Session 4

Agenda

DC motor

01

- DC motor
- L293d Driver
- L298n Driver

Servo Motor

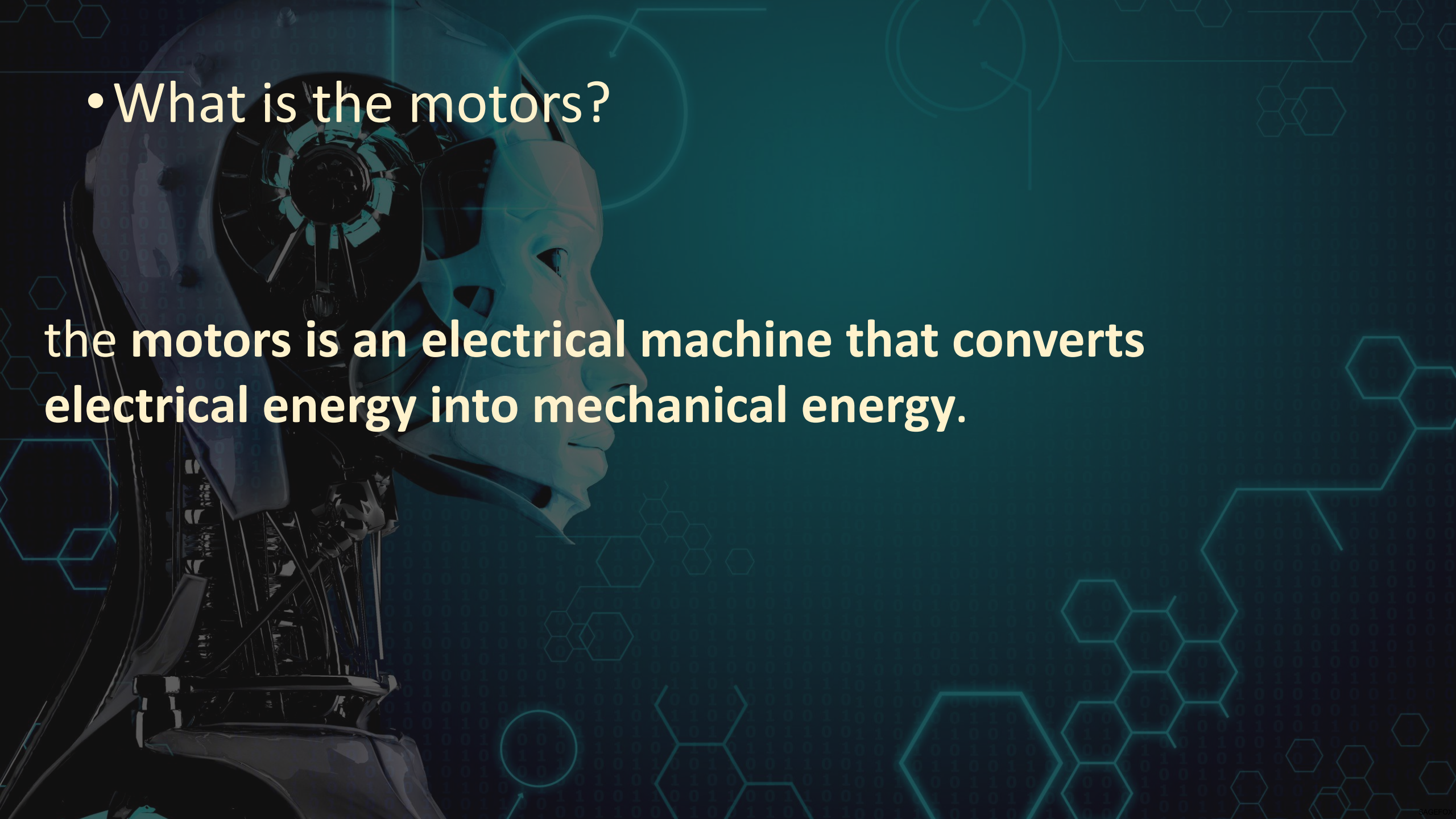
02

- Servo motor

Stepper motor

03

- Stepper motor
- A4988 driver



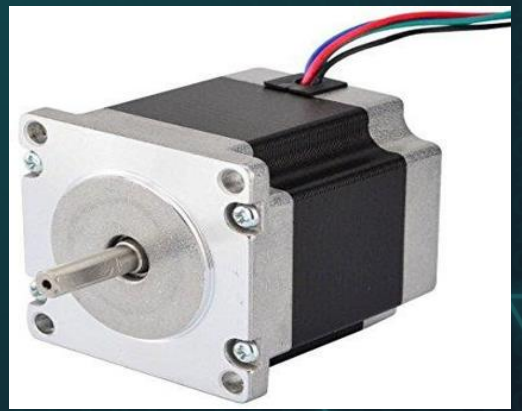
- What is the motors?

the **motors is an electrical machine that converts electrical energy into mechanical energy.**

- What is the types of motors?

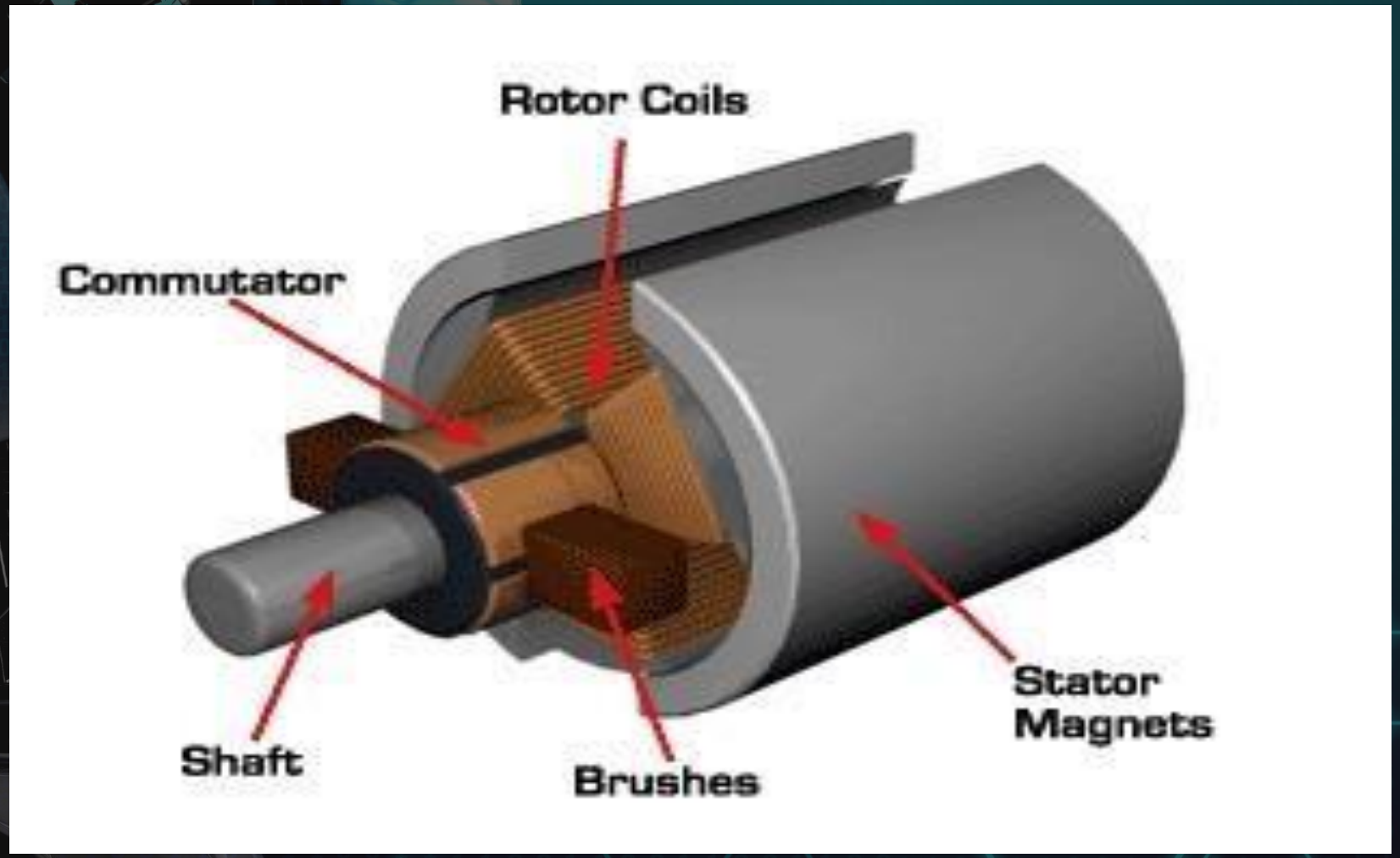
- DC Motor

- Servo Motor

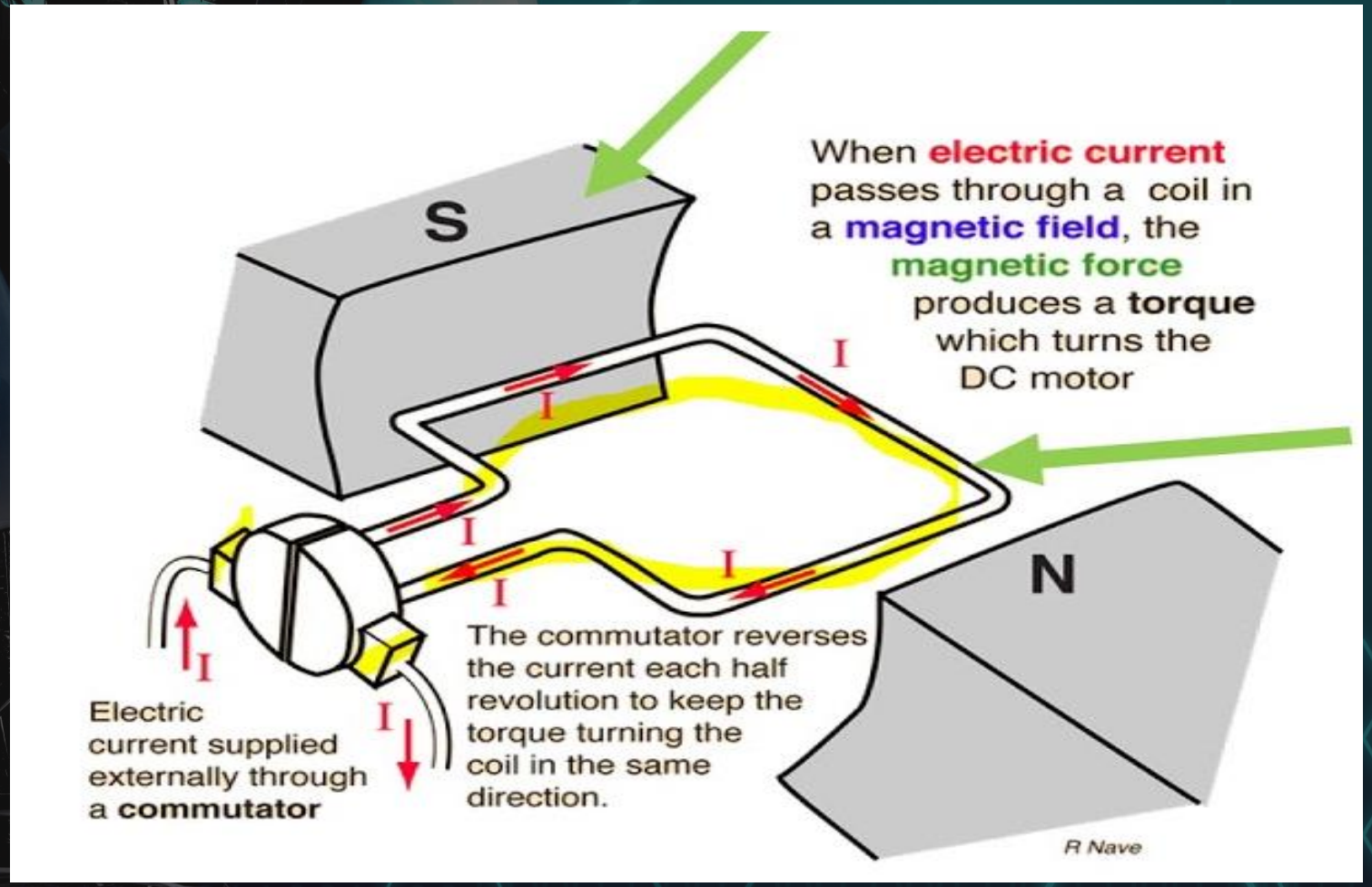


- Stepper Motor

- DC mechanism

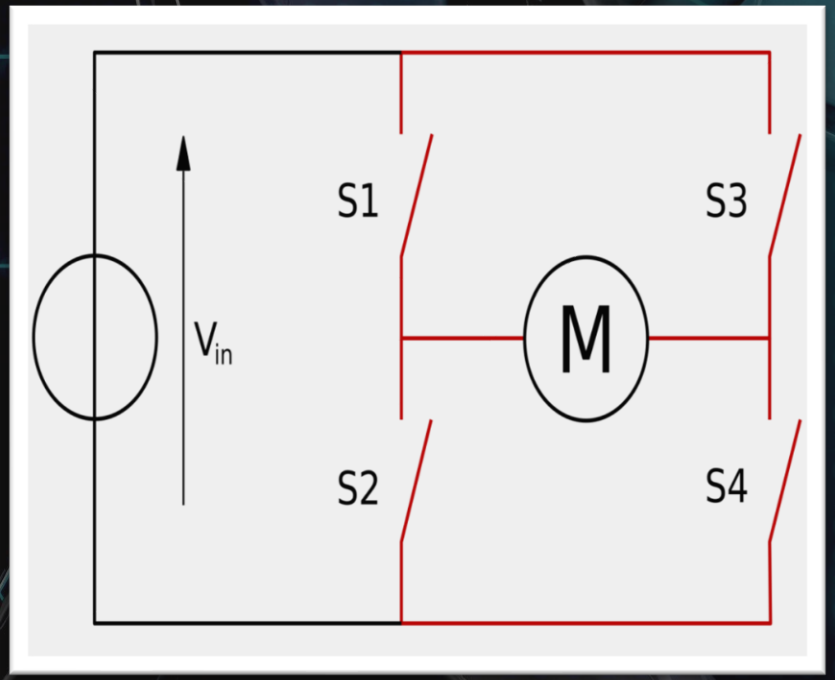


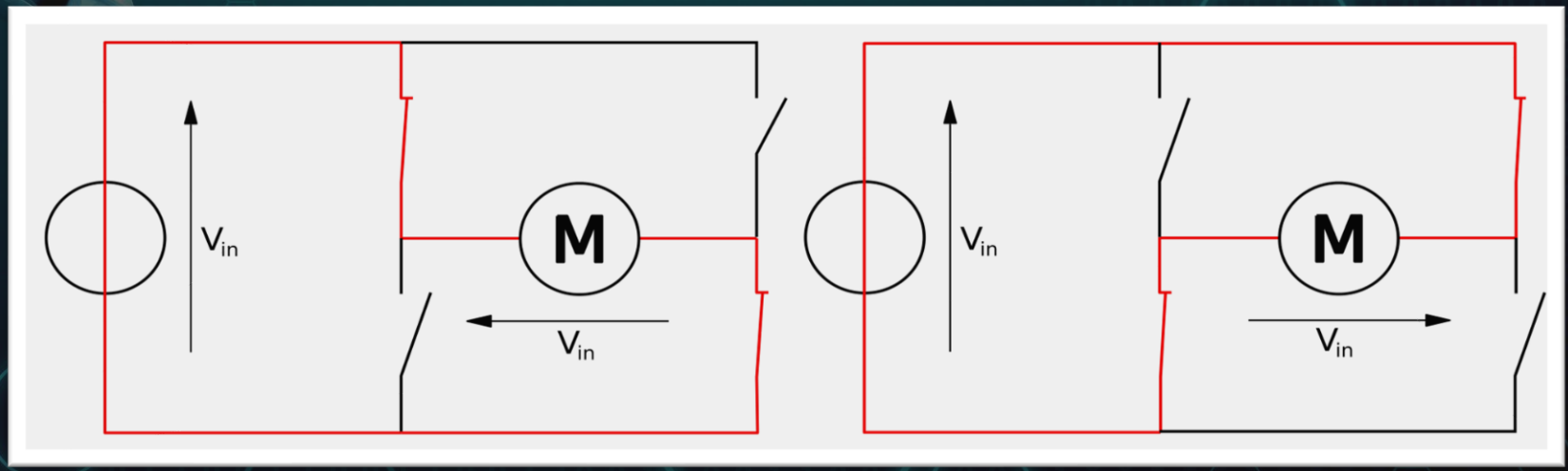
- DC mechanism



• H-Bridge

- The term *H bridge* is derived from the typical graphical representation of such a circuit.
- H bridge is built with four switches .

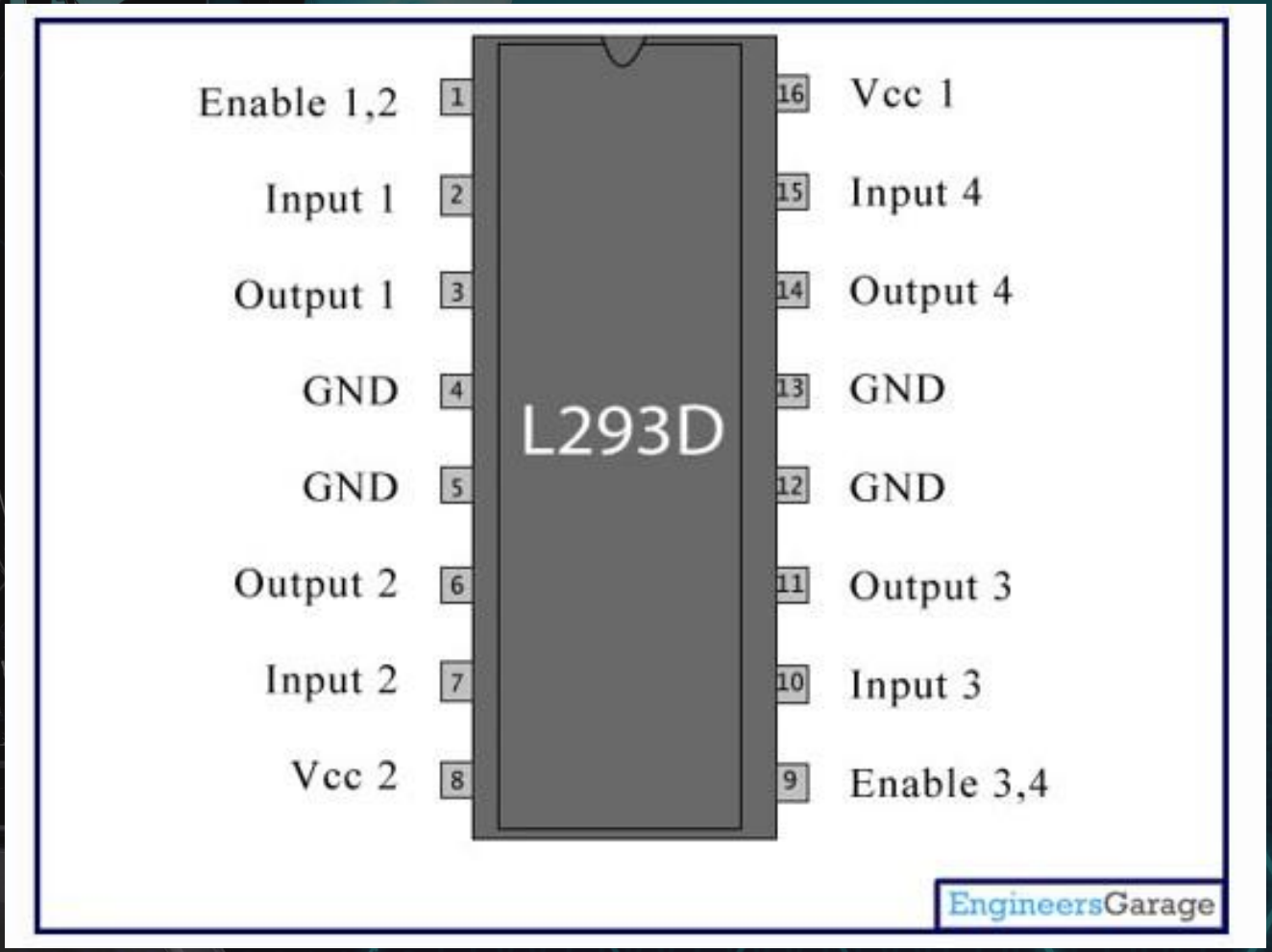




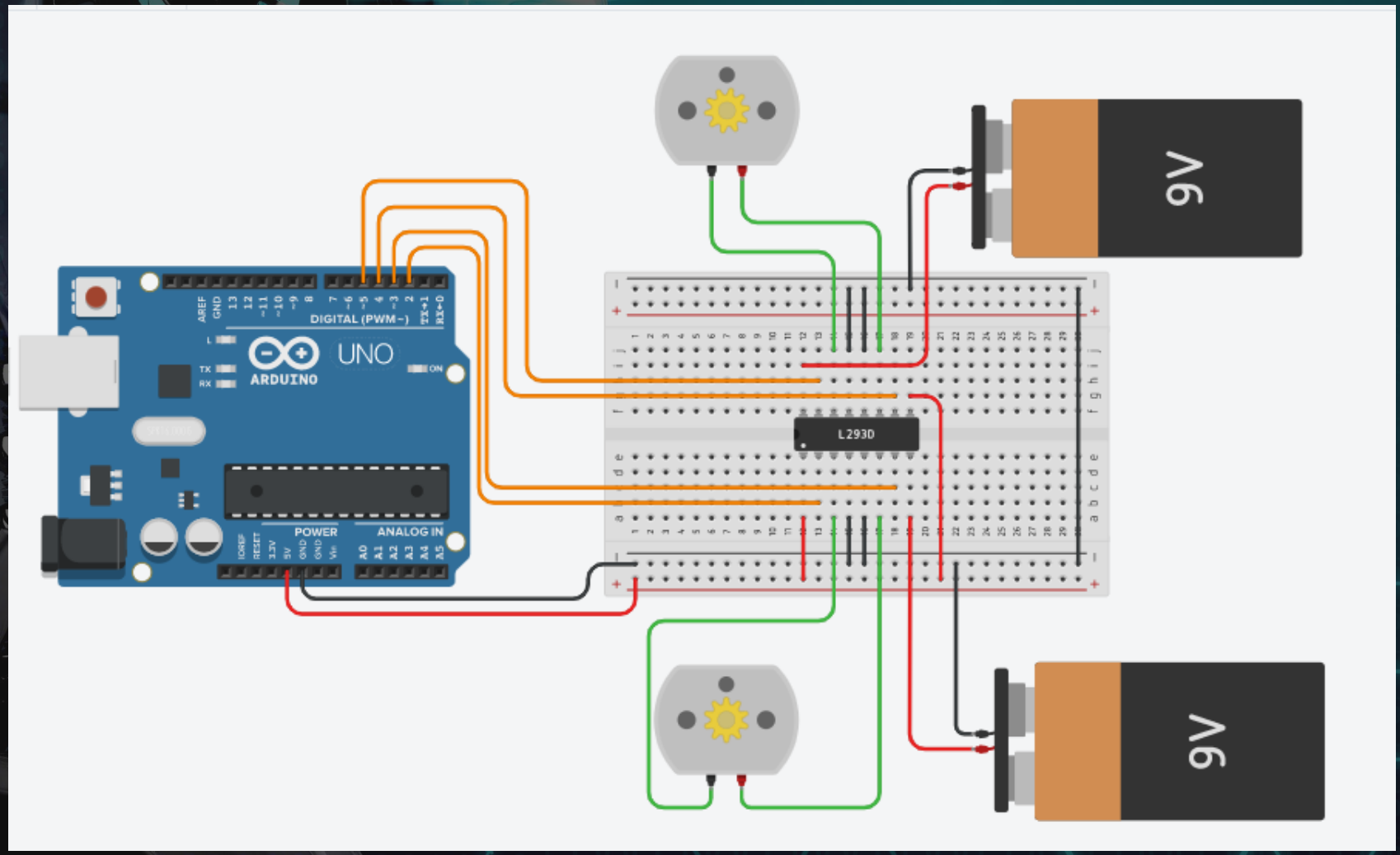
- What are Drivers?

Motor driver is a chip that makes the motor move as per the given instructions or the inputs (high and low). It listens to the low voltage from the controller/processor and control an actual motor which needs high input voltage. a motor driver IC controls the direction of the motor based on the commands or instructions it receives from the controller.
and H-bridge is used in the L293D motor driver .

- L293D Driver



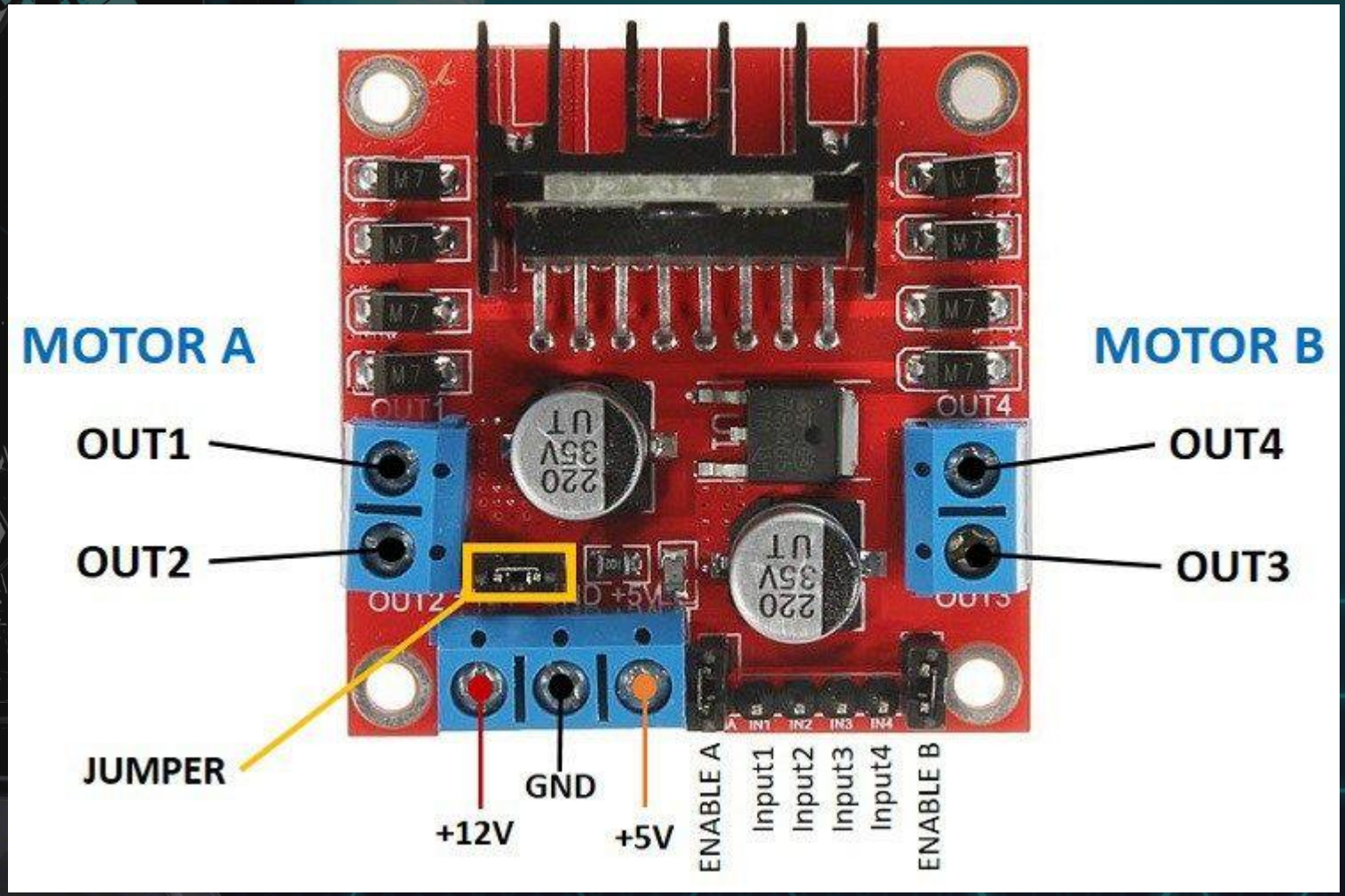
- L293D Driver Connection



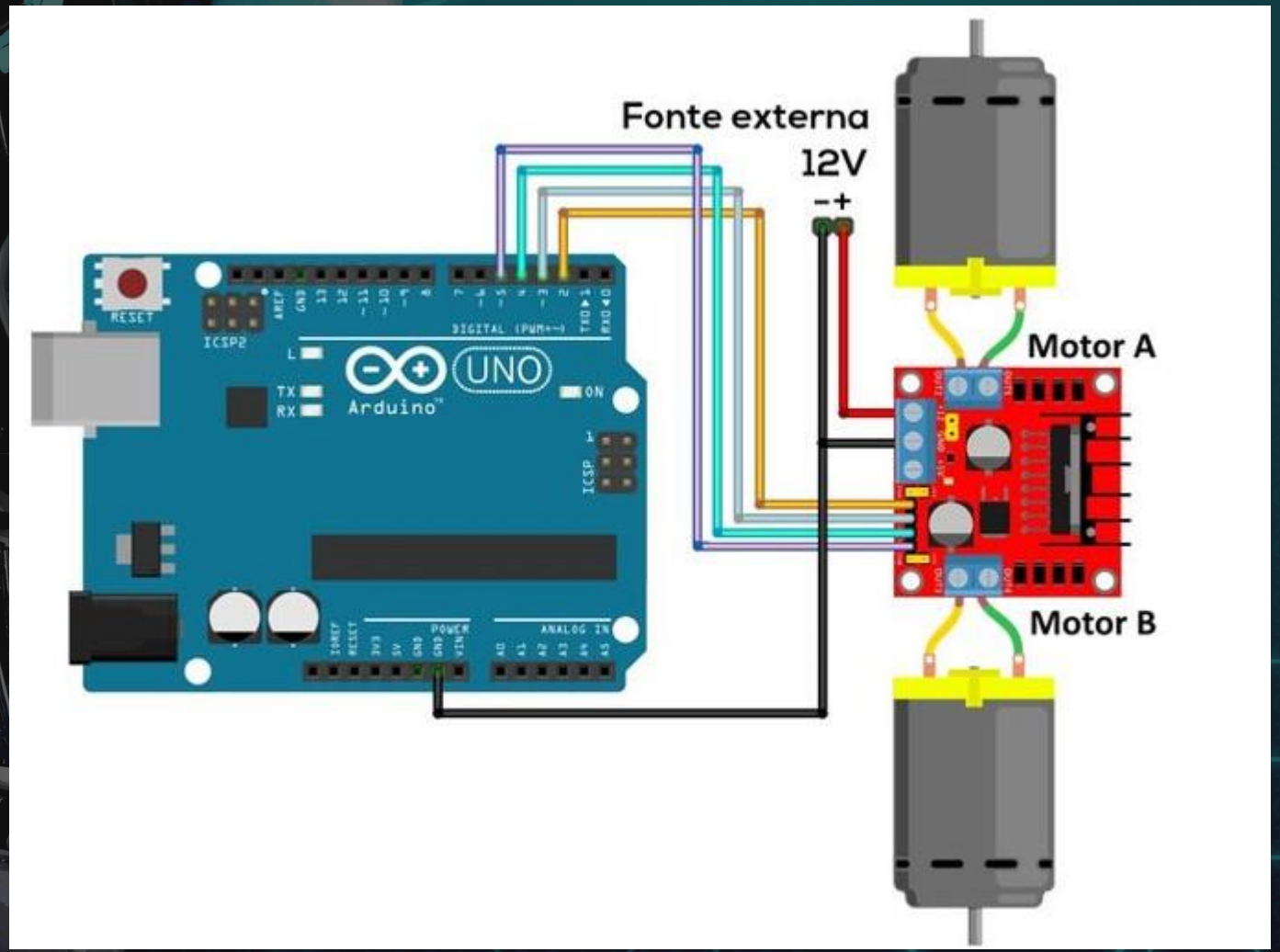
- L293D Driver Code

```
  int m1_in_1 =2 ;
  int m1_in_2 =3 ;
  int m2_in_3 =4 ;
  int m2_in_4 =5 ;
void setup() {
pinMode(m1_in_1,OUTPUT);
pinMode(m1_in_2,OUTPUT);
pinMode(m2_in_3,OUTPUT);
pinMode(m2_in_4,OUTPUT);
}
void loop()
{
    digitalWrite( m1_in_1,HIGH) ;
    digitalWrite( m1_in_2,LOW) ;
    digitalWrite( m2_in_3,HIGH) ;
    digitalWrite( m2_in_4,LOW) ;
    delay(1000);
    digitalWrite( m1_in_1,LOW) ;
    digitalWrite( m1_in_2,HIGH) ;
    digitalWrite( m2_in_3,LOW) ;
    digitalWrite( m2_in_4,HIGH) ;
}
```

- L298n driver



- L298n driver connection



• L298n driver code

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```
int motor1pin1 = 2;
int motor1pin2 = 3;

int motor2pin1 = 4;
int motor2pin2 = 5;

void setup() {
  // put your setup code here, to run once:
  pinMode(motor1pin1, OUTPUT);
  pinMode(motor1pin2, OUTPUT);
  pinMode(motor2pin1, OUTPUT);
  pinMode(motor2pin2, OUTPUT);
}
```

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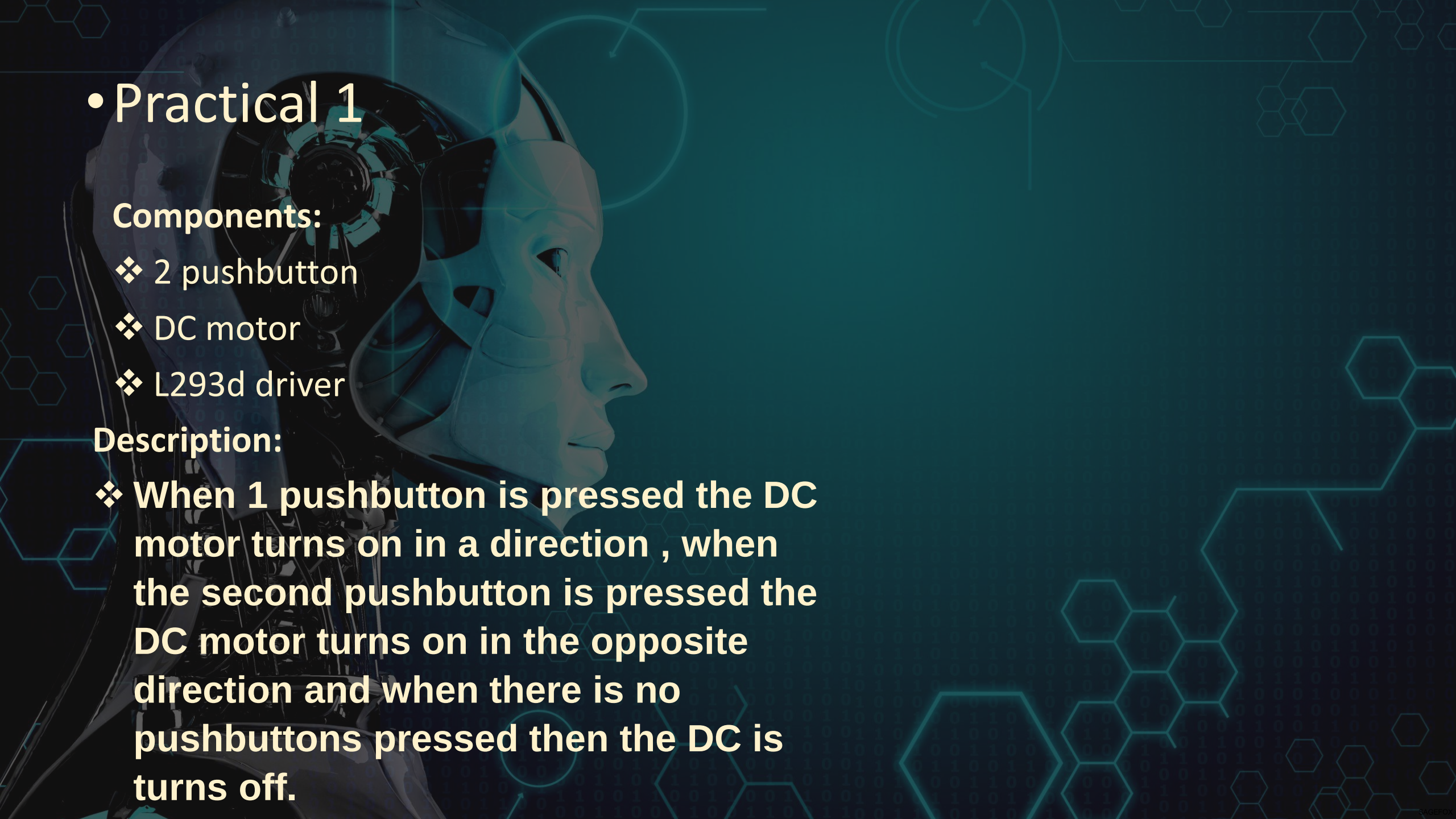
```
void loop() {
  // put your main code here, to run repeatedly:
  digitalWrite(motor1pin1, HIGH);
  digitalWrite(motor1pin2, LOW);

  digitalWrite(motor2pin1, HIGH);
  digitalWrite(motor2pin2, LOW);
  delay(1000);

  digitalWrite(motor1pin1, LOW);
  digitalWrite(motor1pin2, HIGH);

  digitalWrite(motor2pin1, LOW);
  digitalWrite(motor2pin2, HIGH);
  delay(1000);
}
```



- Practical 1

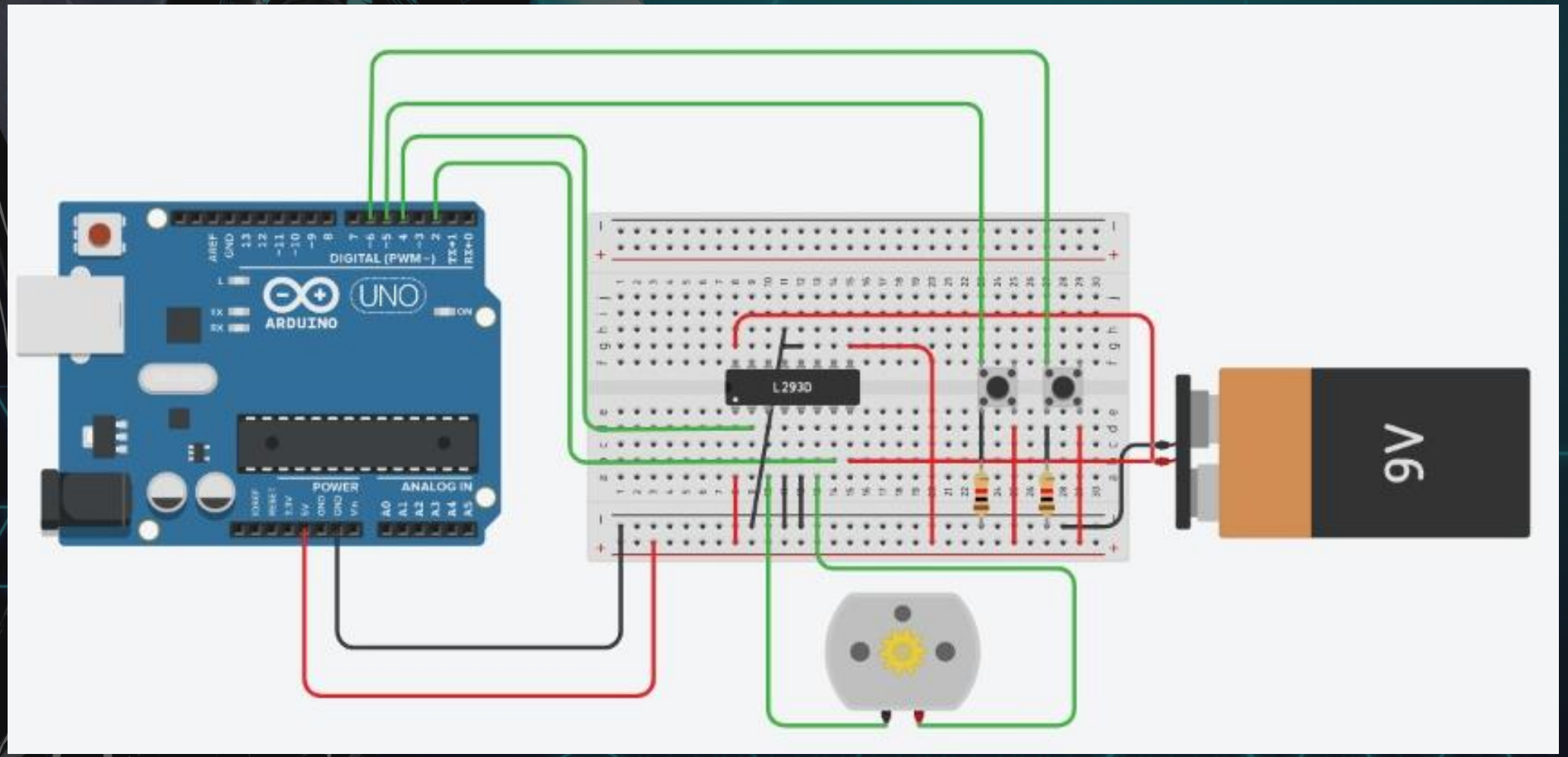
Components:

- ❖ 2 pushbutton
- ❖ DC motor
- ❖ L293d driver

Description:

- ❖ **When 1 pushbutton is pressed the DC motor turns on in a direction , when the second pushbutton is pressed the DC motor turns on in the opposite direction and when there is no pushbuttons pressed then the DC is turns off.**

- Practical 1 solution



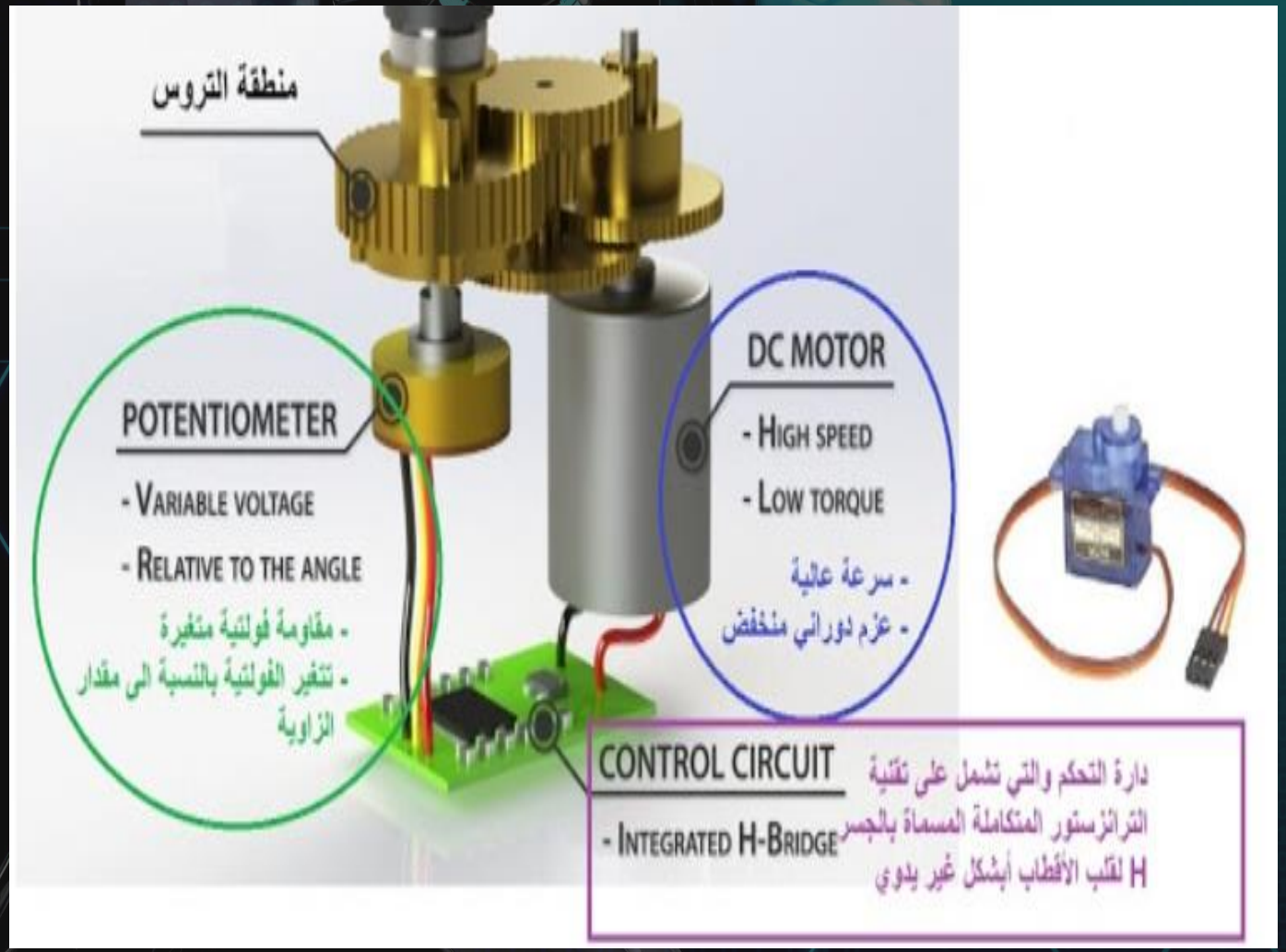
- Practical 1 solution

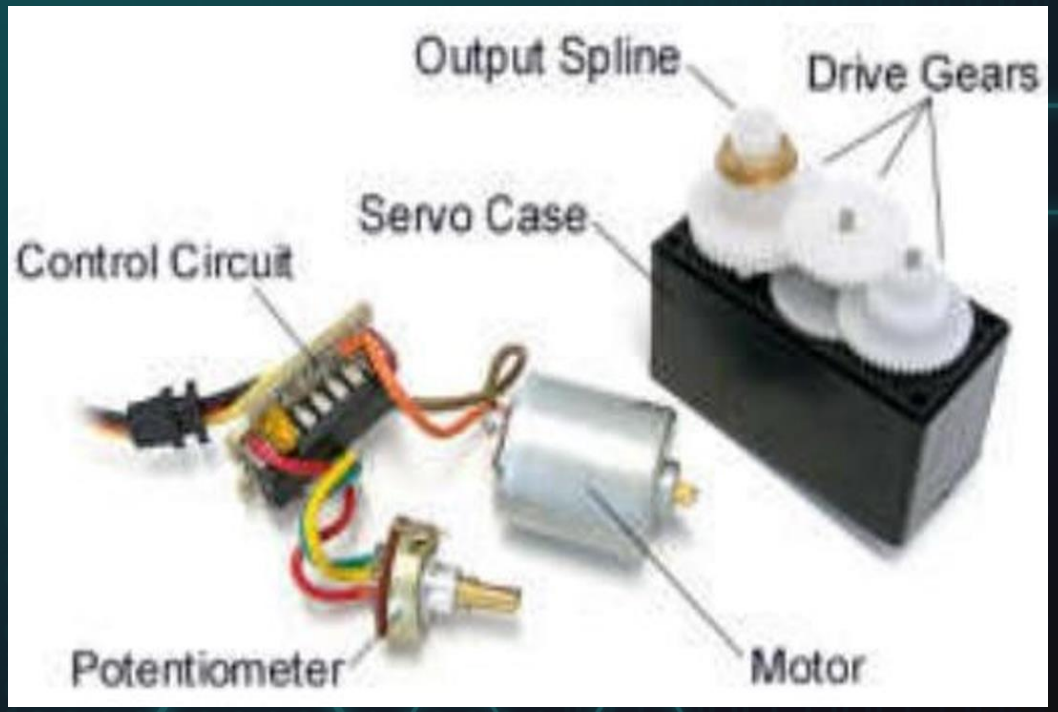
```
int motor1 = 7 ;
int motor2 = 6 ;
int push1 = 2 ;
int push2 = 3 ;

void setup() {
  // put your setup code
pinMode(push1,INPUT);
pinMode(push2 , INPUT);
pinMode(motor1,OUTPUT);
pinMode(motor2,OUTPUT);
}
```

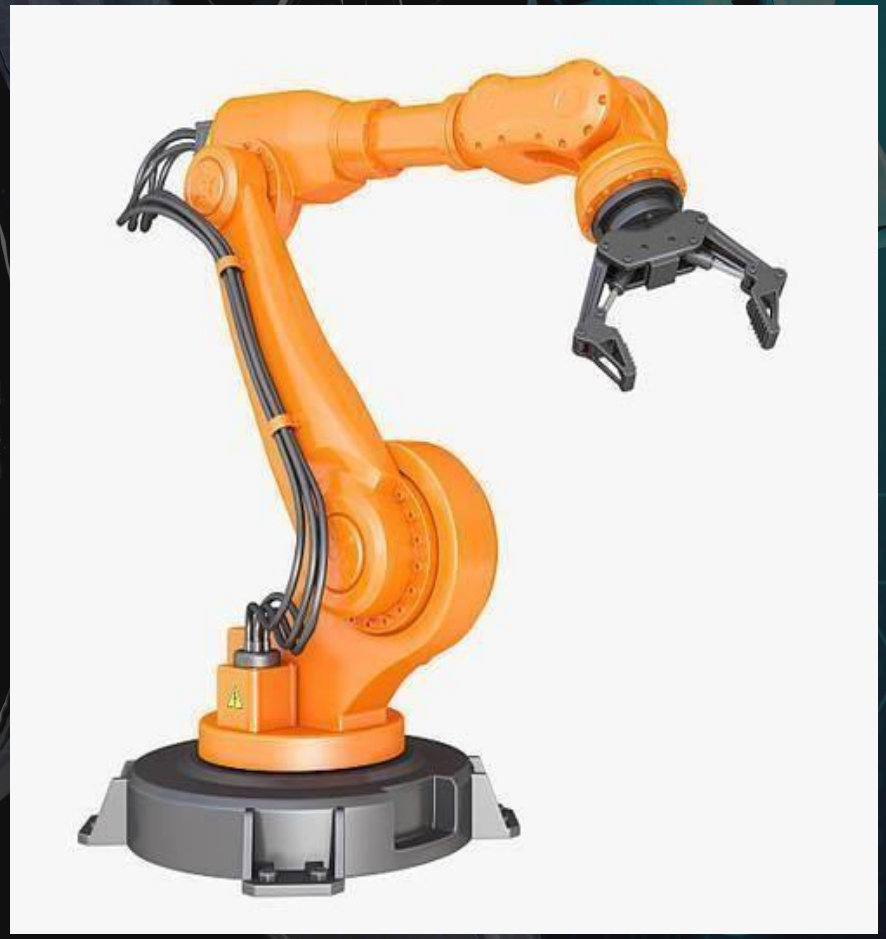
```
void loop() {
  // put your main code here, to run repeatedly:
  int val1= digitalRead(push1);
  int val2 = digitalRead(push2);
  if (val1 == 1)
  {
    digitalWrite(motor1,LOW);
    digitalWrite(motor2,HIGH);
  }
  else if (val2 == 1)
  {
    digitalWrite(motor1,HIGH);
    digitalWrite(motor2,LOW);
  }
  else
  {
   digitalWrite(motor1,LOW);
   digitalWrite(motor2,LOW);
  }
 }
```

- Servo motor

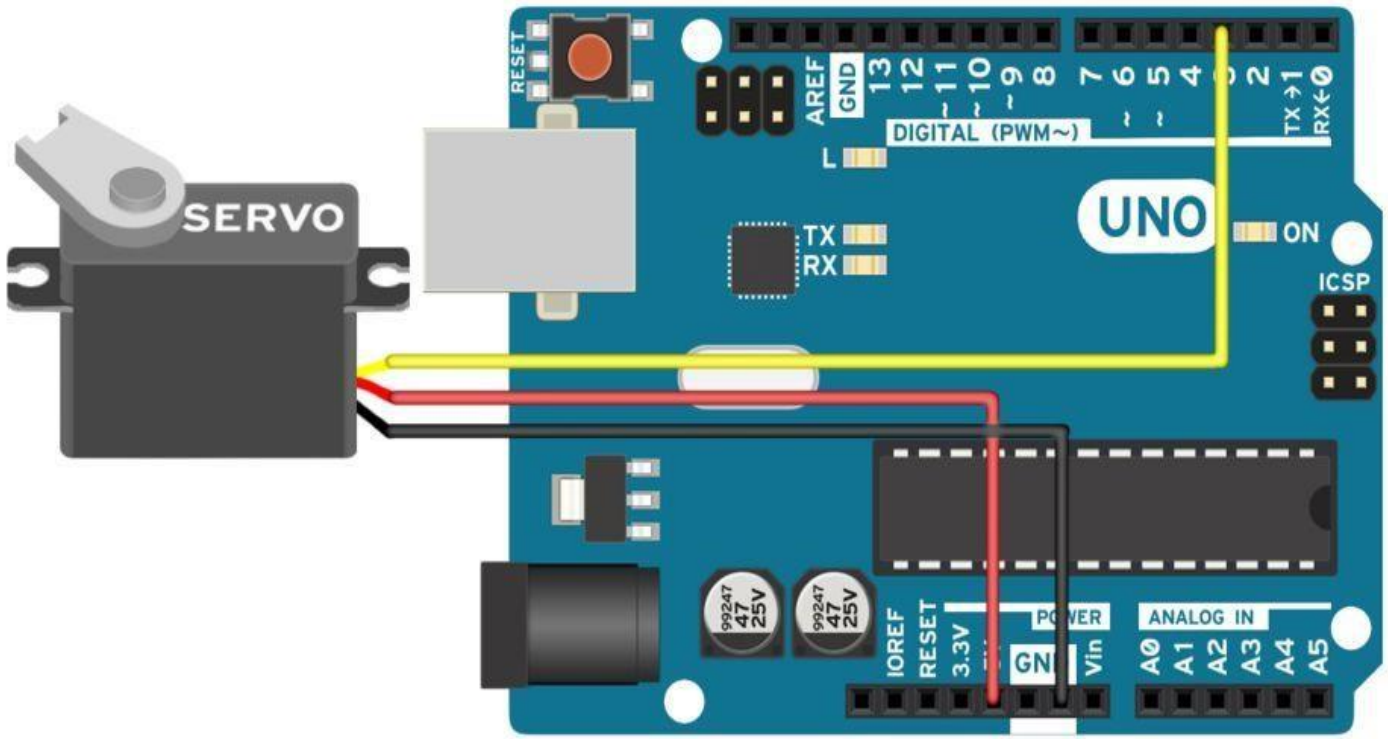

منطقة التروس
POTENTIOMETER
- VARIABLE VOLTAGE
- RELATIVE TO THE ANGLE
- مقاومة فولتية متغيرة
- تتغير الفولتية بالنسبة الى مقدار الزاوية
DC MOTOR
- HIGH SPEED
- LOW TORQUE
- سرعة عالية
- عزم دوراني منخفض
CONTROL CIRCUIT
- INTEGRATED H-BRIDGE
دارة التحكم والتي تشمل على تقنية الترانزستور المتكاملة المسماة بالجسر H لقلب الأقطاب أبشكل غير يدوي


Output Spline
Drive Gears
Servo Case
Control Circuit
Potentiometer
Motor

- Robotic arm

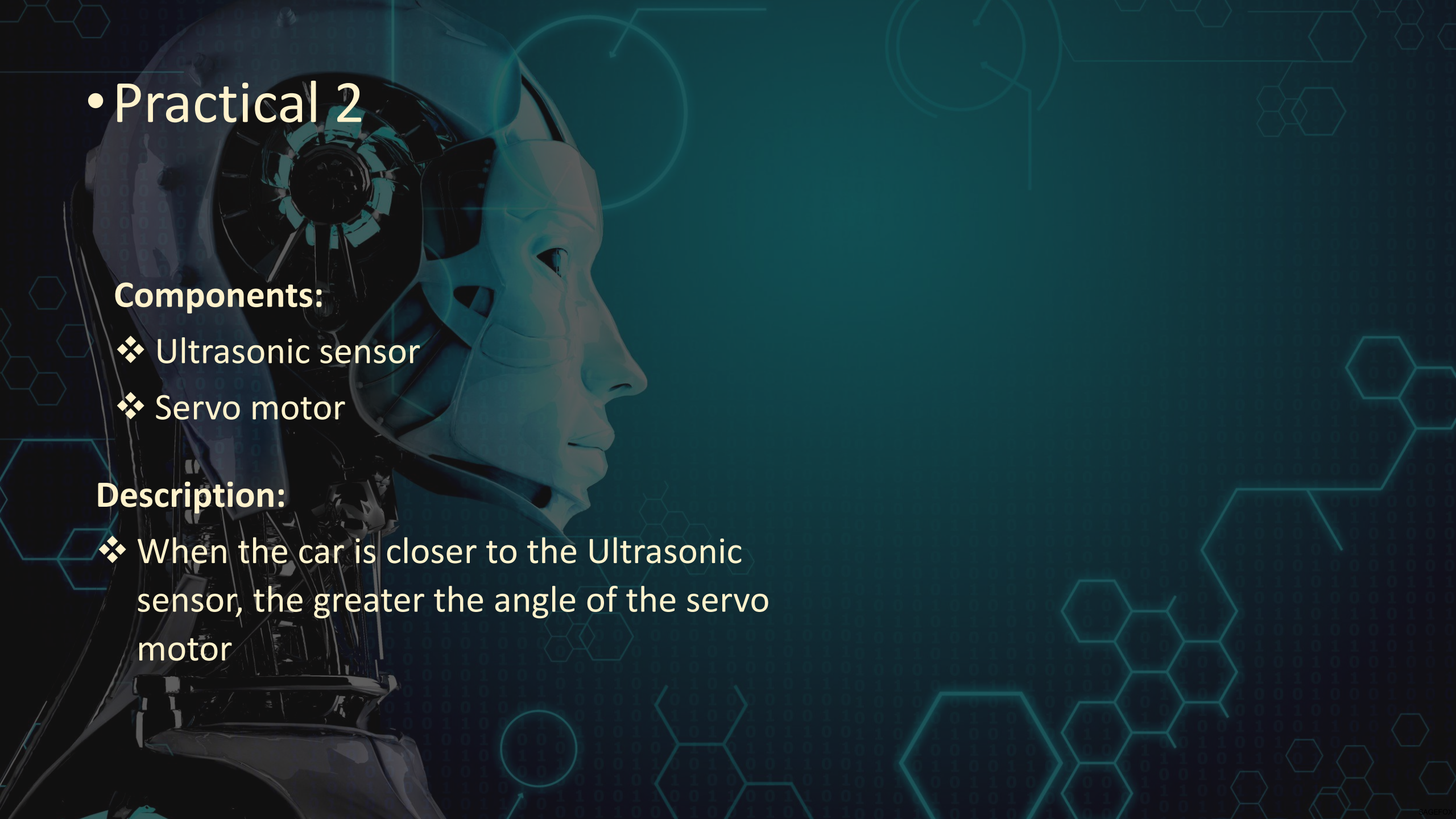


- Servo motor connection and code




```
#include <Servo.h>
Servo myServo;
void setup() {
  myServo.attach(3);
}

void loop() {
  myServo.write(0);
  delay(100);
  myServo.write(45);
  delay(100);
  myServo.write(90);
  delay(100);
  myServo.write(180);
  delay(100);
}
```



- Practical 2

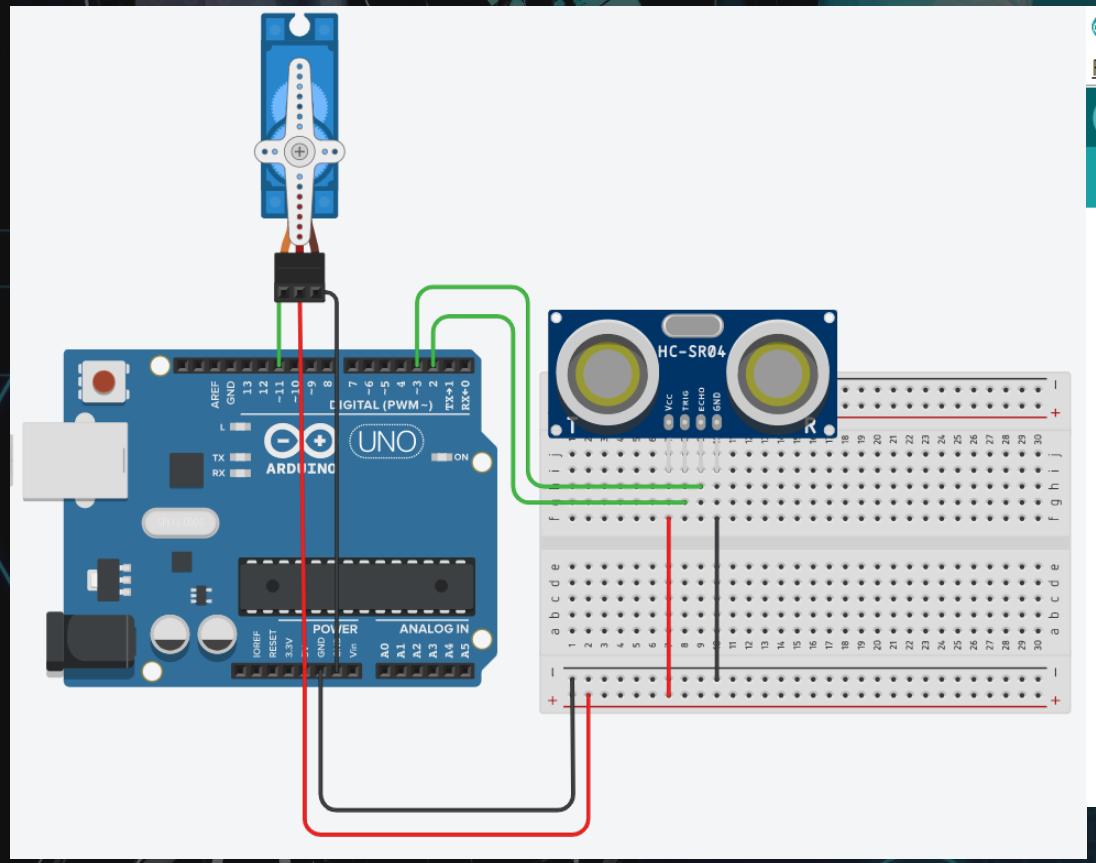
Components:

- ❖ Ultrasonic sensor
- ❖ Servo motor

Description:

- ❖ When the car is closer to the Ultrasonic sensor, the greater the angle of the servo motor

- Practical 2 Solution



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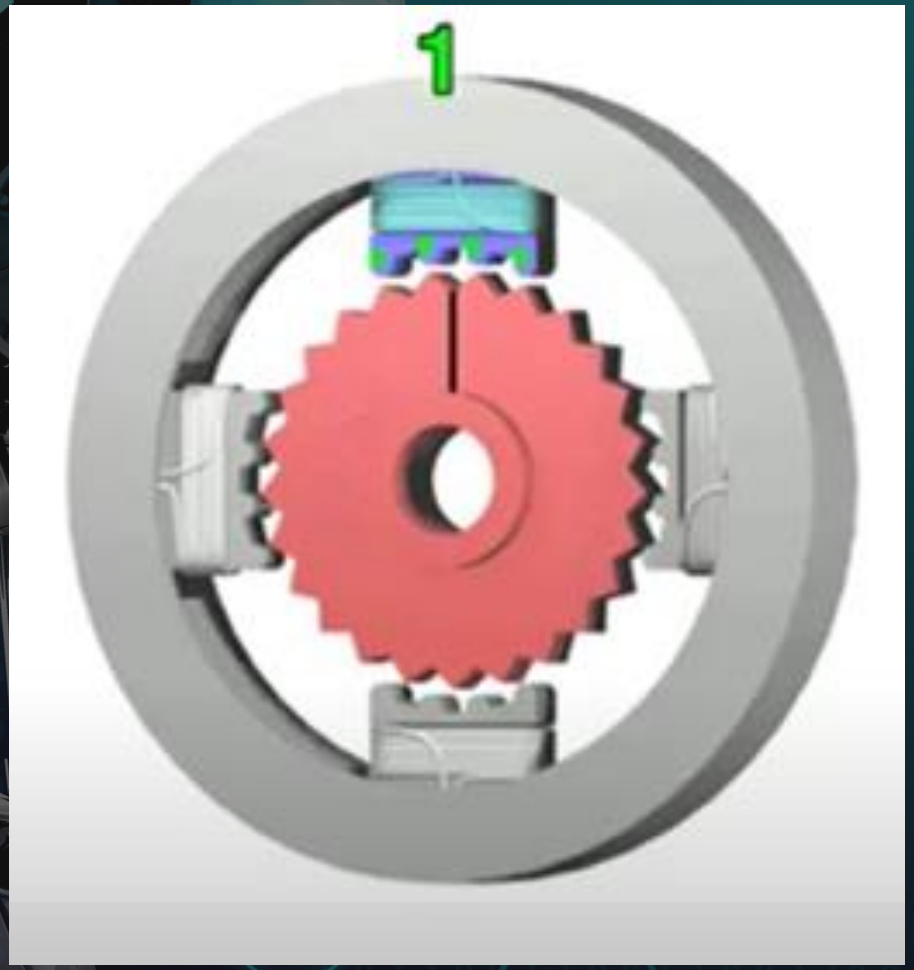
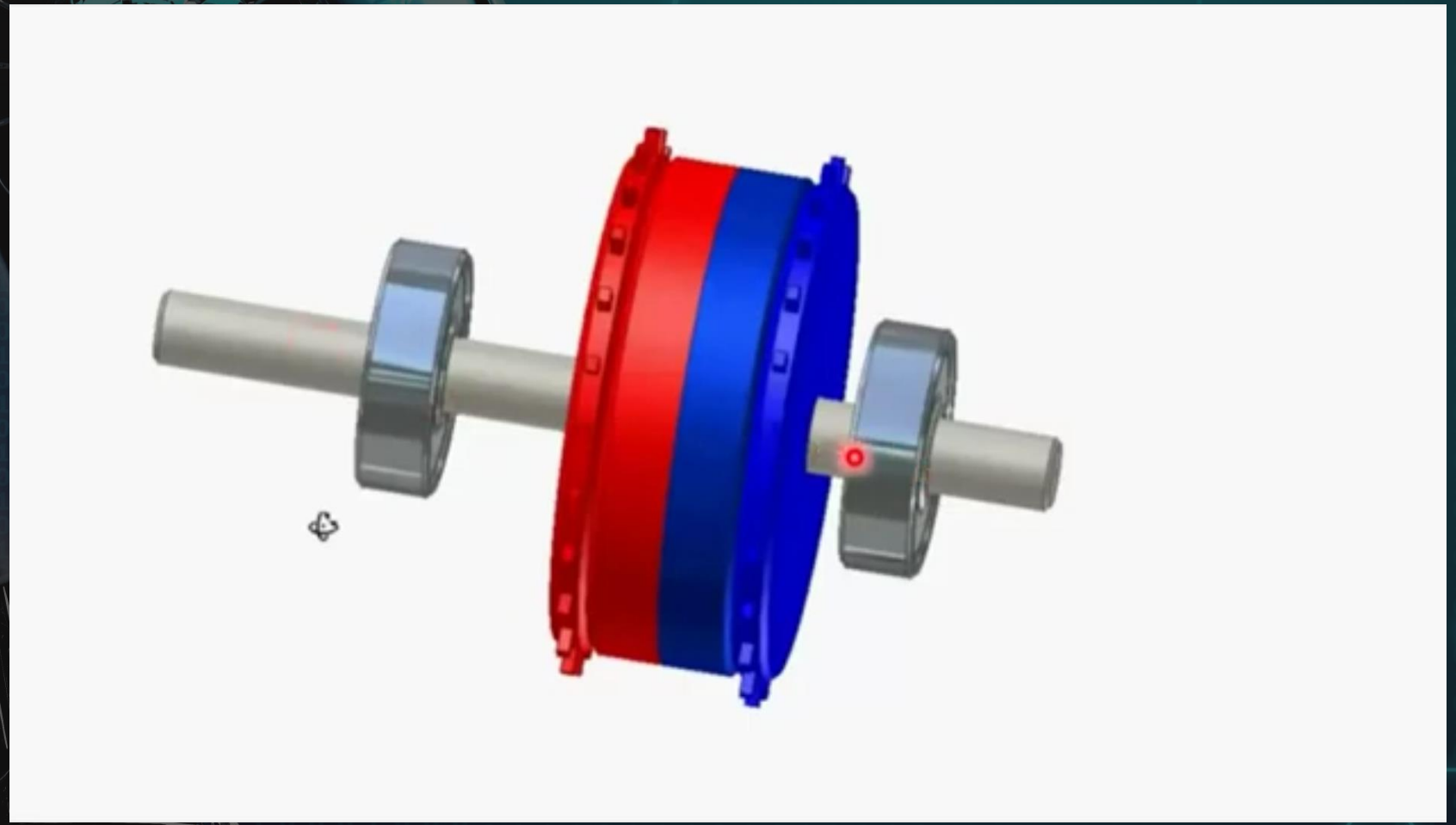
sketch_aug01a §

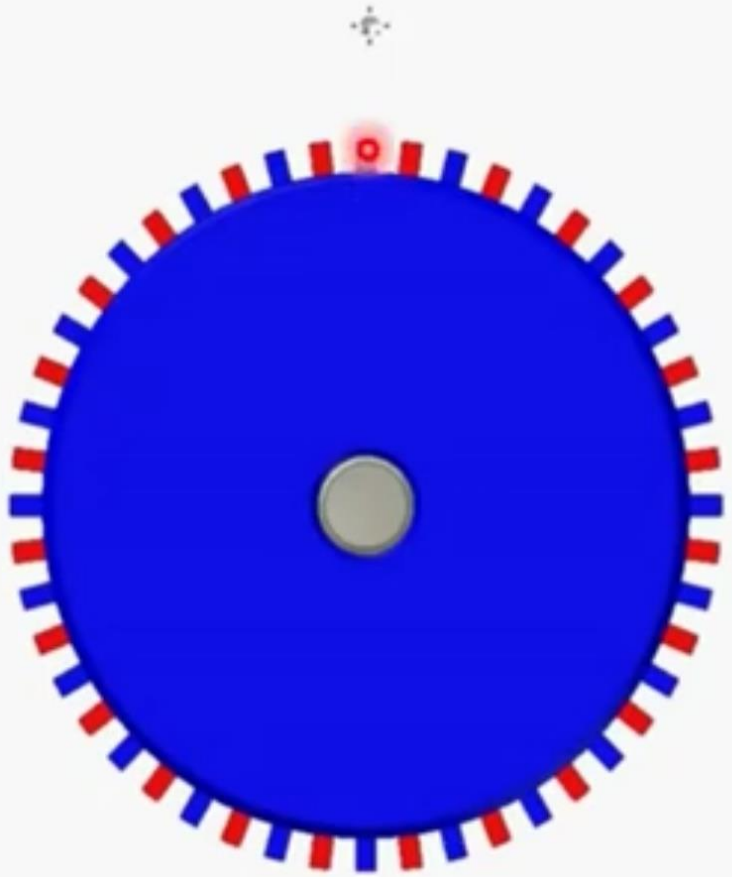
```
#include<Servo.h>
Servo myServo;
int trig=2;
int echo=3;
void setup()
{
  pinMode(trig,OUTPUT);
  pinMode(echo,INPUT);
  myServo.attach(11);
  myServo.write(0);
}
```

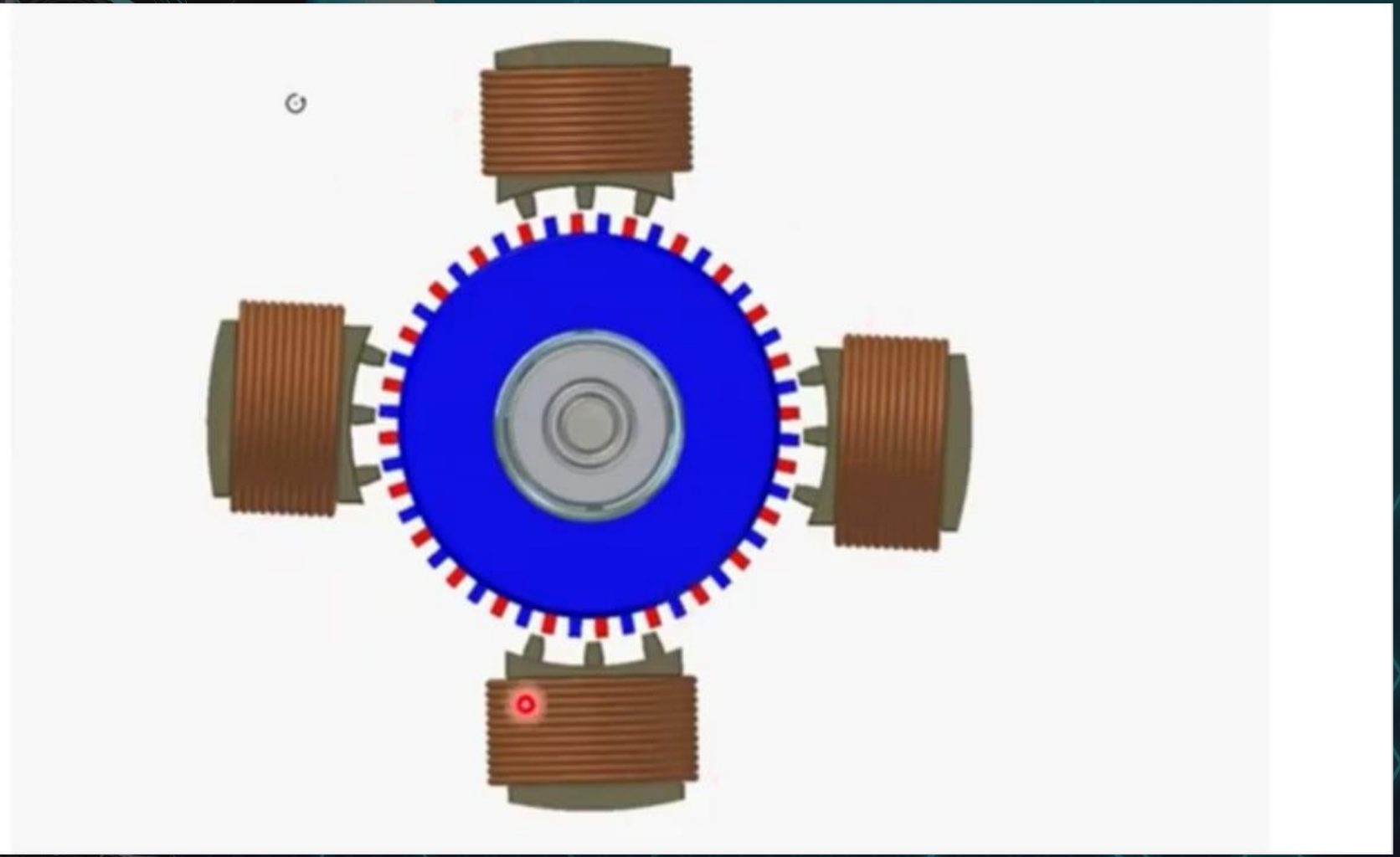
```
void loop()
{
  digitalWrite(trig,LOW);
  delayMicroseconds(5);
  digitalWrite(trig,HIGH);
  delayMicroseconds(5);
  digitalWrite(trig,LOW);
  float duration=pulseIn(echo,HIGH);
  float dis=duration/29/2;
  int mapvalue= map(dis,3,400,0,360);

   myServo.write(mapvalue);
  delay(200);

}
```

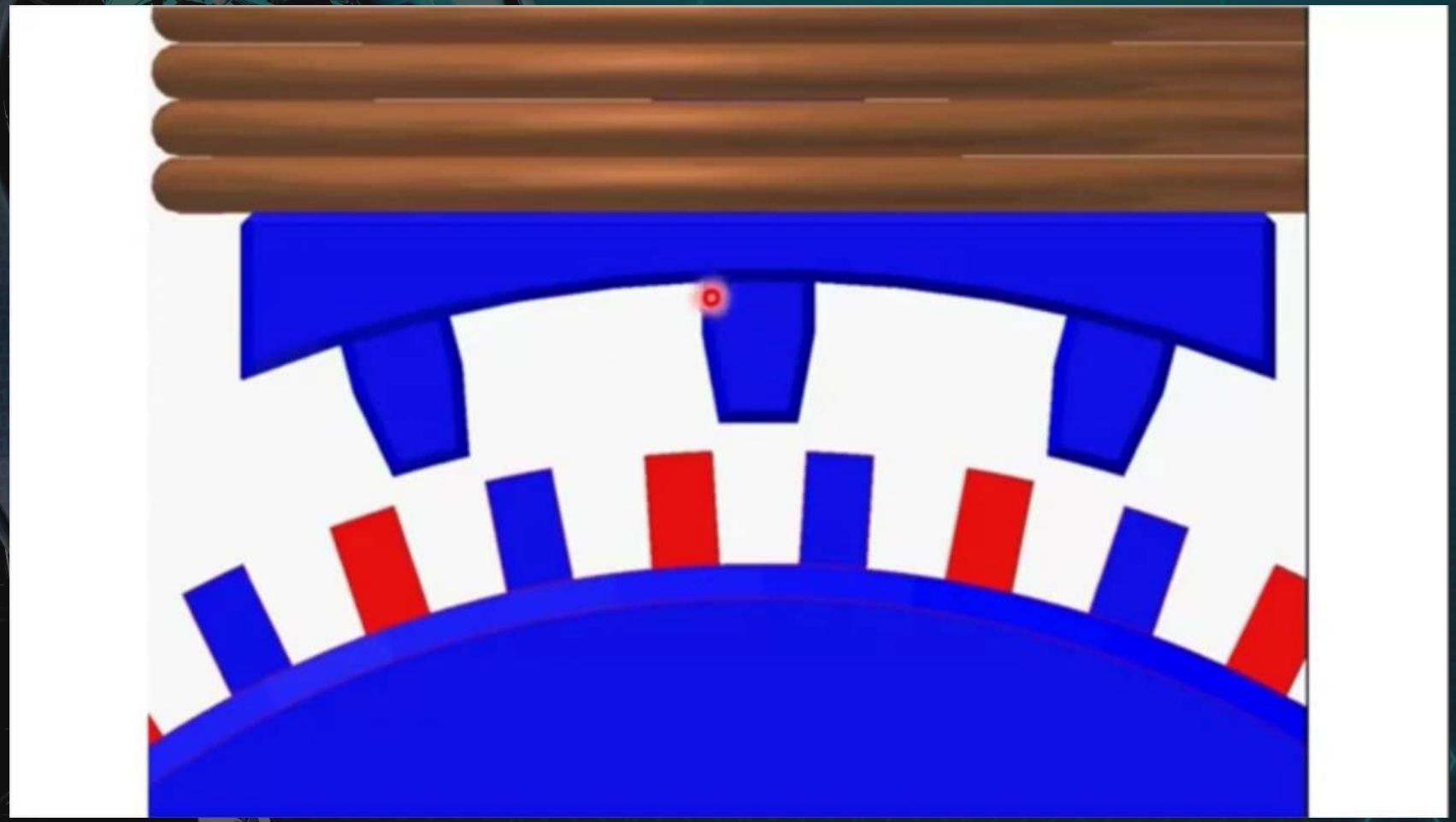
- Stepper motor mechanism

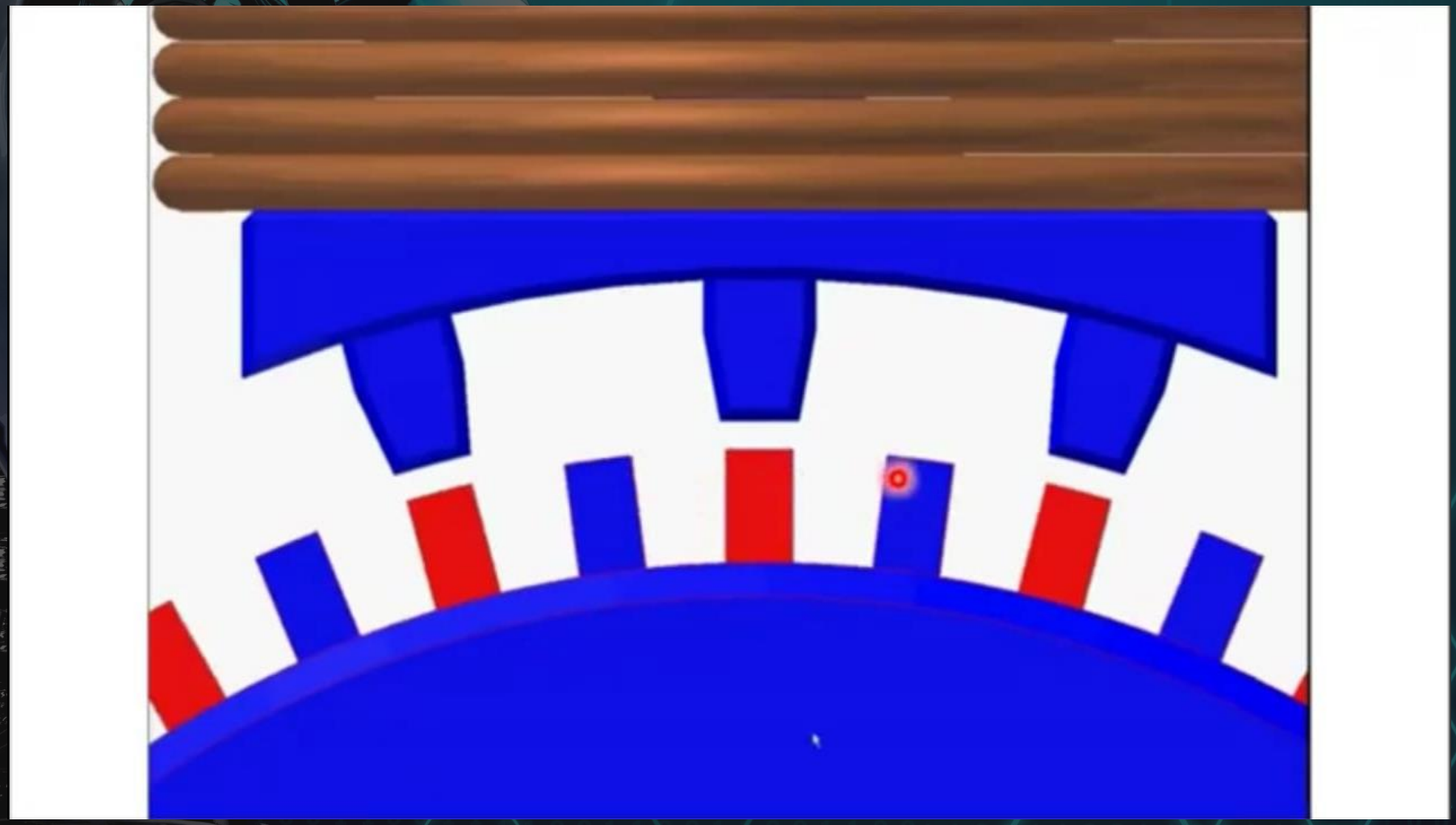








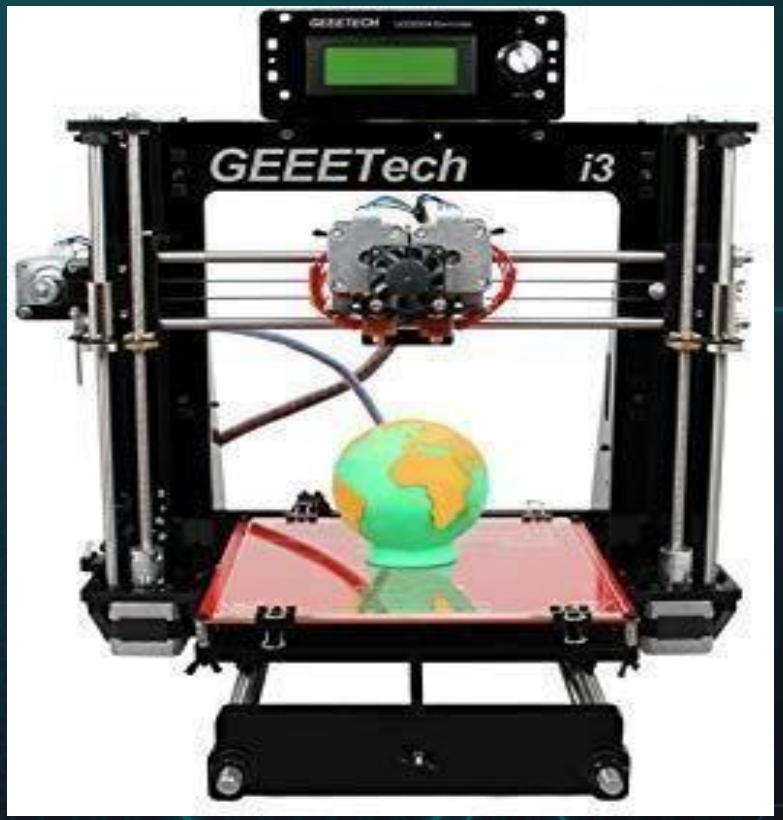




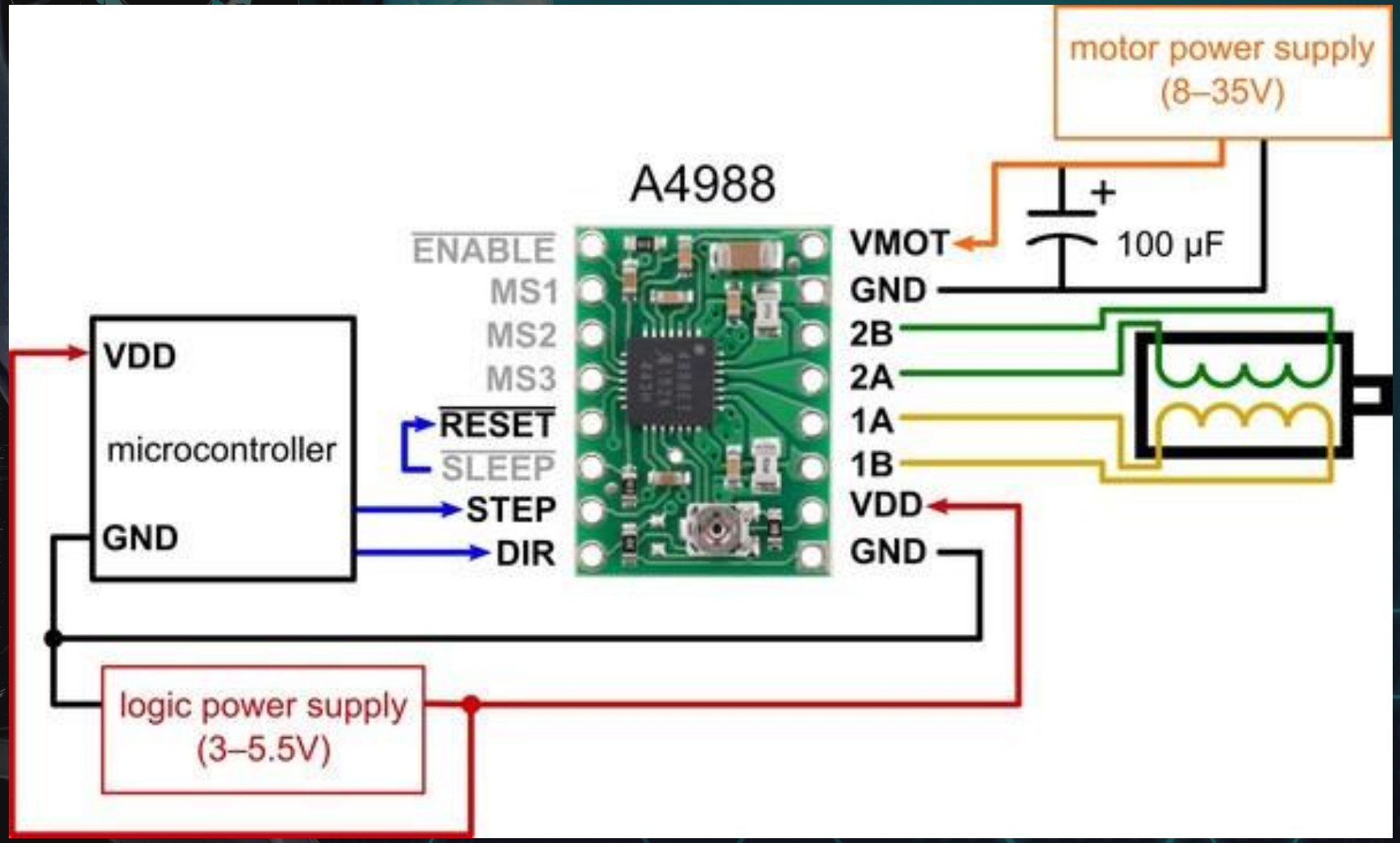
- Stepper Motor Application

❖CNC

❖3D Printer



- A4988 driver



- A4988 driver code

```
const int stepPin = 3;
const int dirPin = 4;

void setup() {
  // Sets the two pins as Outputs
  pinMode(stepPin,OUTPUT);
  pinMode(dirPin,OUTPUT);
}
void loop() {
  digitalWrite(dirPin,HIGH); // Enables the motor to move in a particular direction
  // Makes 200 pulses for making one full cycle rotation
  for(int x = 0; x < 200; x++) {
    digitalWrite(stepPin,HIGH);
    delayMicroseconds(500);
    digitalWrite(stepPin,LOW);
    delayMicroseconds(500);
  }
  delay(1000); // One second delay

  digitalWrite(dirPin,LOW); //Changes the rotations direction
  // Makes 400 pulses for making two full cycle rotation
  for(int x = 0; x < 400; x++) {
    digitalWrite(stepPin,HIGH);
    delayMicroseconds(500);
```

• Difference Between types of motors

DC motor	Servo motor	Stepper motor
DC motors are fast and continuous rotation motors mainly used for anything that needs to rotate at a high rotation per minute (RPM). For instance; car wheels, fans etc.	Servo motors are high torque, fast, accurate rotation in a limited angle. Generally, a high-performance alternative to stepper motors, but more complicated setup with PWM tuning. Suited for robotic arms/legs or rudder control etc.	Stepper motors are slow, easy setup, precise rotation, and control – Advantage over other motors like servo motors in controlling of a position. Where these motors require a feedback mechanism and backing circuitry to drive locating, this motor has positional control through its nature of rotation by fractional additions. Suitable for 3D printers and related devices where the position is essential.

- The End

THANK YOU