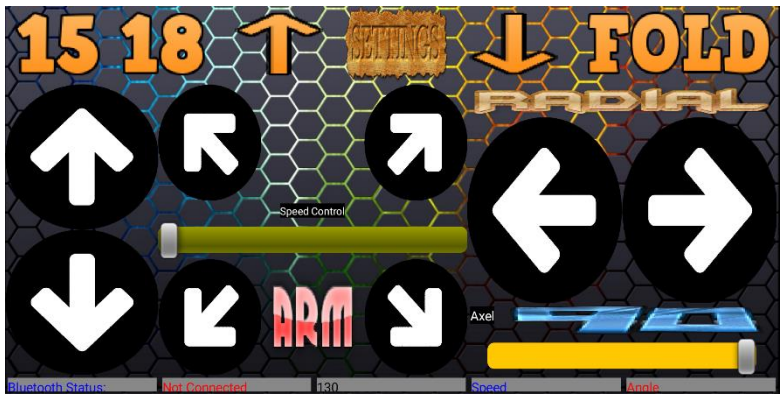
After receiving data microcontroller compares them with some preset commands and gives

command to motor driver for differential drive

# Modes of Operation:

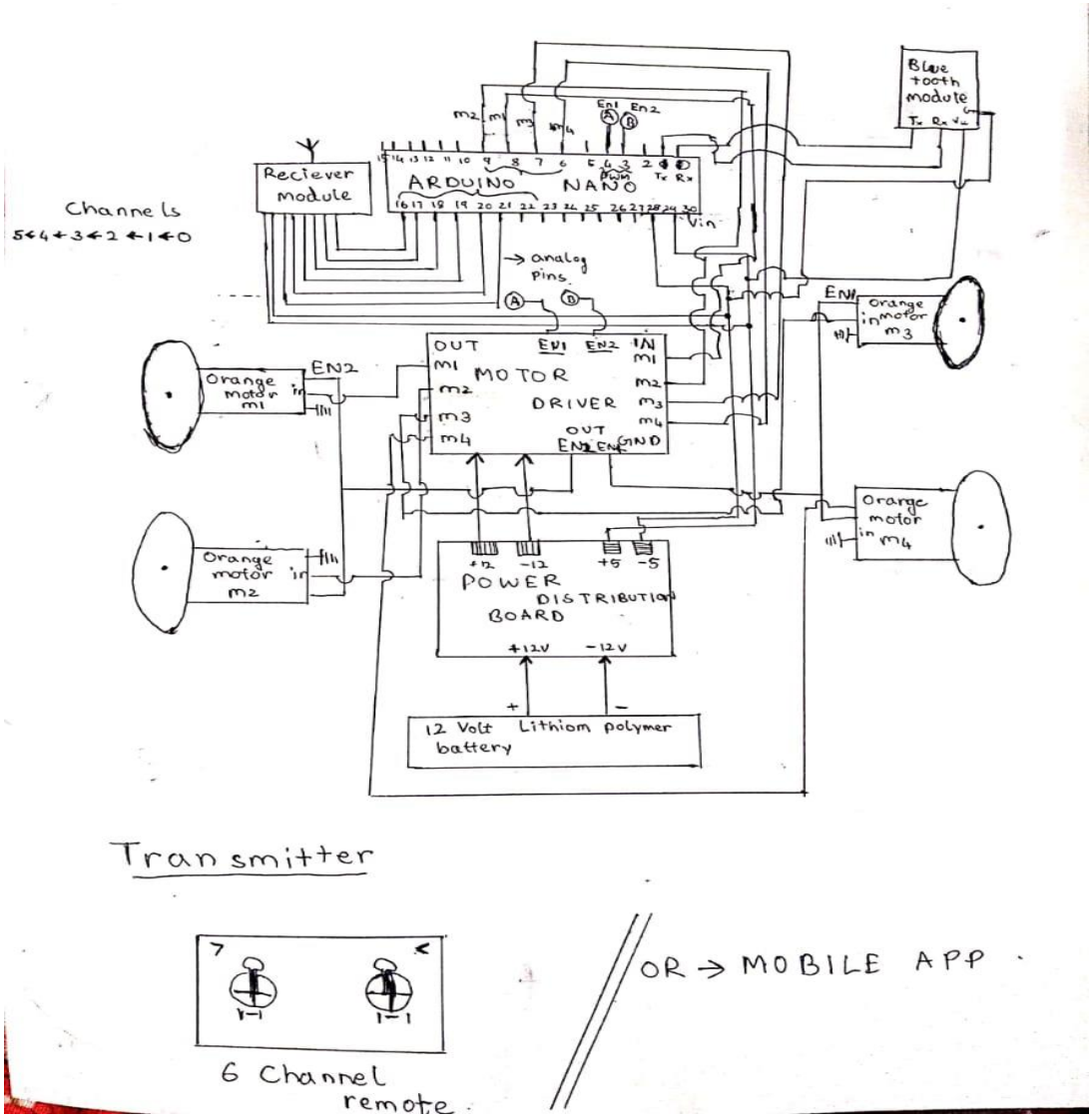
WE HAD MADE 2 WAYS TO CONTROL THIS BOT:

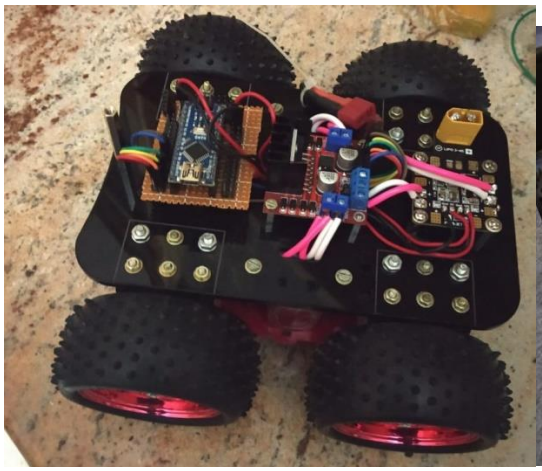
1. THROUGH ANDROID APP: THIS APP IS BUILT BY US USING MIT APP INVENTOR THROUGH BLUETOOTH COMUNICATION.
2. THROUGH REMOTE CONTROLLER





# Circuit Diagram:



# Arduino Code:

## Remote Controller Optimizing code:

```
#include<math.h>
int ch[7]={0,0,0,0,0,0,0};
int ci[6]={8,8,9,10,11,12};
double channel[7]={0,0,0,0,0,0};
double high[7]={0,0,0,0,0,0};
double low[7]={100000,100000,100000,100000,100000,100000};
int m1=7;
int m2=5;
int m3=4;
int m4=2;
int j=0;
int sp1=3;
int sp2=6;

int i;

void setup() {
  pinMode(m1,OUTPUT);
  pinMode(m2,OUTPUT);
  pinMode(m3,OUTPUT);
  pinMode(m4,OUTPUT);
  pinMode(sp1,OUTPUT);
  pinMode(sp2,OUTPUT);
  Serial.begin(9600);
for(i=1;i<6;i++){
   pinMode(ch[i],INPUT);

  }
}

void loop() {

for(i=1;i<6;i++){
channel[i]=pulseIn(ci[i],HIGH);
```

```
}

for(i=1;i<6;i++){

if(high[i]<channel[i])
{high[i]=channel[i];
Serial.print(i);
Serial.print("h=");
Serial.print(high[i]);
Serial.println();

}

if(low[i]>channel[i])
{low[i]=channel[i];
Serial.print(i);
Serial.print("l=");
Serial.print(low[i]);
Serial.println();
}
}
}
```

**Code of the Car:**

```
// declaring motor pins
int m1=7;
int m2=5;
int m3=4;
int m4=2;



// declaring enable pins
int en1=3;
int en2=6;
```

```
// declaring store values
int speedcar;
int intake;

// declaring switch cases
char ec;


void setup()
{
// attaching servos

  // configuring port type
  pinMode(m1,OUTPUT);
  pinMode(m2,OUTPUT);
  pinMode(m3,OUTPUT);
  pinMode(m4,OUTPUT);
  pinMode(en1,OUTPUT);
  pinMode(en2,OUTPUT);
  pinMode(2,INPUT);
  Serial.begin(9600);
attachInterrupt(0,wwtt,RISING);
}


void wwtt(){
 Stop();
  delay(300);


  }
void loop()
{


  if(Serial.available()>0)   //checking for serial available
  {
    intake=Serial.read();    //reading the serial value
```

```
 if(intake<126)
  {
    speedcar=map(intake,100,125,170,255);
  }
 else
 {
  ec= dec(intake);

switch(ec)
{
  case 'F':
  forward();
  break;
  case 'B':
  back();
  break;
  case 'L':
  left();
  break;
  case 'R':
  right();
  break;
  case 'G':
  forward_left();
  break;
  case 'I':
  forward_right();
  break;
  case 'H':
  back_left();
  break;
  case 'J':
  back_right();
  break;
  case 'S':
  Stop();
  break;
  }
```

```
    }
    }
    }

 char dec(int a)
{
a=intake;

 if(a==130)
   return 'S';

 if(a==150)
  return 'F';

 if(a==151)
   return 'B';

 if(a==152)
   return 'G';

 if(a==153)
   return 'I';

 if(a==154)
   return 'L';

 if(a==155)
   return 'R';

 if(a==158)
 return 'G';
 if(a==159)
 return 'I';
 if(a==160)
 return 'H';
 if(a==161)
 return 'J';

}
```

```
void forward()
{
 analogWrite(en1,speedcar);
 analogWrite(en2,speedcar);
 digitalWrite(m1,LOW);
 digitalWrite(m2,HIGH);
 digitalWrite(m3,LOW);
 digitalWrite(m4,HIGH);



}
void back()
{
 digitalWrite(m1,HIGH);
 digitalWrite(m2,LOW);
 digitalWrite(m3,HIGH);
 digitalWrite(m4,LOW);

 analogWrite(en1,speedcar);
 analogWrite(en2,speedcar);

}
void left()
{
 digitalWrite(m1,HIGH);
 digitalWrite(m2,LOW);
 digitalWrite(m3,LOW);
 digitalWrite(m4,HIGH);

 analogWrite(en1,speedcar);
 analogWrite(en2,speedcar);

}
void right()
{
 digitalWrite(m1,LOW);
 digitalWrite(m2,HIGH);
```

```
  digitalWrite(m3,HIGH);
  digitalWrite(m4,LOW);

  analogWrite(en1,speedcar);
  analogWrite(en2,speedcar);

}
void forward_left()
{
  digitalWrite(m1,LOW);
  digitalWrite(m2,LOW);
  digitalWrite(m3,LOW);
  digitalWrite(m4,HIGH);

  analogWrite(en1,speedcar);
  analogWrite(en2,speedcar);

}
void forward_right()
{
  digitalWrite(m1,LOW);
  digitalWrite(m2,HIGH);
  digitalWrite(m3,LOW);
  digitalWrite(m4,LOW);

  analogWrite(en1,speedcar);
  analogWrite(en2,speedcar);

}
void back_left()
{
  digitalWrite(m1,LOW);
  digitalWrite(m2,LOW);
  digitalWrite(m3,HIGH);
  digitalWrite(m4,LOW);

  analogWrite(en1,speedcar);
  analogWrite(en2,speedcar);
```

```
}
void back_right()
{
  digitalWrite(m1,HIGH);
  digitalWrite(m2,LOW);
  digitalWrite(m3,LOW);
  digitalWrite(m4,LOW);

  analogWrite(en1,speedcar);
  analogWrite(en2,speedcar);

}
void Stop()
{
  digitalWrite(m1,HIGH);
  digitalWrite(m2,HIGH);
  digitalWrite(m3,HIGH);
  digitalWrite(m4,HIGH);


  analogWrite(en1,speedcar);
  analogWrite(en2,speedcar);
 }
```

# Conclusion:

Throughout this project our goal was to concentrate on the design of the Robo car right from chassis to PCB layout and its circuitry hand in hand with its performance and efficiency in different terrains.

We aimed for competing in Technoxian event it was specifically designed for the completion of the given track, but unfortunately, we could not proceed to the final round, had to drop out in the second round since our car was not efficiently designed to climb an inclination of $52^0$.Our best effort was a climb of $45^0$ of inclination.

**Improvements to be done:** the axil length should be increased for increase in climb inclination.

# ACHIEVEMENTS:

- **Won 2nd** place in **National Level Robotics Competition** held at **BMS Institute**, Bengaluru in 2019, August.
- **27th place** in **World Robotics Championship**, **Technoxian** event organized by **Times of India** held at Delhi in 2019, September.