Project No&Topic: Lab Assignment #3 Differential Drive Mobile Robot

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1.Introduction:

In this assignment we designed and manufactured a differential drive mobile robot with an illumination dependent speed control . The robot works with battery, has three states of speed depended on light and is remote controlled with Bluetooth .

2.Equipment:

1-)LDR : LDR is Light Dependent Resistor.Another name is photo resistance.Although LDR is a type of resistance,it is also a passive sensor.LDRs provide an output with varying resistance values in their circuits,but they act as a sensor since they perform this process with a physical change from the external environment.It has a working principle inversely proportional to the light intensity falling on it.In other words,as the light intensity increases,the resistance value decreases,and as the light intensity decreases,the resistance value increases.LDRs act as switching by changing their resistance values.

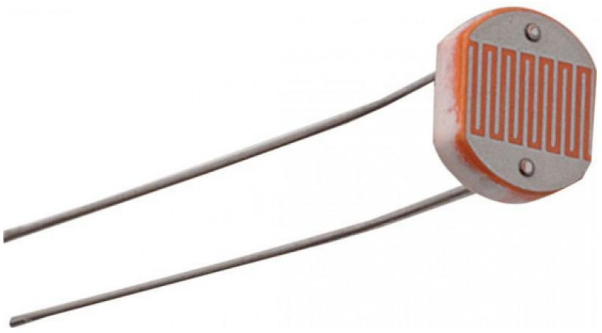

Figure 1 – Light Dependent Resistor

2-)Motor Driver Module(L298N):L298N DC Motor Drive is a motor driver board prepared to drive two motors between 4.8V-46V.This two-channel motor drive delivers 2A current per channel.

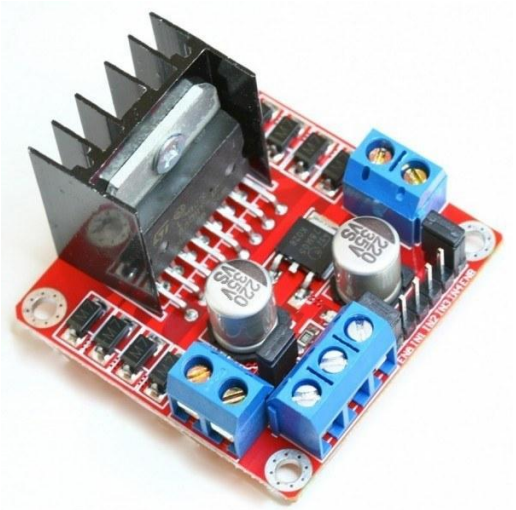

Figure 2 - Motor Driver Module(L298N)

3-)Arduino UNO: Arduino is an open source microcontroller which has 14 digital input/output pins and 6 analog inputs.Arduino Uno contains all of the components required to support a microcontroller.

Figure 3 - Arduino UNO

4-)HC-05 Bluetooth Module: The HC-05 Bluetooth-Serial Module Card is designed fort he use Bluetooth SPP (Serial Port Standard) and wireless serial communication applications.

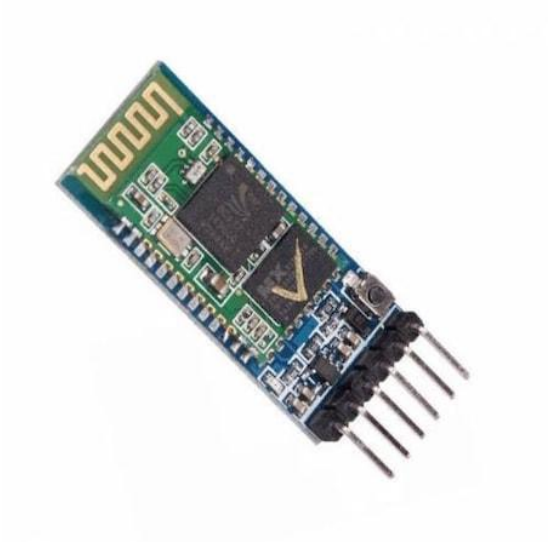

Figure 4 – HC-05 Bluetooth Module

5-)DC Gear Motor and Wheel: DC motor is a machine that converts straight current electrical energy into mechanical energy.When the electric current is applied to the windings inside the motor,it is based on the principle of moving by the effect of the magnetic force formed in the opposite direction to the permanen magnets inside the motor.

Figure 5 – DC Gear Motor and Wheel

3.Software:

```
#include<SoftwareSerial.h>

SoftwareSerial bluetooth_iletisim(12,13);


const byte ldr_pin=A0;

int ldr_deger;


const int in1 = 4;

const int in2 = 5;

const int in3 = 6;

const int in4 = 7;


const int enA = 9;

const int enB = 10;


int speedcar1 = 100;

int speedcar2 = 150;

int speedcar3 = 200;


void setup()

{

pinMode(in1, OUTPUT);

pinMode(in2, OUTPUT);

pinMode(in3, OUTPUT);

pinMode(in4, OUTPUT);
```

```
pinMode(enA, OUTPUT);
pinMode(enB, OUTPUT);
Serial.begin(9600);
bluetooth_iletisim.begin(9600);
}
void loop() {

if(bluetooth_iletisim.available()) {
char data = bluetooth_iletisim.read();

if(digitalRead(data) == LOW) {
shut_down();
} else {

if(data == 'F') {
forward();
} else if(data == 'B') {
back();
} else if(data == 'L') {
left();
} else if(data == 'R') {
right();
} else {
shut_down();
}

}
}
```

```
}

void forward(){
ldr_deger = analogRead(ldr_pin);
int yeni_deger=map(ldr_deger,0,1023,0,255);
Serial.println(yeni_deger);

if(yeni_deger<=85)
{
analogWrite(enA, speedcar1); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
analogWrite(enB, speedcar1); //motor2
digitalWrite(in3,LOW);
digitalWrite(in4,HIGH);
}
else if(85<yeni_deger<=170)
{
analogWrite(enA, speedcar2); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
analogWrite(enB, speedcar2); //motor2
digitalWrite(in3,LOW);
digitalWrite(in4,HIGH);
}
else
{
```

```
analogWrite(enA, speedcar3); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
analogWrite(enB, speedcar3); //motor2
digitalWrite(in3,LOW);
digitalWrite(in4,HIGH);
}
}

void back(){
ldr_deger = analogRead(ldr_pin);
int yeni_deger=map(ldr_deger,0,1023,0,255);
Serial.println(yeni_deger);
if(yeni_deger<=85)
{
analogWrite(enA, speedcar1); //motor1
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
analogWrite(enB, speedcar1); //motor2
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
}
else if(85<yeni_deger<=170)
{
analogWrite(enA, speedcar2); //motor1
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
analogWrite(enB, speedcar2); //motor2
```

```
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
}
else
{
analogWrite(enA, speedcar3); //motor1
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
analogWrite(enB, speedcar3); //motor2
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
}
}
void left(){
ldr_deger = analogRead(ldr_pin);
int yeni_deger=map(ldr_deger,0,1023,0,255);
Serial.println(yeni_deger);
if(yeni_deger<=85)
{
analogWrite(enA, speedcar1); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
analogWrite(enB, speedcar1); //motor2
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
}
else if(85<yeni_deger<=170)
{
```

```
analogWrite(enA, speedcar2); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
analogWrite(enB, speedcar2); //motor2
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
}
else
{
analogWrite(enA, speedcar3); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,HIGH);
analogWrite(enB, speedcar3); //motor2
digitalWrite(in3,HIGH);
digitalWrite(in4,LOW);
}
}
void right() {
ldr_deger = analogRead(ldr_pin);
int yeni_deger=map(ldr_deger,0,1023,0,255);
Serial.println(yeni_deger);
if(yeni_deger<=85)
{
analogWrite(enA, speedcar1); //motor1
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
analogWrite(enB, speedcar1); //motor2
digitalWrite(in3,LOW);
```

```
digitalWrite(in4,HIGH);
}
else if(85<yeni_deger<=170)
{
analogWrite(enA, speedcar2); //motor1
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
analogWrite(enB, speedcar2); //motor2
digitalWrite(in3,LOW);
digitalWrite(in4,HIGH);
}
else
{
analogWrite(enA, speedcar3); //motor1
digitalWrite(in1,HIGH);
digitalWrite(in2,LOW);
analogWrite(enB, speedcar3); //motor2
digitalWrite(in3,LOW);
digitalWrite(in4,HIGH);
}
}

void shut_down() {
analogWrite(enA,LOW); //motor1
digitalWrite(in1,LOW);
digitalWrite(in2,LOW);
analogWrite(enB,LOW); //motor2
digitalWrite(in3,LOW);
```

digitalWrite(in4,LOW);

}

4.Design and Assembly

We designed two platforms which are bottom and upper in Solidworks and then printed them with a 3D printer.The lengths of the platforms were adjusted according to the dimensions of the devices to be placed.Two bases combined by using metal spacer.We mounted the motors and the caster on the bottom base. With the help of tape,we placed the batteries and motor driver on the bottom base.Also,we placed the arduino and breadboard in upper base.

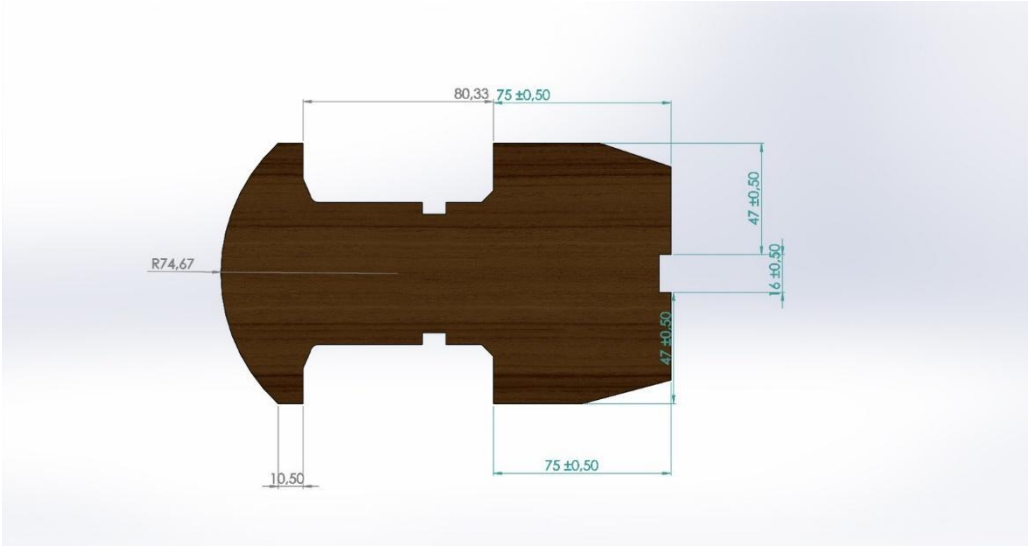

Figure 6 – Bottom Base

Figure 7 – Upper Base

5.Results And Discussion:

The robot should have three states of speed and is coded like that but we can only observe 2 states of speed because LDR we used is very sensitive in the third speeds LDR output interval and this causes us to not see the third speed state. The robot mechanism was not designed to have too much cables this caused us to make bad cable management and bad cable management can cause problems in both electrical and mechanical system .Our Bluetooth module sometimes shutdowns with unknown reasons and this causes disconnection from remote control program. We needed to create a time based log file for acquired light intensity , state of light and vehicle velocity but log file coding was too complicated and we were out of time so we couldn’t do it.

6.Conclusion:

At this Project we design a differential mobile robot.so firstly we learned that what is differential mobile robot. A differential wheeled robot is a mobile robot whose movement is based on two separately driven wheels placed on either side of the robot body. It can thus change its direction by varying the relative rate of rotation of its wheels. Mobile robots powered by batteries.Also at this Project again we used H bridge module.Also we learned that we can use it like velocity control module at enableA and enB pins.At this Project we also built a sensor circuits.Thanks to sensor circuits we can change the velocity of mobile robot.For controlling the mobile robot we use bluetooth module so we learned that how to coding a bluetooth module.also how to connection bluetooth module and ardunio.