Global Academy of Technology

Department Of Electronics and Communication Engineering

Report On

ARM-BOT

V Semester

Academic Year: 2019-2020

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Acknowledgement:

We the students of BE V semester, Department of E&C Engineering, would like to express our heartier gratitude to all, who have extended their valuable support and have been immensely helpful during the completion of our Project.

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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.

In recent years the industry and daily routine works are found to be more attracted and implemented through automation via Robots. The pick and place robot are one of the technologies in manufacturing industries which is designed to perform pick and place operations. The system is so designed that it eliminates the human error and human intervention to get more precise work.

There are many fields in which human intervention is difficult but the process under consideration has to be operated and controlled this leads to the area in which robots find their applications. Literature suggests that the pick and place robots are designed, implemented in various fields such as; in bottle filling industry, packing industry, used in surveillance to detect and destroy the bombs etc.

The project deals with implementing a pick and place robot using Robo Arduino for any pick and place functions. The pick and place robot so implemented is controlled using android application controlled through Bluetooth module. The chassis is supported for the displacement of robotic arm by four Omni wheels. The robotic arm implemented has two degrees of freedom. Many other features such as line follower, wall hugger, obstacle avoider, metal detector etc can be added to this robot for versatility of usage.

CONTENTS:

INTRODUCTION:

Since many years people try to replace human work with machines. Machines called robots are faster and more effective than people. The term robotics is practically defined as the study, design and use of robot systems for manufacturing. Robots are generally used to perform unsafe, hazardous, highly repetitive, and unpleasant tasks. They have many different functions such as material handling, assembly, arc welding, resistance welding and machine tool load and unload functions, painting, spraying, etc.

Many elements of robots are built with inspiration from the nature. Construction of the manipulator as the arm of the robot is based on human arm. The robot has the ability to manipulate objects such as pick and place operations. It is also able to function by itself. The development of electronic industry robot system technology has been expanded increasingly. As one such application, the service robot with machine vision capability has been developed recently. In this highly developing society time and man power are critical constrains for completion of task in large scales. The automation is playing important role to save human efforts in most of the regular and frequently carried works.

One of the major and most commonly performed works is picking and placing of jobs from source to destination. Present day industry is increasingly turning towards computer-based automation mainly due to the need for increased productivity and delivery of end products with uniform quality. The inflexibility and generally high cost of hard-automation systems, which have been used for automated manufacturing tasks in the past, have led to a broad-based interest in the use of mechanical arm capable of performing a variety of manufacturing functions in a flexible environment and at lower costs.

The use of Industrial mechanical arm characterizes some of contemporary trends in automation of the manufacturing process. However, present day industrial mechanical arm also exhibits a monolithic mechanical structure and closed-system software architecture. They are concentrated on simple repetitive tasks, which tend not to require high precision.

The pick and place mechanical arm is a human controlled based system that detects the object, picks that object from source location and places at the desired location. For detection of object, human detect presence of object and move machine accordingly.

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.

8. METAL GEARED SEVRO MOTOR

MG995 **Metal Gear Servo Motor** is a high-speed standard **servo** can rotate approximately 180 degrees (60 in each direction) used for airplane, helicopter, RC-cars and many RC model. Provides 10kg/cm at 4.8V, and 12kgcm at 6V.

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

Nut, Bolt & Spacer: Size-3mm

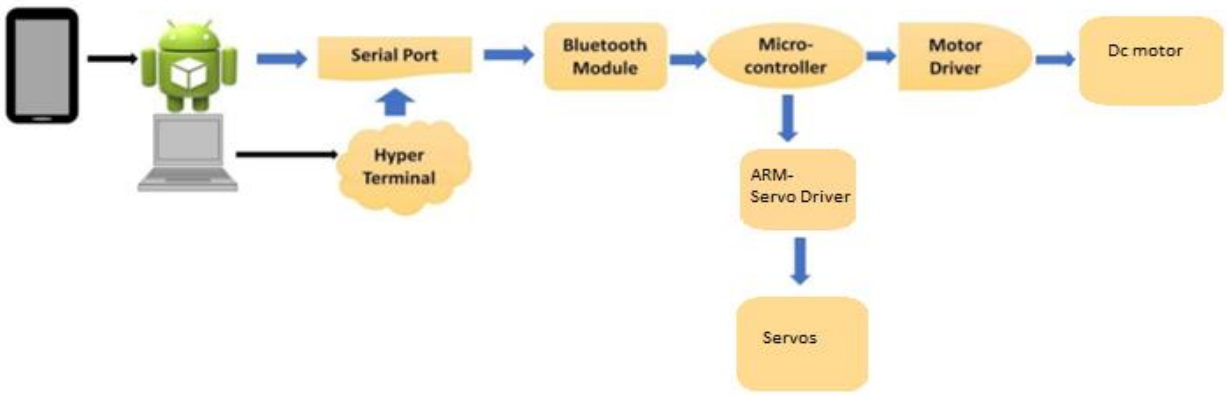
Wire: 29-Gauge(.2mm),10-Gauge(2.5mm)

PCB: 5cmx7cm

Header Pins: Female Header Pins

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

Working Principle:



The vehicle is controlled using Bluetooth through android app (Short Range).

The basic working principle of the project 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 checks whether the signal from the user interface app is for the Arm or the movement of the car and compares with some preset commands and gives command to motor driver for motion of the car, when the signal is received for motion of the arm it gives command to the servo which is supplied with additional power source. The degrees of freedom deigned for the arm is 4 degrees.

Robotic Arm Features:

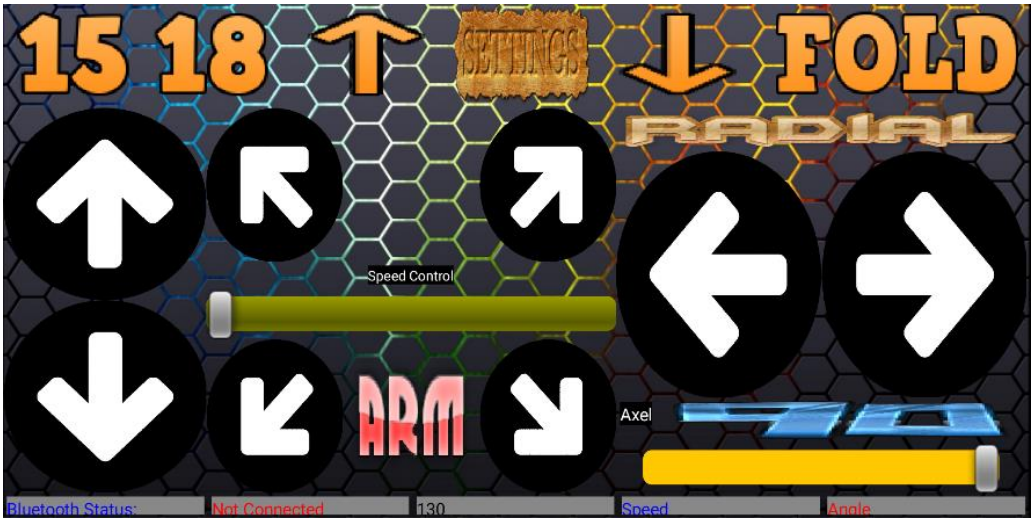
This is a set of a Robot Arm with 4 degree of freedom.
It will be a fun and entry level servo control robotics project to get started with.

- 3mm acrylic sheet body parts
- 5 x Servo bracket
- 4 x U-shaped bracket
- 3 x U-shaped base bracket
- 1 x L-shaped bracket
- 1 x Claw
- 1 x Set of screw nut
- Width when claw opens: 55mm

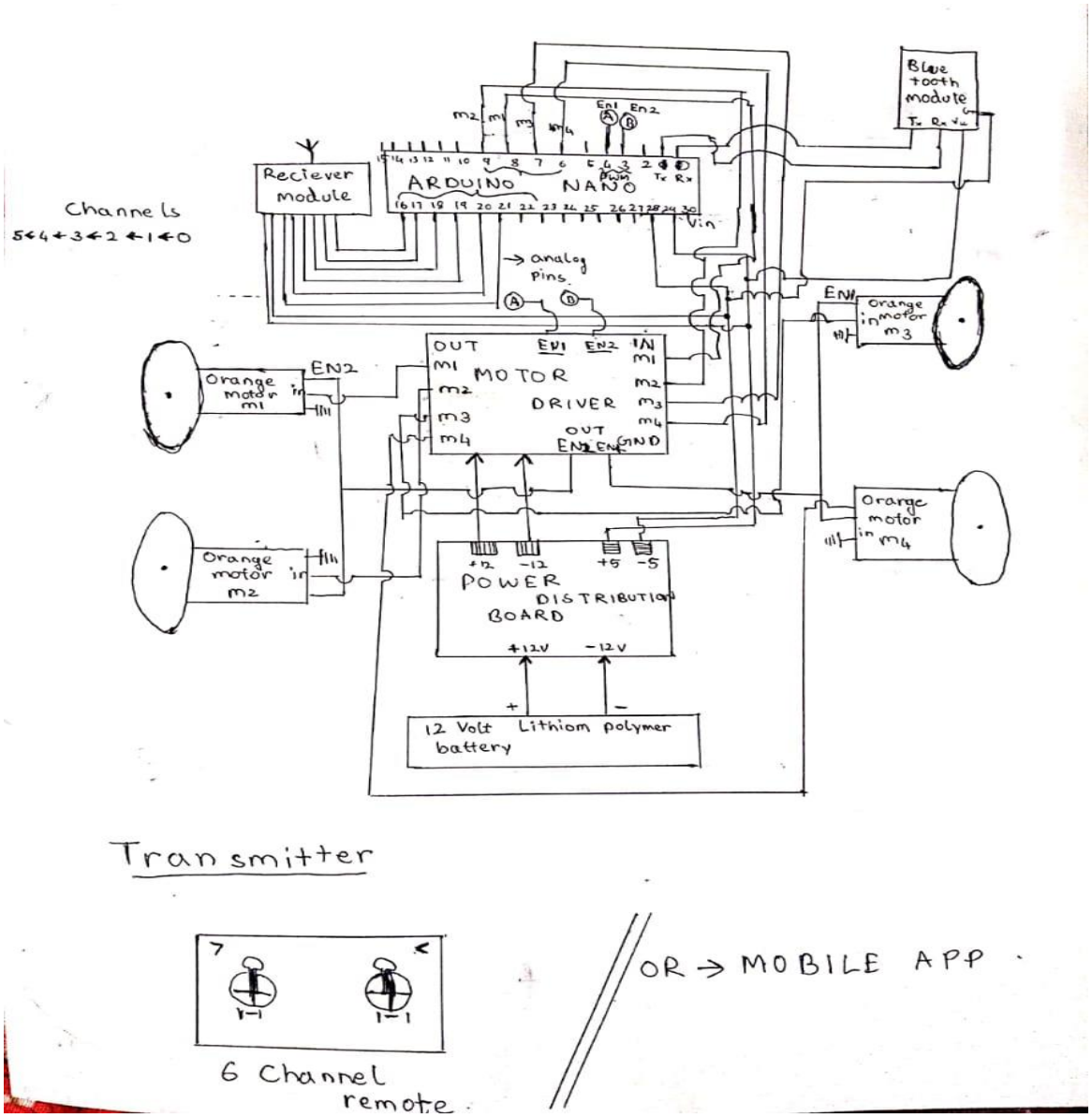
Modes of Operation:

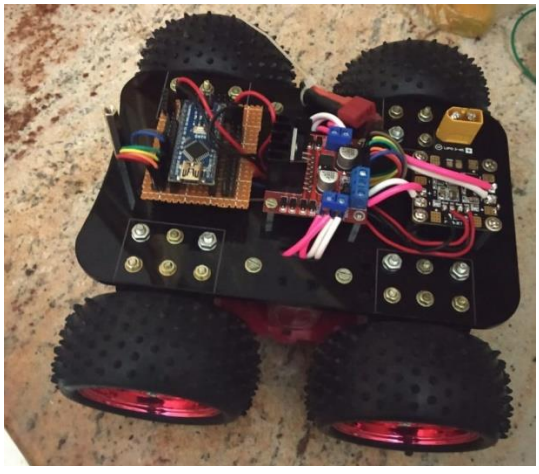
WE HAD MADE 2 WAYS TO CONTROL THIS BOT:

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

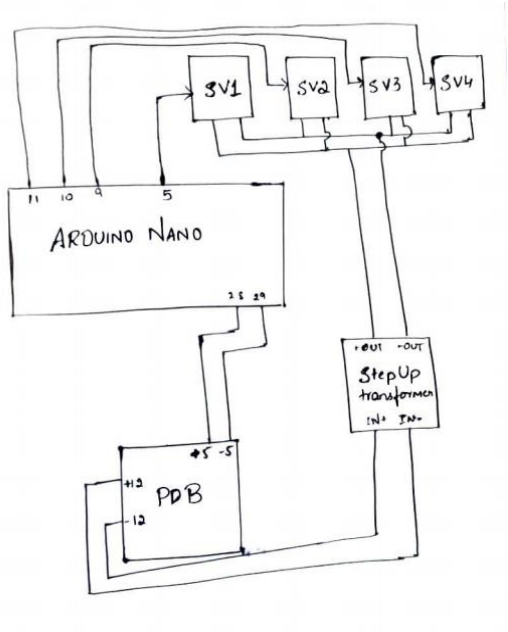


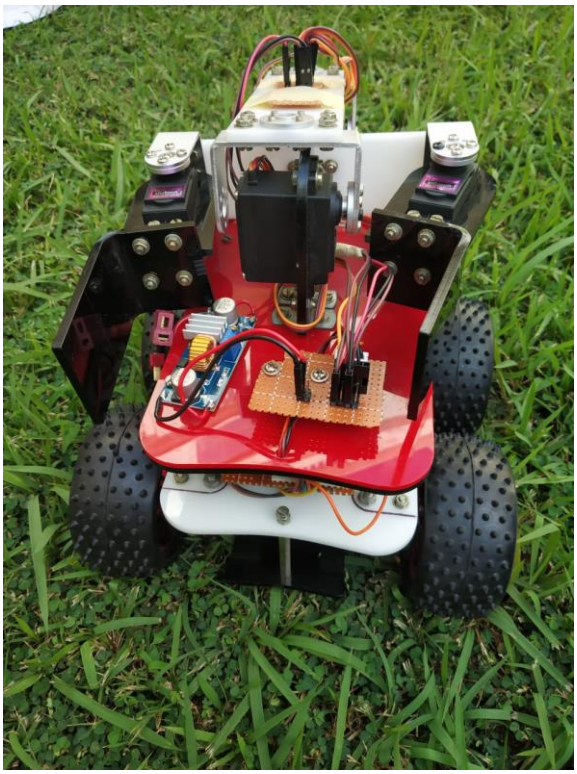
Circuit Diagram of CAR:

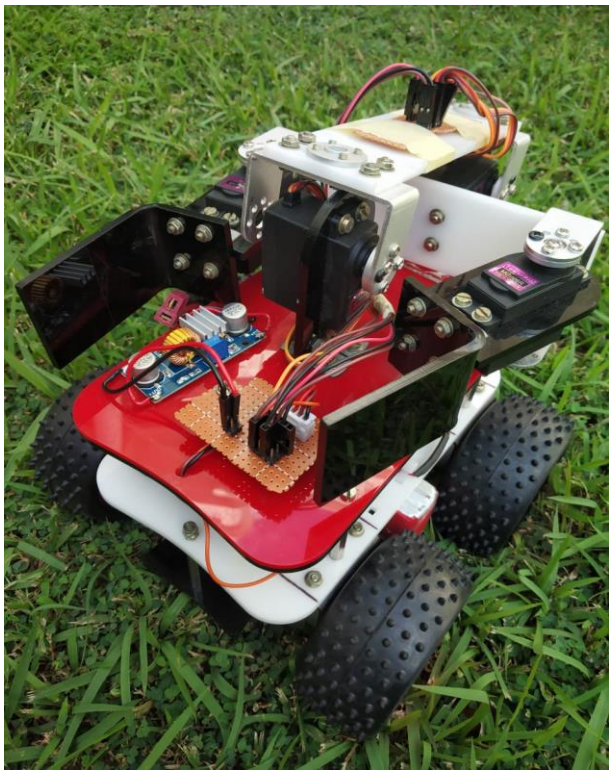




Circuit Diagram of ARM:







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:

This project was to demonstrate a pick and move bot, the arm model was fit on top of the car which was taken for the Technoxian event, upon adding the arm onto the car it became unstable as the center of gravity was not considered, since it was a demonstration project.

Improvements to be done: The center of gravity is should be maintained, and design improvisation

ACHIEVEMENTS:

- **Won 1st** place in **OPEN DAY** event held at **GLOBAL ACADEMY OF TECHNOLOGY**, Bengaluru in 2019, November.