

Hand Gesture Controlled Robot using Arduino.

Report for

EC5512 Summer Project

Submitted by

DHIYANESH KV - 2019105524

**B.E (ELECTRONICS AND COMMUNICATION
ENGINEERING)**



**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

ANNA UNIVERSITY, CHENNAI

DEC 2021

ABSTRACT

Now a days people are going towards more energy efficient and time saving Methods for works around them. In the search of this technological development of mechanism in day-to-day life we have searched an idea which make's the controlling of a car (or robot in future cases) more easier sitting in a stable position (At home). As world is moving towards more technological developments and has developed more different electronic items which can be used to develop new ideas and implement in real life.

We have taken a microcontroller named as “ARDUINO UNO” which is a type of motherboard which can be used to receive a set of commands and run the code and get the results which we wanted by using more modules and sensors.

We have developed a car which is controlled by the gestures of our hand direction for a range of 10 meters (Demo model).

In this project a microcontroller (Arduino uno) is used which is connected to our sensor accelerometer (angle detector) which detects the angle and send the data to microcontroller and it sends the data to the other part of the project which is in car body which contains another microcontroller and a sensor to receive the data from the hand part and send the data to motor driver shield which controls the wheel of the car.

So, in this project we can control a car with the gestures which we make using our hand and get the work which has to be done.

In the near Future this may change into a next Gen concept where we can control the car by just our thoughts.

Acknowledgement

Place:

Date:

I _____ of III Year, V Semester, Department of ECE would like to express my sincere thanks to **Mrs.R.Ann Caroline Jenifer** for their valuable guidance and support in completing my project. I would also like to express my gratitude towards our Head of Department **Dr.M.Meenakshi** for giving me this great opportunity to do a project on

_____ (topic name).

Without their support and suggestions, this project would not have been completed.

Your name:

Signature:

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CHAPTER 1:

INTRODUCTION

This is robot which can be controlled by just the gestures which we make using our hand. Is a tech which is futuristic and a less energy consuming mechanism or idea.

In this project we used 2 micro-controllers and some sensors and modules to get the required data for this project

This idea can be useful for peoples like people who are siting in a wheel chair, elderly person, who can take the wheel chair to any destination by just hand gestures which they make

Our aim is to make a car which can be useful for people who are physically injured (leg injury), and futuristic ideas can also be implemented by modifying our current project.

The components which are used in this project is mentioned below,

1.2 Components used:

This are hardware parts:

- Arduino uno
- RF pair module (receiver and transmitter)
- L293D Motor driver module
- ADXL335 SENSOR (accelerometer)
- Car body with motor.
 - 1.chasis.
 - 2.motor with 100 RPM.
 3. caster wheel.
 - 4.mini bread board.
 - 5.Jumper wires (m-f).
 6. And pair of 9V battery for power source

Software used:

- The software which is used for this project is Arduino IDE, which is coded in c /c++.

CHAPTER 2:

PROJECT:

This project is divided into 2 parts

1. Hardware
2. Software

2.1 Hardware:

In this part the overall project of Hardware is divided into 2 parts.

1. Hand (Transmitter)
2. car body (Receiver)

2.1.1 Hand (Transmitter):

This is the set of parts which consist the microcontroller [ARDUINO UNO], ADXL335 SENSOR (accelerometer), RF pair module (transmitter).

1. Arduino uno:

which is the microcontroller used to control all the process going through the whole system .it is an open-source hardware and software controller. The language which we are going to use is C/C#. We use 2 board because one for the car bot and the other in hand. we connect it to our computer and program it and do the further process by running it .and applying it to the used components.

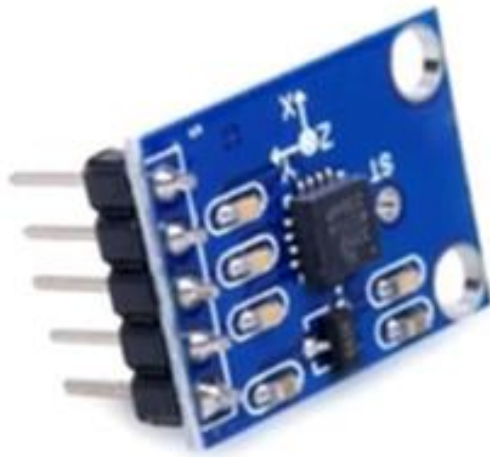


2 Arduino UNO

2. ADXL335 SENSOR (accelerometer):

- The ADXL335 is a small, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. It finds the axis's (X, Y, Z) and send data so that we can calculate the angle at what hand

moves and then send the data to bot so that it can decide its path using code written in Arduino.

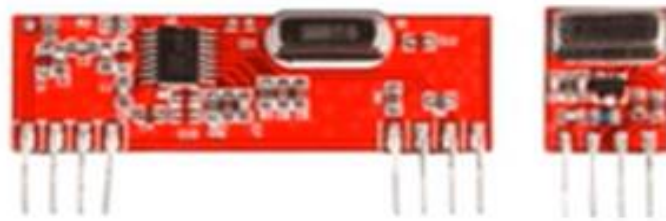


ADXL335 Sensor

3. RF pair module (transmitter):

- An RF module (short for radio-frequency module) is a small electronic device used to transmit radio signals between two devices.
- RF pair module is the transmitter and receiver used for this project where 1 part is connected to the hand Arduino board and other to the bot, which collects the received data from the other part.

- It is 433MHz
- So, without antenna min range (3 meter) and max will be (100 meter) with antenna.



RF Pair Module

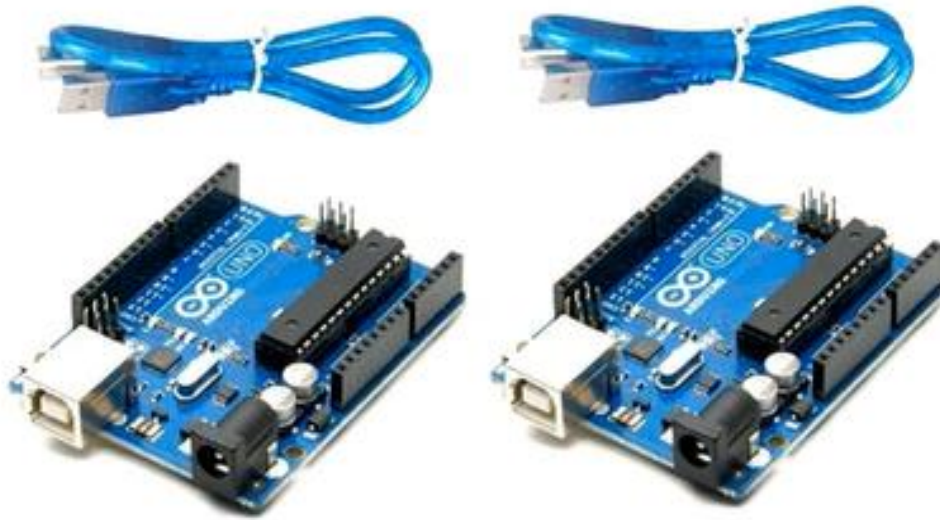
2.1.2 CAR BODY (Receiver):

This is the set of parts which consist the microcontroller [ARDUINO UNO, RF pair module (transmitter), L293D Motor driver module.

1. Arduino uno:

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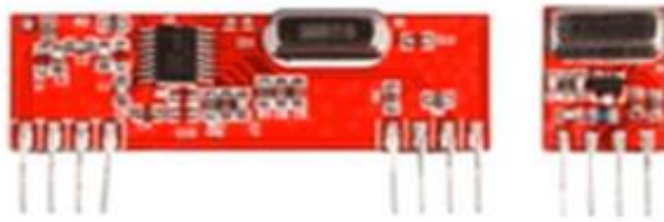
our computer and program it and do the further process by running it .and applying it to the used components.



2 Arduino UNO

2. RF pair module (Receiver):

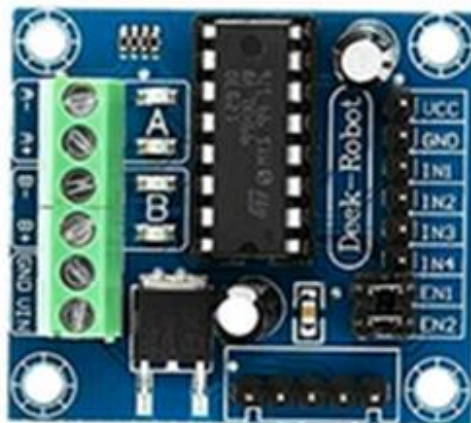
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RF Pair Module

3. L293D Motor driver module:

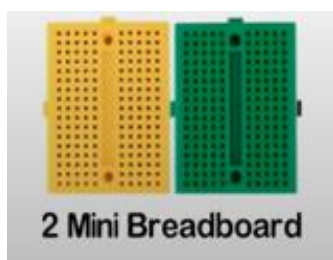
L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D IS 16 PIN IC which drive 2 motors simultaneously in 2 different directions.



L293D Motor driver Module

Car body with motor:

- 1.chasis
- 2.motor with 100 RPM
- 3. caster wheel
- 4.mini bread board
- 5.Jumper wires (m-f)
- 6. And pair of 9V battery for power source.



2.2 Software:

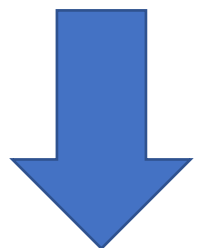
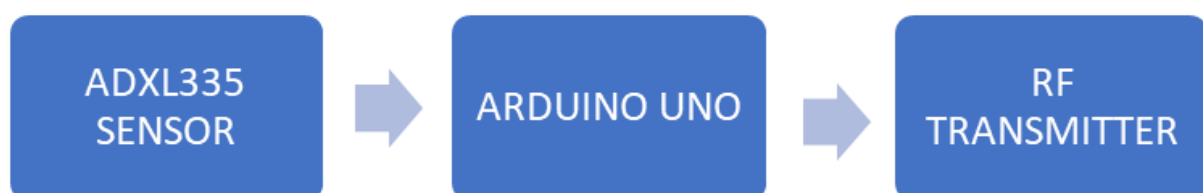
In this project the code is written in the language of c with some basic libraries for the modules and sensors. The code is written in Arduino IDE software.

2.2.1 Arduino IDE:

This is used to write and upload programs to Arduino compatible boards. The programs are written in the text editor and are saved with extensions of .ino. using Arduino IDE, one can write and upload codes to different board after downloading the required library.

2.3 BLOCK DAIGRAM:

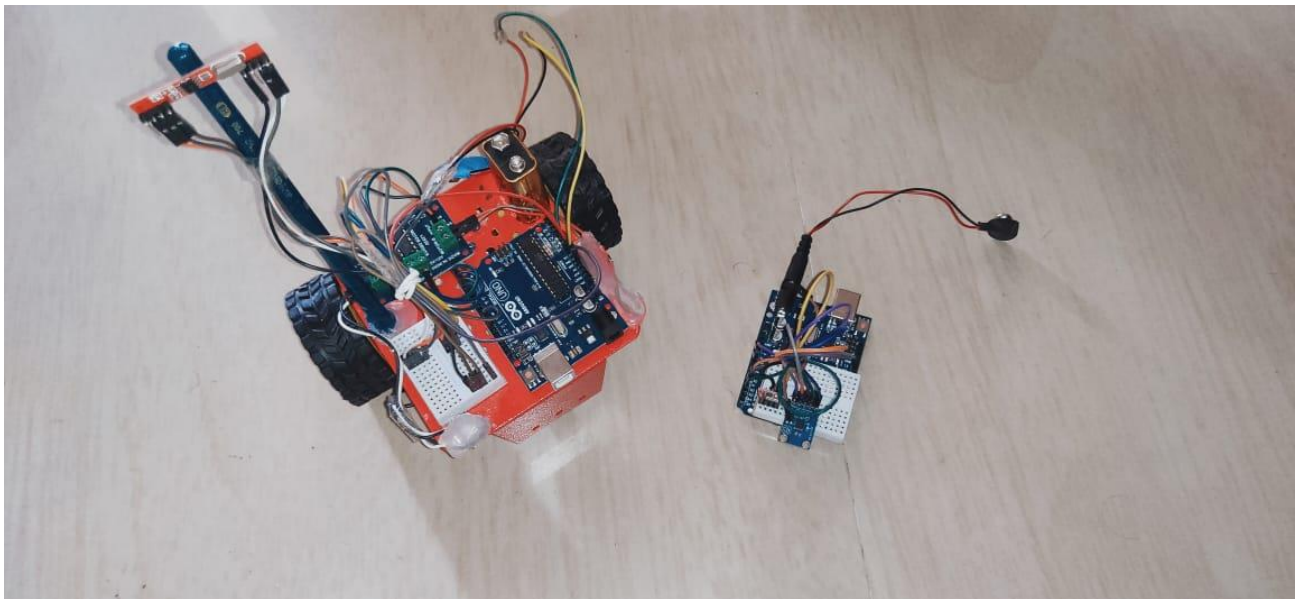
Transmitter (hand)



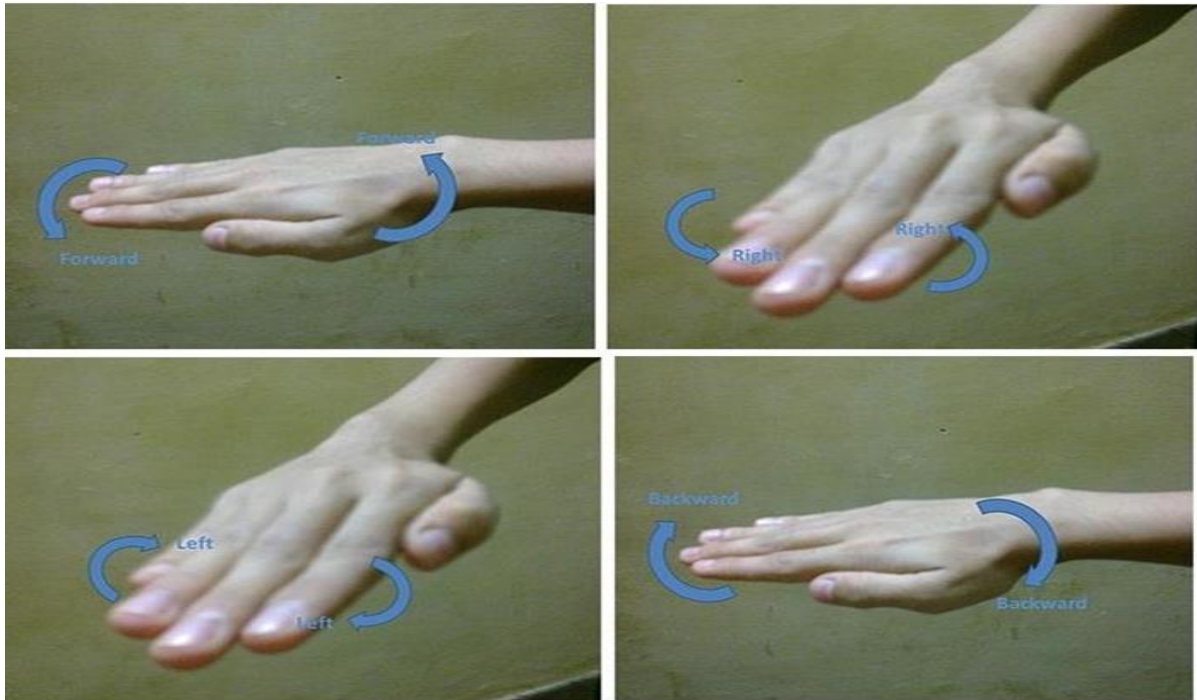
Receiver(BOT)



2.4 MODEL WHICH WE CREATED:



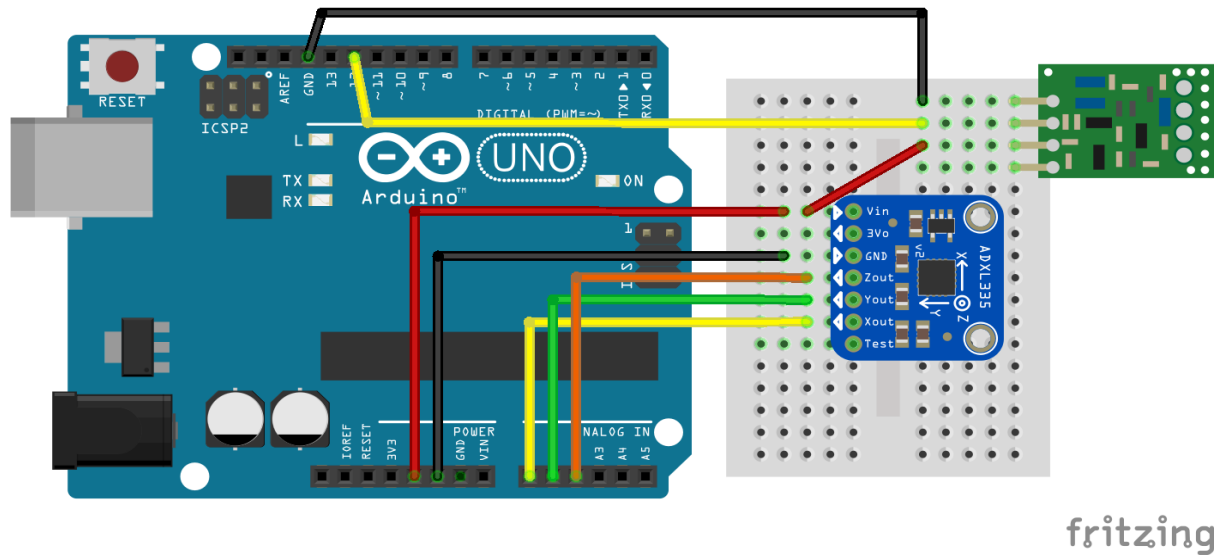
2.5 HAND GEASTURE:



2.6 Transmitter:

- This part is presented in the hand which detects the hand gesture and send the signal.
- Here the components are ARDUINO, RF pair module, ADXL335 SENSOR
- The sensor receives the hand gesture (X, Y, Z) values and send the data to Arduino and Arduino send's the data to the car part using the RF pair module

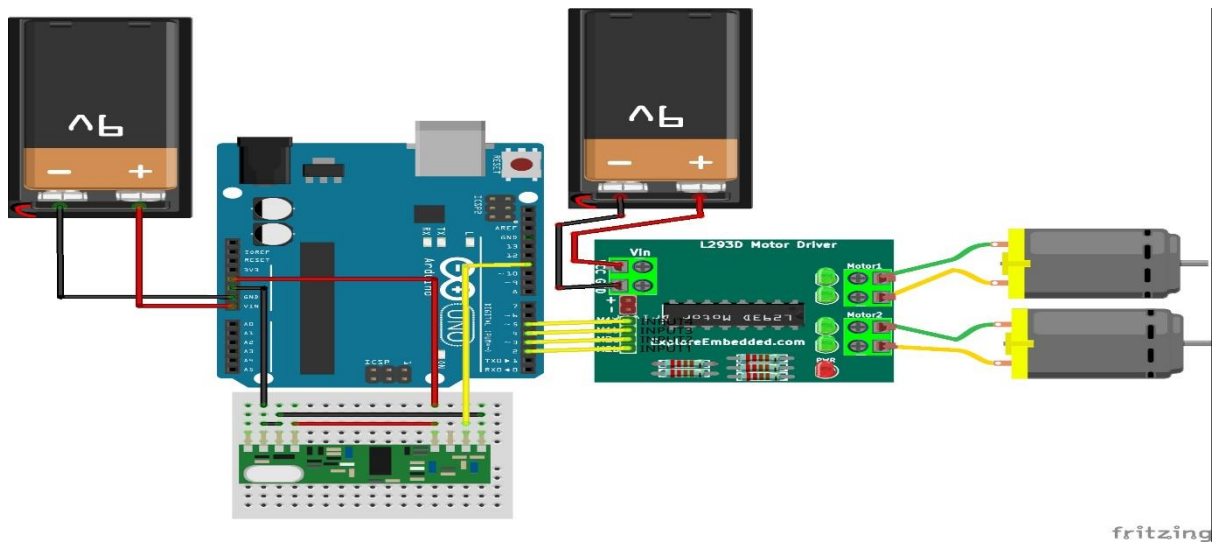
Circuit diagram:



2.7 Receiver:

- This part is presented in the car body which detects the data from hand part and drives the car.
- Here the components are ARDUINO, RF pair module, L293D Motor driver module
- The RF module receives data from other unit from hand part and send the data to Arduino and Arduino send the data to L293D motor driver module and it control's the wheel accordingly to the code. Written

Circuit diagram:



CHAPTER 3:

RESULT:

3.1 Algorithm:

Input: moving the hand in the direction required and getting the data.

Output: After transmitting the car is moved in the required directions.

Start

Get the angles when the hand is moved

Receive the values of angles in data format

Send the data to Arduino uno

Send the data to the receiver part using RF pair module.

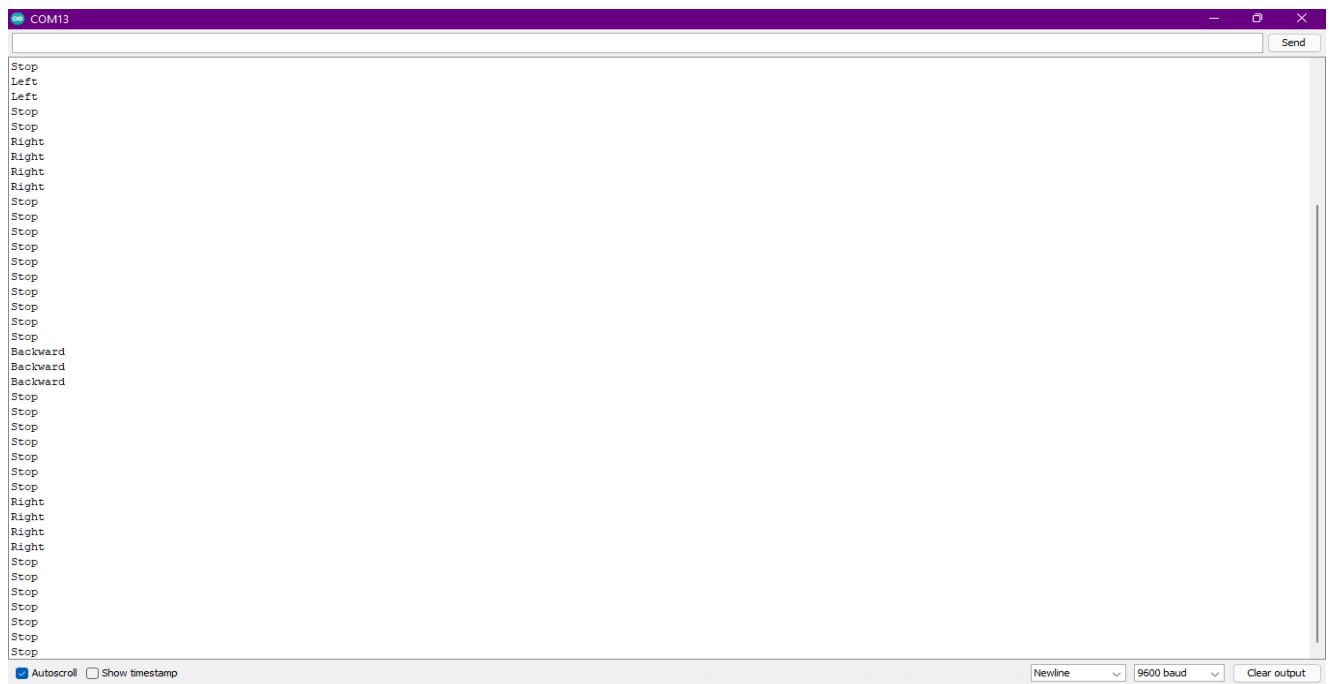
After receiving the data send the data to Arduino uno

Send the data which is received in Arduino to motor driver shield

The motor driver shield receives the data and control the car wheels accordingly

The car moves in required directions.

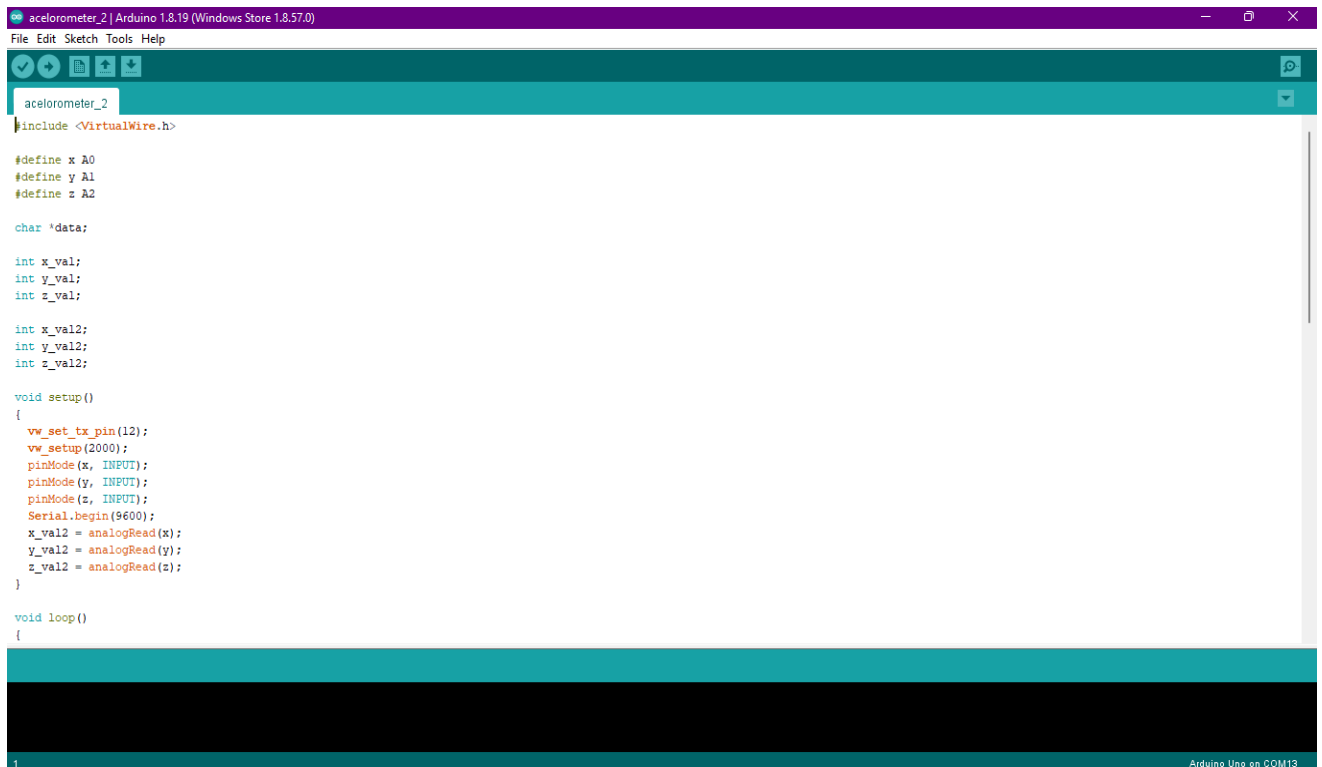
End



As the values detected successfully and the robot works as designed.

3.2 CODE:

3.2.1 Transmitter:



```
acelorometer_2 | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help

acelorometer_2
#include <VirtualWire.h>

#define x A0
#define y A1
#define z A2

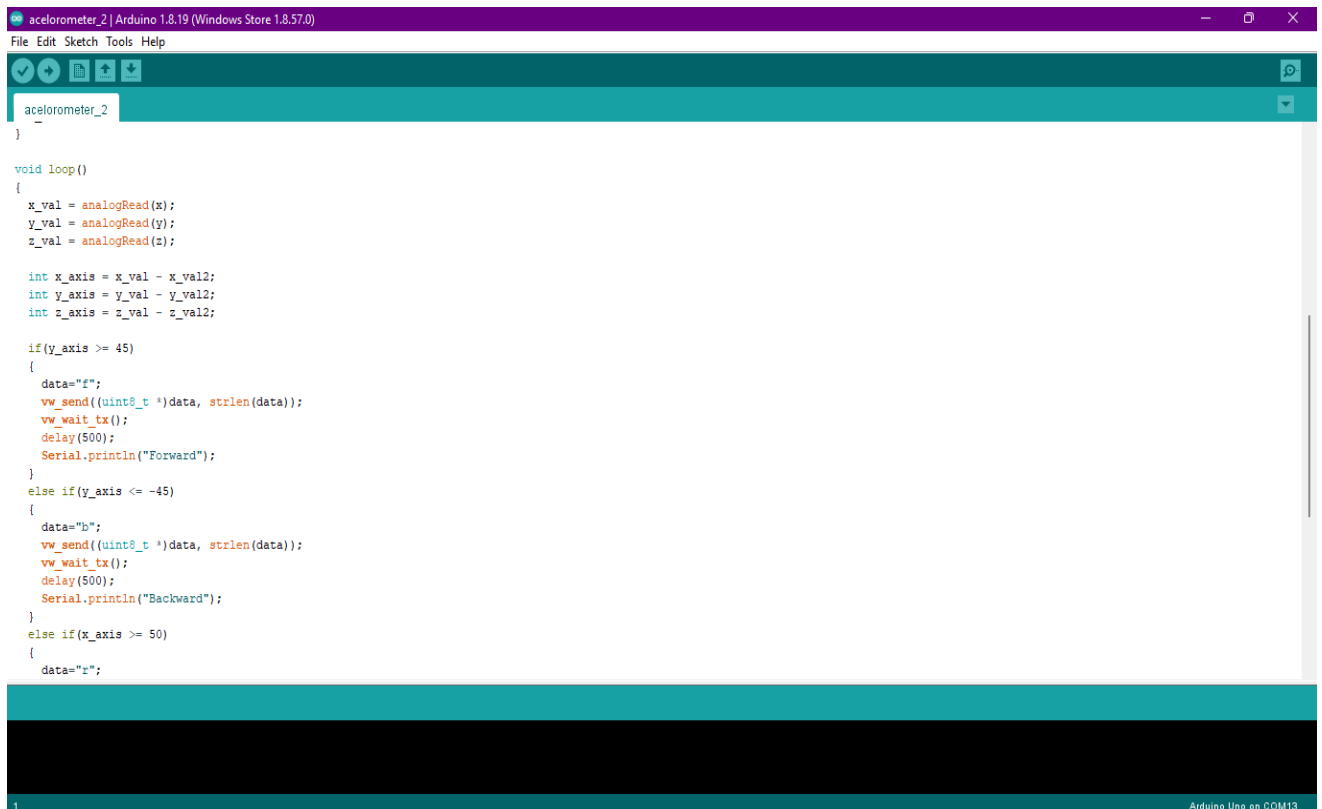
char *data;

int x_val;
int y_val;
int z_val;

int x_val2;
int y_val2;
int z_val2;

void setup()
{
    vw_set_tx_pin(12);
    vw_setup(2000);
    pinMode(x, INPUT);
    pinMode(y, INPUT);
    pinMode(z, INPUT);
    Serial.begin(9600);
    x_val2 = analogRead(x);
    y_val2 = analogRead(y);
    z_val2 = analogRead(z);
}

void loop()
{
}
```



```
acelorometer_2 | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help

acelorometer_2
-
}

void loop()
{
    x_val = analogRead(x);
    y_val = analogRead(y);
    z_val = analogRead(z);

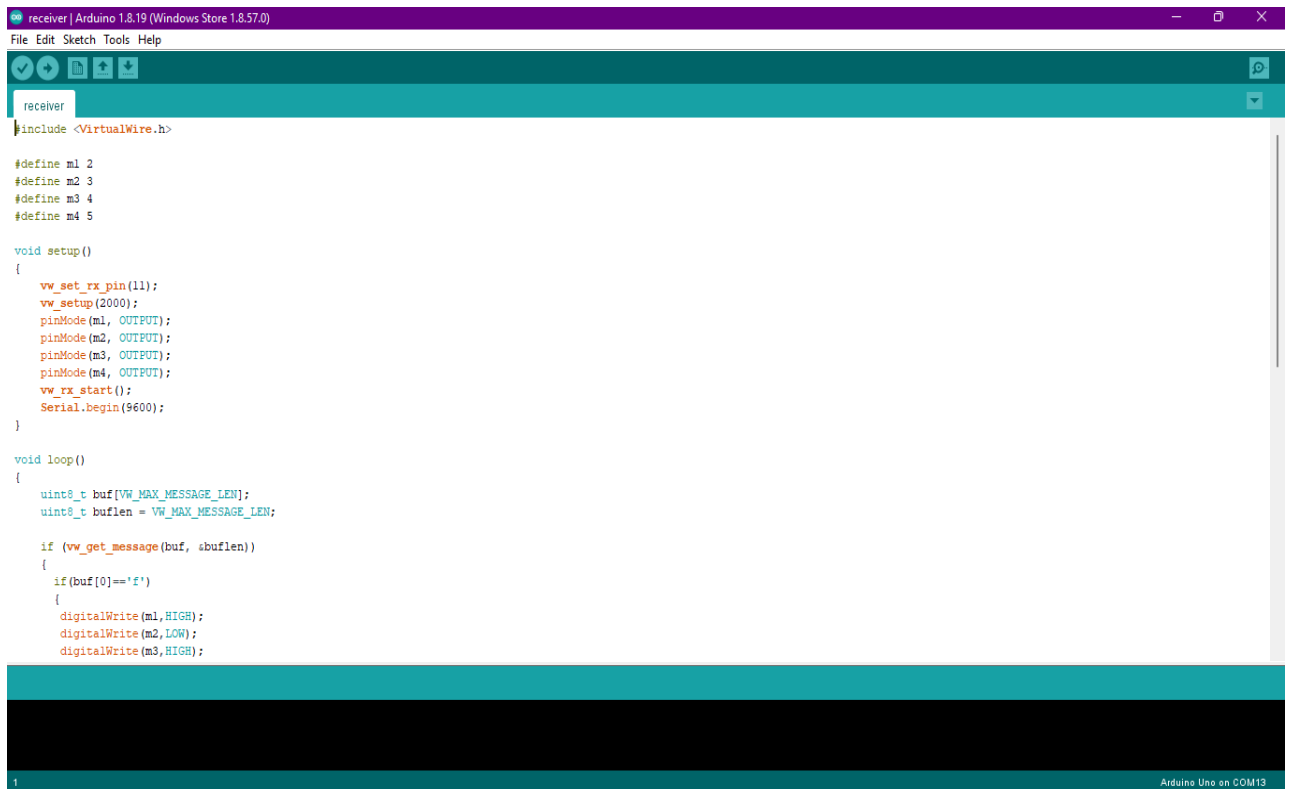
    int x_axis = x_val - x_val2;
    int y_axis = y_val - y_val2;
    int z_axis = z_val - z_val2;

    if(y_axis >= 45)
    {
        data="f";
        vw_send((uint8_t *)data, strlen(data));
        vw_wait_tx();
        delay(500);
        Serial.println("Forward");
    }
    else if(y_axis <= -45)
    {
        data="b";
        vw_send((uint8_t *)data, strlen(data));
        vw_wait_tx();
        delay(500);
        Serial.println("Backward");
    }
    else if(x_axis >= 50)
    {
        data="r";
    }
}
```

acelorometer_2

```
data="b";  
vw_send((uint8_t *)data, strlen(data));  
vw_wait_tx();  
delay(500);  
Serial.println("Backward");  
}  
else if(x_axis >= 50)  
{  
data="r";  
vw_send((uint8_t *)data, strlen(data));  
vw_wait_tx();  
delay(500);  
Serial.println("Right");  
}  
else if(x_axis <= -50)  
{  
data="l";  
vw_send((uint8_t *)data, strlen(data));  
vw_wait_tx();  
delay(500);  
Serial.println("Left");  
}  
else  
{  
data="s";  
vw_send((uint8_t *)data, strlen(data));  
vw_wait_tx();  
delay(500);  
Serial.println("Stop");  
}  
}
```

3.2.2 Receiver:



```
receiver | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help

receiver
#include <VirtualWire.h>

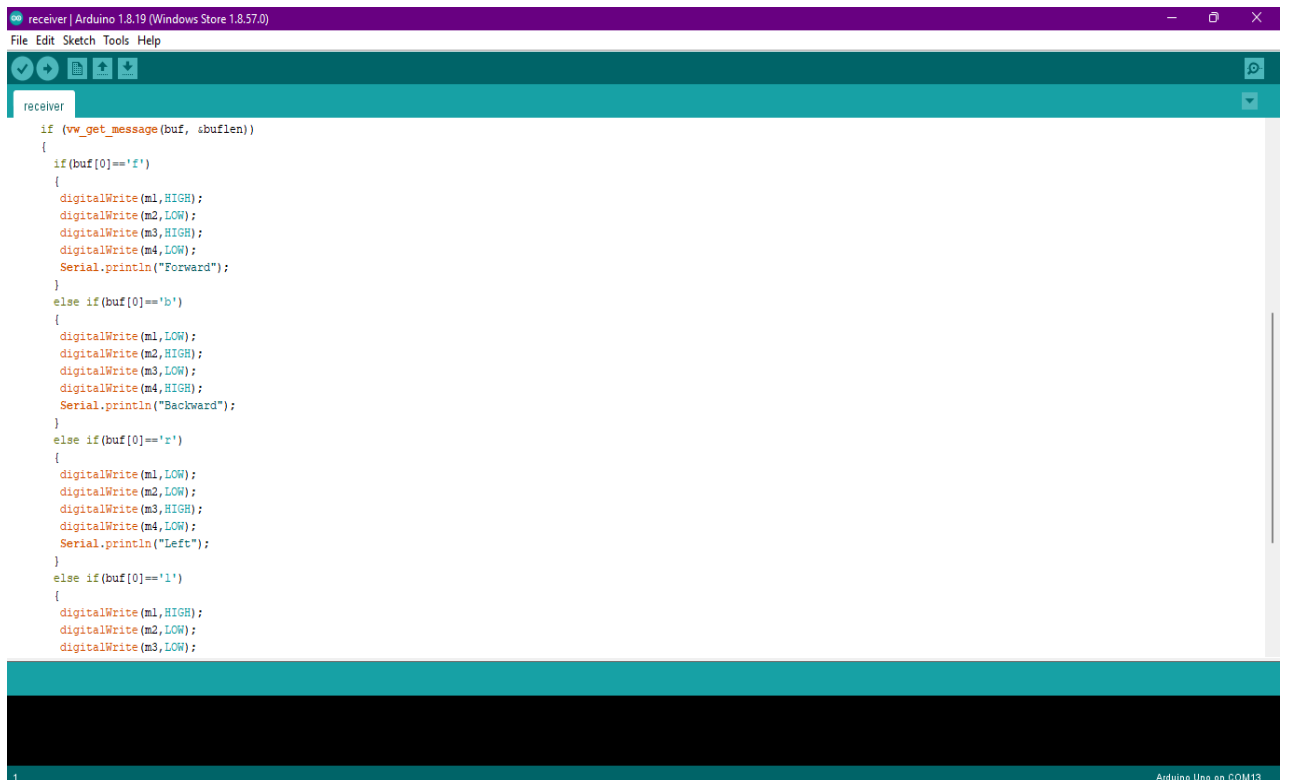
#define m1 2
#define m2 3
#define m3 4
#define m4 5

void setup()
{
  vw_set_rx_pin(11);
  vw_setup(2000);
  pinMode(m1, OUTPUT);
  pinMode(m2, OUTPUT);
  pinMode(m3, OUTPUT);
  pinMode(m4, OUTPUT);
  vw_rx_start();
  Serial.begin(9600);
}

void loop()
{
  uint8_t buf[VW_MAX_MESSAGE_LEN];
  uint8_t buflen = VW_MAX_MESSAGE_LEN;

  if (vw_get_message(buf, buflen))
  {
    if (buf[0] == 'f')
    {
      digitalWrite(m1, HIGH);
      digitalWrite(m2, LOW);
      digitalWrite(m3, HIGH);
    }
  }
}
```

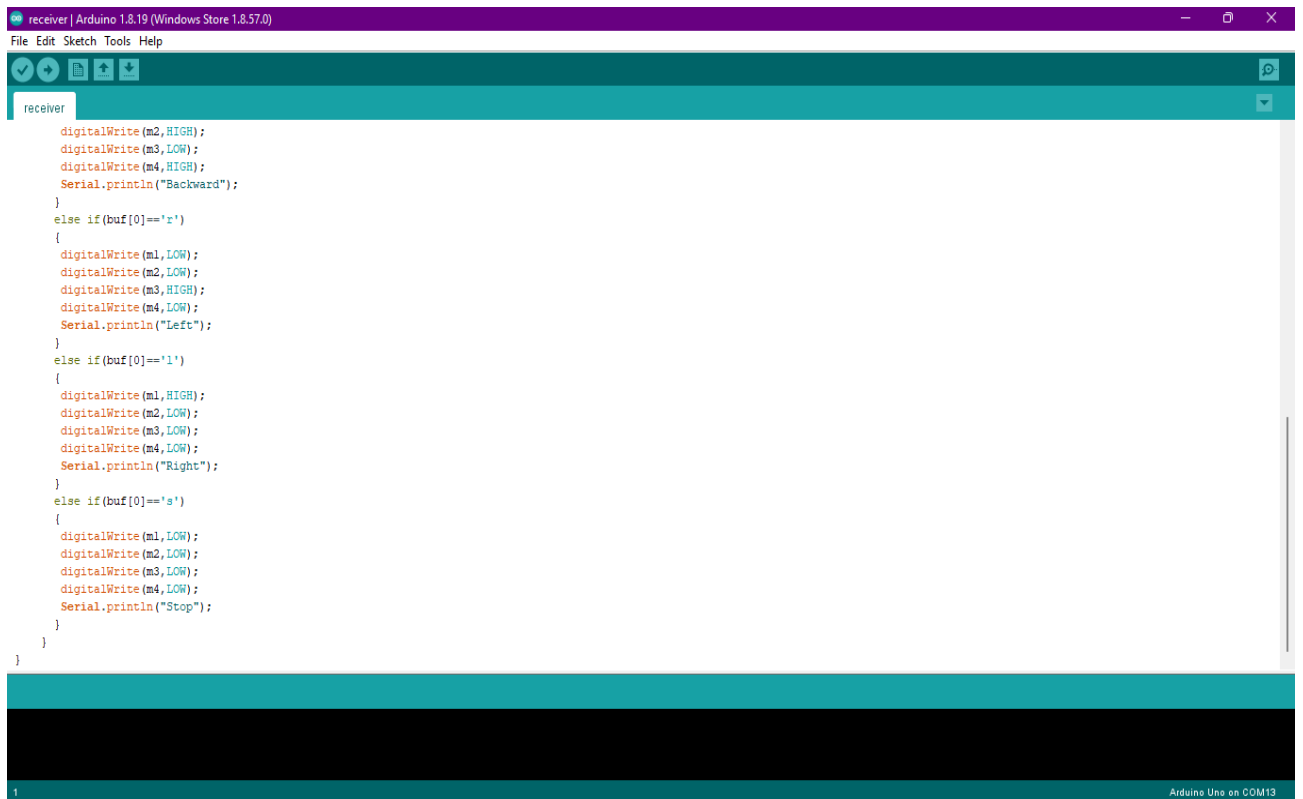
1 Arduino Uno on COM13



```
receiver | Arduino 1.8.19 (Windows Store 1.8.57.0)
File Edit Sketch Tools Help

receiver
  if (vw_get_message(buf, buflen))
  {
    if (buf[0] == 'f')
    {
      digitalWrite(m1, HIGH);
      digitalWrite(m2, LOW);
      digitalWrite(m3, HIGH);
      digitalWrite(m4, LOW);
      Serial.println("Forward");
    }
    else if (buf[0] == 'b')
    {
      digitalWrite(m1, LOW);
      digitalWrite(m2, HIGH);
      digitalWrite(m3, LOW);
      digitalWrite(m4, HIGH);
      Serial.println("Backward");
    }
    else if (buf[0] == 'r')
    {
      digitalWrite(m1, LOW);
      digitalWrite(m2, LOW);
      digitalWrite(m3, HIGH);
      digitalWrite(m4, LOW);
      Serial.println("Left");
    }
    else if (buf[0] == 'l')
    {
      digitalWrite(m1, HIGH);
      digitalWrite(m2, LOW);
      digitalWrite(m3, LOW);
    }
  }
}
```

1 Arduino Uno on COM13



CHAPTER 4:

4.1 CONCLUSION:

The data is received as the angle is detected when the hand is moved in different directions and the data is sent to the body of the car and the car is travelled in the direction as per designed successfully.

Here the robot which we have designed is a simple concept of hand gesture-controlled activities, where we use a sensor to detect at which angle does our hand move and send the value of (X, Y, Z) to the Arduino and the microcontroller send's the data to the other micro controller (in car body)

Using RF pair module which consist of 2-part transmitter and receiver at its position and send's the data to Arduino and Arduino send the data to drover shield to control the wheels accordingly

4.2 FUTURE WORKS:

This project is a future tech which is a more useful in many domains like where humans cannot be reached

Where robot can reach and this robot can be controlled using hand gestures, and this idea is also supportive to people who are sitting in wheel chair and they can control the wheel

movement by just the hand gestures which they make and travel to the required destination easily.

This idea can be developed in to next Gen where the hand gestures are removed and instead of it, we can control the mechanics just by our thoughts or in simple forms by just thinking we can move the robot in out required path with just mind control.

SLIDES:

" MINI PROJECT- Hand Gesture Controlled Robot using Arduino.

Done by:

DHIYANESH KV [2019105524]

RAMANIDHARAN[2019105042]

Components used :

- **Arduino uno**
- **RF pair module (receiver and transmitter)**
- **L293D Motor driver module**
- **ADXL335 SENSOR (accelerometer)**
- **Car body with motor.**
 - 1.chasis.
 - 2.motor with 100 RPM.
 - 3. caster wheel .
 - 4.mini bread board .
 - 5.Jumper wires (m-f).
 - 6. And pair of 9V battery for power source.

Hardware and software used :

- This is a hardware project which consist the above mentioned parts .
- The software which is used for this project is Arduino IDE
- Which run's using C++.

ARDUINO UNO:

- Arduino uno , which is the microcontroller used to control all the process going through the whole system .it is an open source hardware and software controller .the language which we are going to use is C/C#. We use 2 board because one for the car bot And the other in hand . we connect it to our computer and program it and do the further process by running it .and applying it to the used components.



2 Arduino UNO

RF pair module (receiver and transmitter):

- An RF module (short for radio-frequency module) is a small electronic device used to transmit and/or receive radio signals between two devices.
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-



RF Pair Module

L293D Motor driver module:

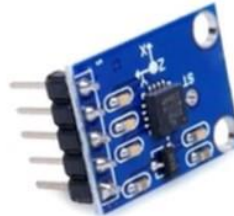
- L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D IS 16 PIN IC which drive 2 motors simultaneously in 2 different direction.



L293D Motor driver Module

ADXL335 SENSOR (accelerometer):

- The ADXL335 is a small, low power, complete 3axis accelerometer with signal conditioned voltage outputs. It finds the axis's (X,Y,Z) and send data so that we can calculate the angle at what hand moves and then send the data to bot so that it can decided its path using code written in Arduino.



ADXL335 Sensor

Car body with motor:

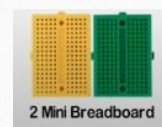
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80 Motors 100RPM



Caster Wheel



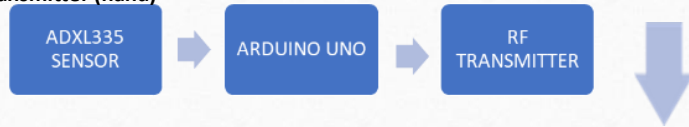
2 Mini Breadboard



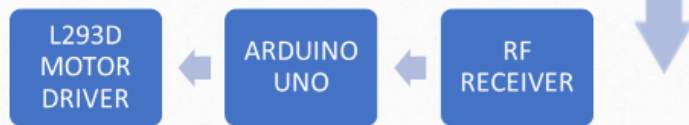
Wires

BLOCK DAIGRAM:

Transmitter (hand)



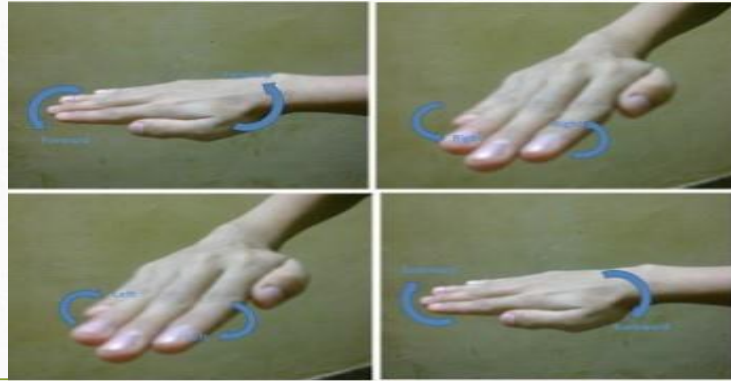
Receiver(BOT)



EXAMPLE MODEL:



HAND GESTURES:



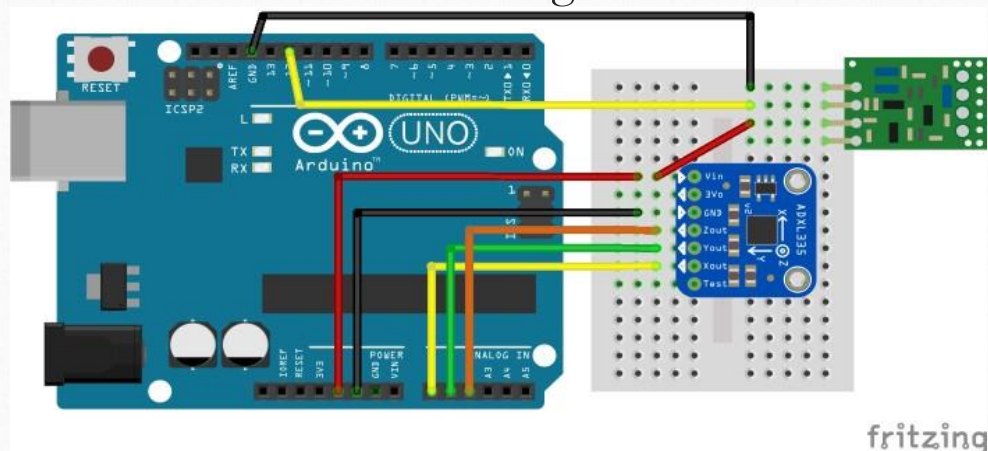
Project division

- This project is divided into 2 sections
- 1. Transmitter
- 2. Receiver

Transmitter

- This part is presented in the hand which detects the hand gesture and send the signal.
- Here the components are **ARDUINO** , **RF pair module**, **ADXL335 SENSOR**
- The sensor receives the hand gesture (X,Y,Z) values and send the data to Arduino and Arduino send's the data to the car part using the RF pair module

Circuit diagram

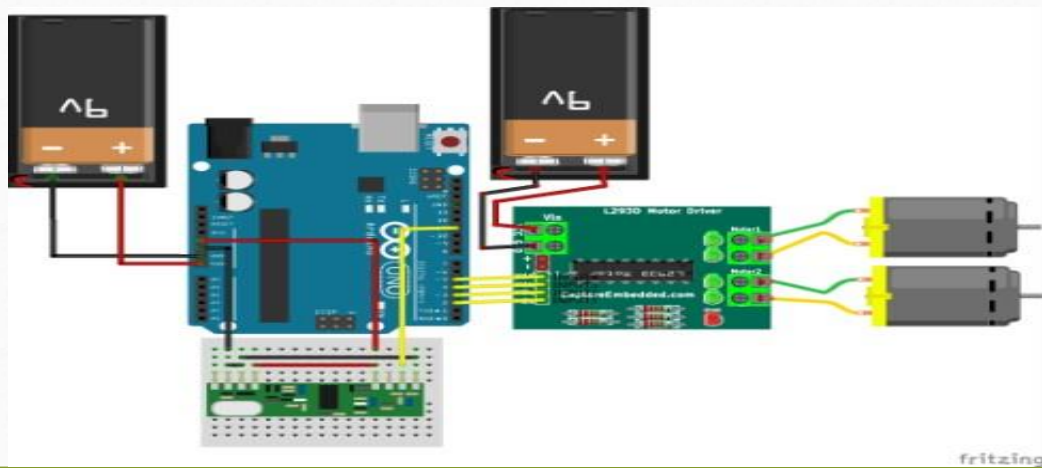


fritzing

Receiver

- This part is presented in the car body which detects the data from hand part and drives the car .
- Here the components are **ARDUINO, RF pair module, L293D Motor driver module**
- The RF module receives data from other unit from hand part and send the data to Arduino and Arduino send the data to L293D motor driver module and it control's the wheel accordingly to the code. Written

Circuit diagram



Conclusion

- Here the robot which we have designed is a simple concept of hand gesture controlled activities ,where we use a sensor to detect at which angle does our hand move and send the value of (X,Y,Z) to the Arduino and the microcontroller send's the data to the other micro controller (in car body)
- Using RF pair module which consist of 2 part transmitter and receiver at its position and send's the data to Arduino and Arduino send the data to drover shield to control the wheels accordingly

THANK YOU
YOURS OBEDIENTLY:

DHIYANESH KV
2019105524