

H-bridge and robot (Control dc motor (12v)) :

In this experiment we will learn how to control two 12v DC motor by using H-bridge module

H-bridge :

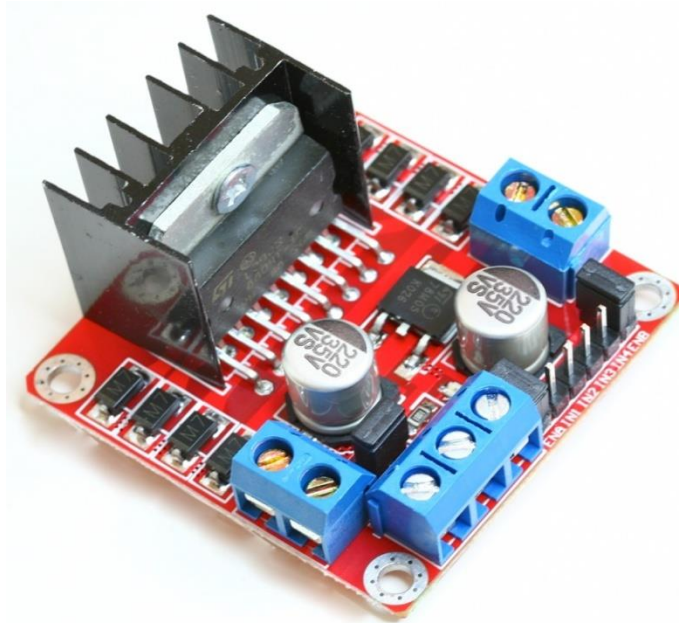


Figure : Dual H-bridge .

An H-Bridge is a circuit that can drive a current in either polarity and be controlled by Pulse Width Modulation (PWM).

H-Bridge is typically used in controlling motors speed and direction.

In this experiment we need :

- 1- Two dc motor .
- 2-Dual H-bridge to drive the motors .
- 3-Arduino board.
- 4-Wires .
- 5-Battery 12v .

See connection diagram :

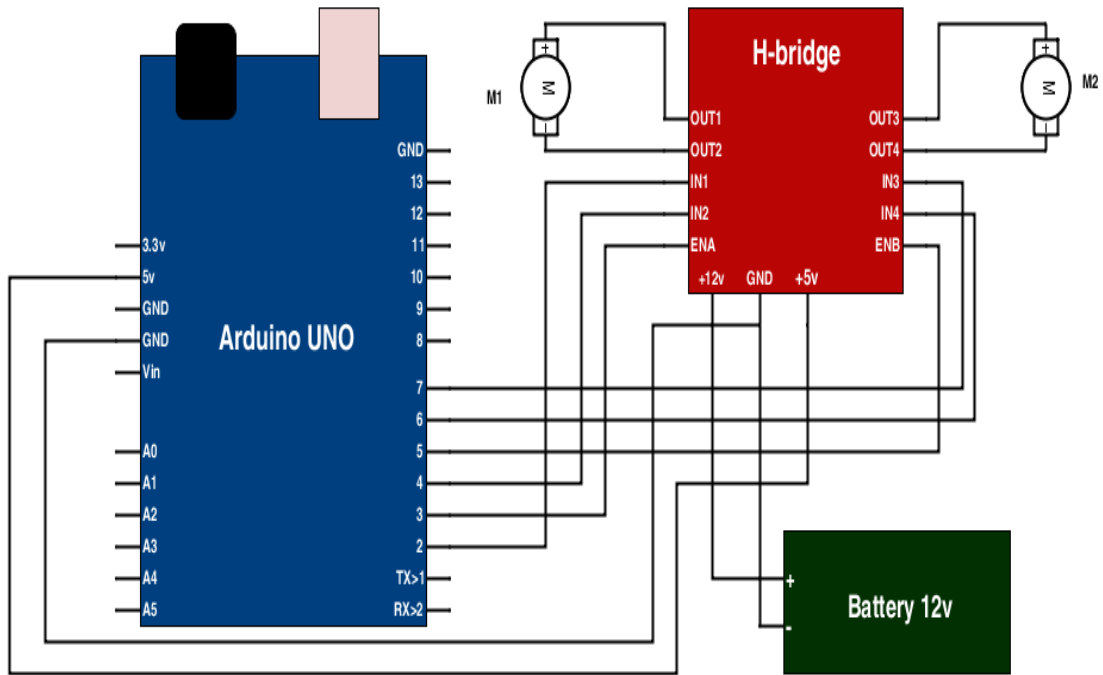


Figure : control two dc motor connection diagram .

We can add to the component four wheel or two wheel , and kit (fitting pieces on it) to control small car forward , backward ,and rotation in both direction .

Like this :

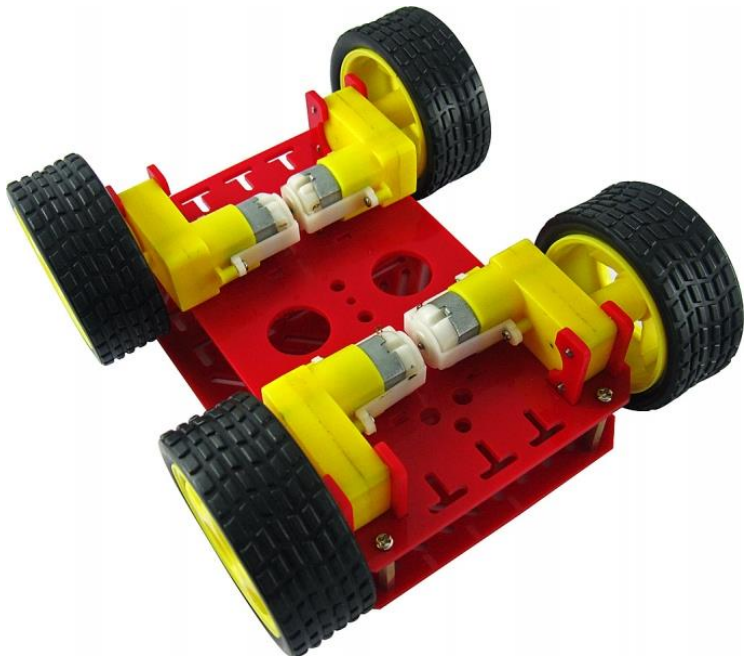


Figure : four wheeled Robot kit .

Note that we connect each two motor together as one motor



Figure : Four wheeled robot .



```
int IN1=2;
int IN2=4;
int ENA=3;

int IN3=7;
int IN4=6;
int ENB=5;
int Speed=255;
void setup() {
  pinMode (IN1, OUTPUT);
  pinMode (IN2, OUTPUT);
  pinMode (ENA, OUTPUT);
  pinMode (IN3, OUTPUT);
  pinMode (IN4, OUTPUT);
  pinMode (ENB, OUTPUT);
  Serial.begin(9600);
}
void loop()
{
  forward();
  delay(1000);
  left();
  delay(1000);
  backward();
  delay(1000);
```

```
right();  
    delay(1000);  
    Stop();  
    delay(1000); }  
void left(){  
    analogWrite (ENA, Speed);  
    analogWrite (ENB, Speed);  
    digitalWrite (IN1, 0);  
    digitalWrite (IN2, 1);  
    digitalWrite (IN3, 0);  
    digitalWrite (IN4, 1);  
}  
void right(){  
    analogWrite (ENA, Speed);  
    analogWrite (ENB, Speed);  
    digitalWrite (IN1, 1);  
    digitalWrite (IN2, 0);  
    digitalWrite (IN3, 1);  
    digitalWrite (IN4, 0);  
}  
void Stop(){  
    analogWrite (ENA, 0);  
    analogWrite (ENB, 0);  
    digitalWrite (IN1, 0);  
    digitalWrite (IN2, 0);  
    digitalWrite (IN3, 0);  
    digitalWrite (IN4, 0); }
```

```
void forward(){
  analogWrite (ENA, Speed);
  analogWrite (ENB, Speed);
  digitalWrite (IN1, 0);
  digitalWrite (IN2, 1);
  digitalWrite (IN3, 1);
  digitalWrite (IN4, 0);
}
void backward(){
  analogWrite (ENA, Speed);
  analogWrite (ENB, Speed);
  digitalWrite (IN1, 1);
  digitalWrite (IN2, 0);
  digitalWrite (IN3, 0);
  digitalWrite (IN4, 1);
}
```

Stepper motor

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements that's mean the motor divide a full rotation into a number of equal steps. The motor's position can then be commanded to move and hold at one of these steps without any feedback sensor.



Figure 5-3 : 5V Stepper Motor + ULN2003 Driver Board

In this experiment you'll need :

- 1- 5v stepper motor .
- 2- ULN2003 Driver Board .
- 3- Arduino Uno .

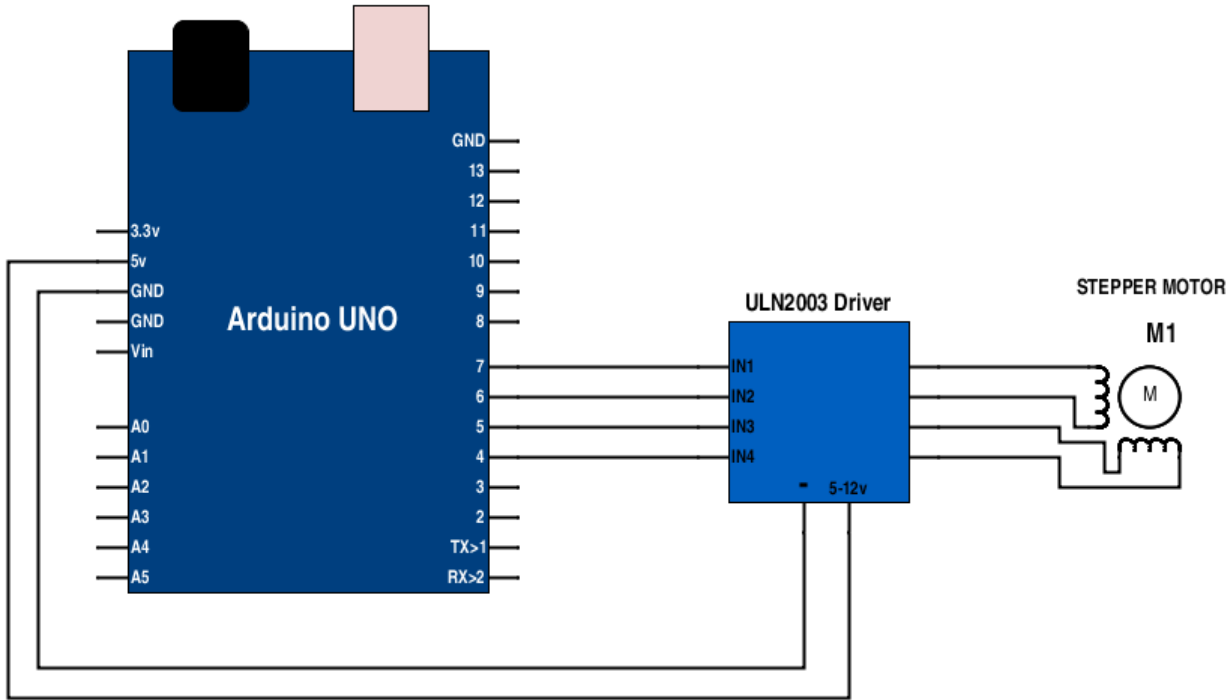


Figure 5-3 : stepper motor with arduino connection diagram.

Now let`s move to the code :

```

void setup(){
    pinMode(7,OUTPUT);
    pinMode(6,OUTPUT);
    pinMode(5,OUTPUT);
    pinMode(4,OUTPUT);
}

void loop (){

```

```
digitalWrite(7,1);  
digitalWrite(6,0);  
digitalWrite(5,0);  
digitalWrite(4,0);  
    delay(3);  
digitalWrite(7,0);  
digitalWrite(6,1);  
digitalWrite(5,0);  
digitalWrite(4,0);  
    delay(3);  
digitalWrite(7,0);  
digitalWrite(6,0);  
digitalWrite(5,1);  
digitalWrite(4,0);  
    delay(3);  
digitalWrite(7,0);  
digitalWrite(6,0);  
digitalWrite(5,0);  
digitalWrite(4,1);  
    delay(3);  
    }
```

Servo motor

A servo motor is a rotary actuator that allows for precise control of angular position, velocity and acceleration.

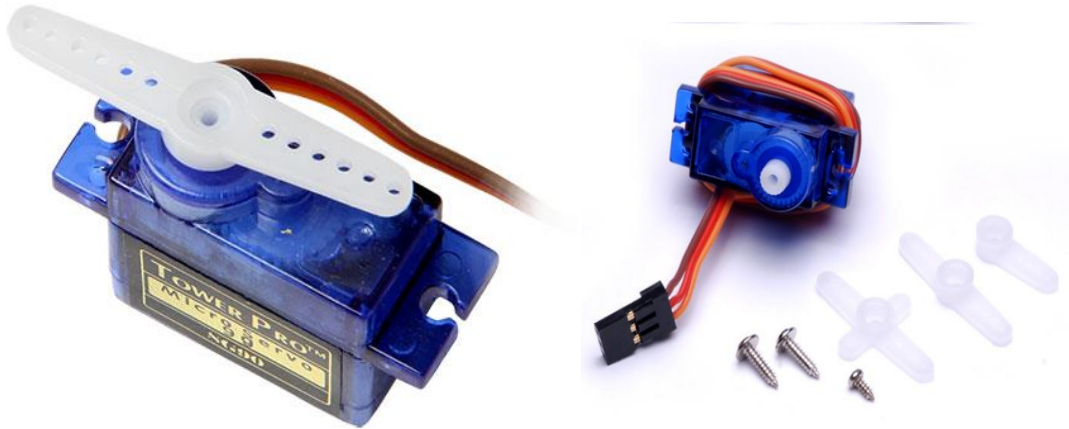


Figure 5-4 : servo motor .

In this experiment you'll need :

- 1- Servo motor .
- 2- Arduino Uno .

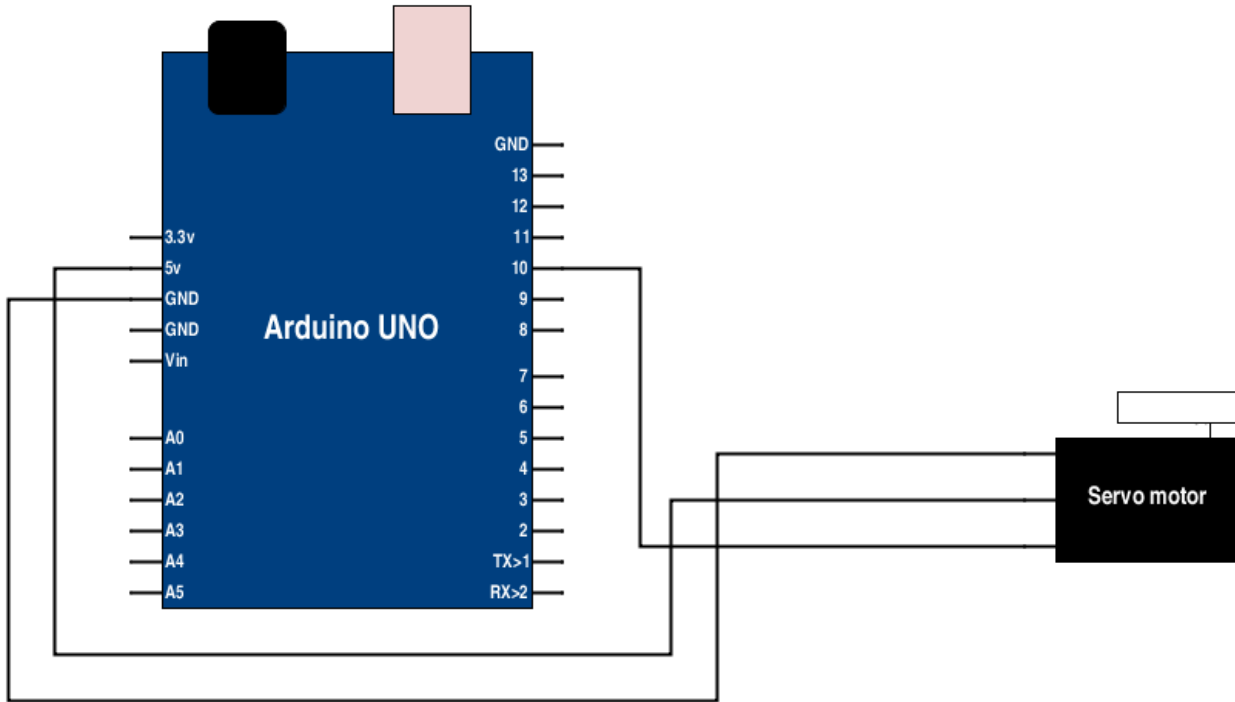


Figure 5-5 : servo motor with arduino connection diagram.

Now let`s move to the code :

```
#include <Servo.h> // we use a ready library from arduino to deal with servo motor and to make the program
easier to write .

Servo myservo;

int pos = 0;

int pos2=30;

int pos3=60;

int pos4=90;

int pos5=180;

void setup()
```

```
        {  
            myservo.attach(10);  
        }  
        void loop()  
        {  
            myservo.write(pos);  
            delay(1000);  
            myservo.write(pos2);  
            delay(1000);  
            myservo.write(pos3);  
            delay(1000);  
            myservo.write(pos4);  
            delay(1000);  
            myservo.write(pos5);  
            delay(1000);  
        }
```

Brushless Motor

A Brushless motor is a type of DC motors which considered to be a high performance motor that is capable of providing large amounts of torque over a vast speed range. it is the ideal choice for applications that require high reliability, high efficiency, and high power-to-volume ratio.



Figure 5-6 : Brushless motor .

In this experiment you'll need :

- 1- Brushless motor .
- 2- Potentiometer.
- 3- ESC .
- 4- 12 v supply .
- 5- Arduino .

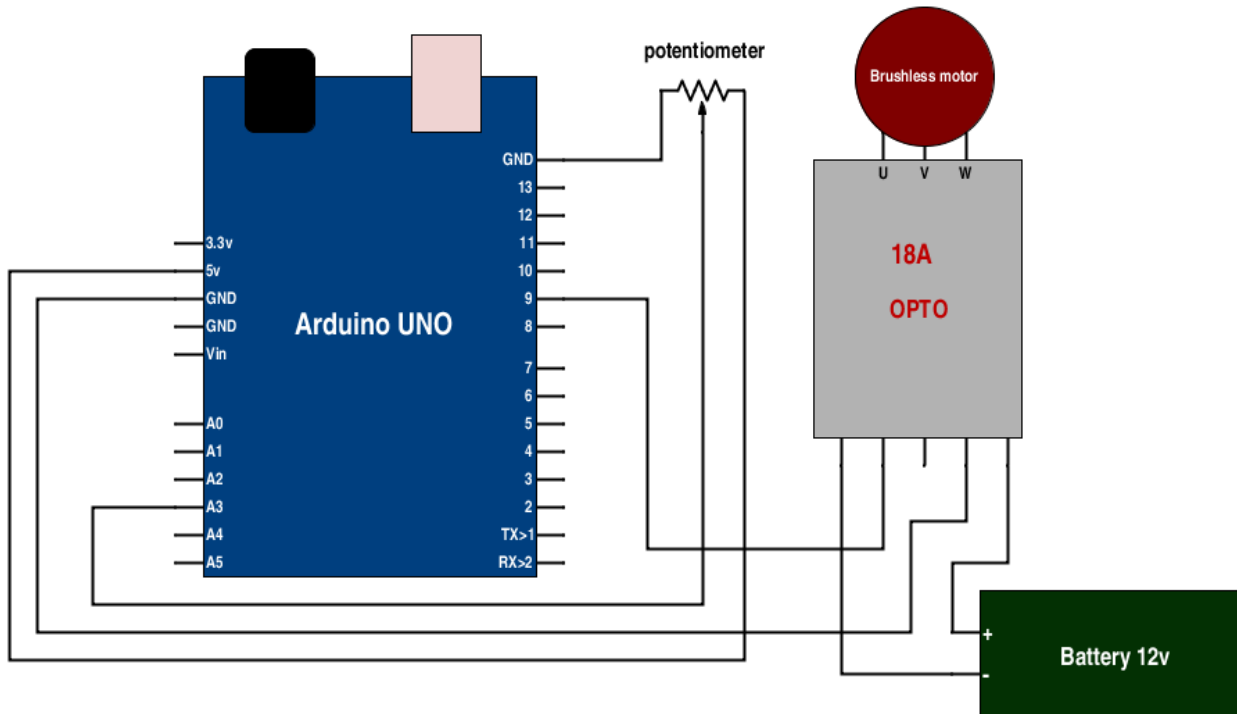


Figure 5-7 : Brushless motor with arduino connection diagram .

Let`s move to the code :

```

#include <Servo.h>

int pot ;

Servo brushless ;

void setup()
{
  Serial.begin(9600);
  brushless.attach(9);
}

void loop(){
  int pot = analogRead(3);
  val = map(pot, 0, 1023, 0, 255);

  Serial.println (pot);
  brushless.write(pot);

  delay(5); }

```