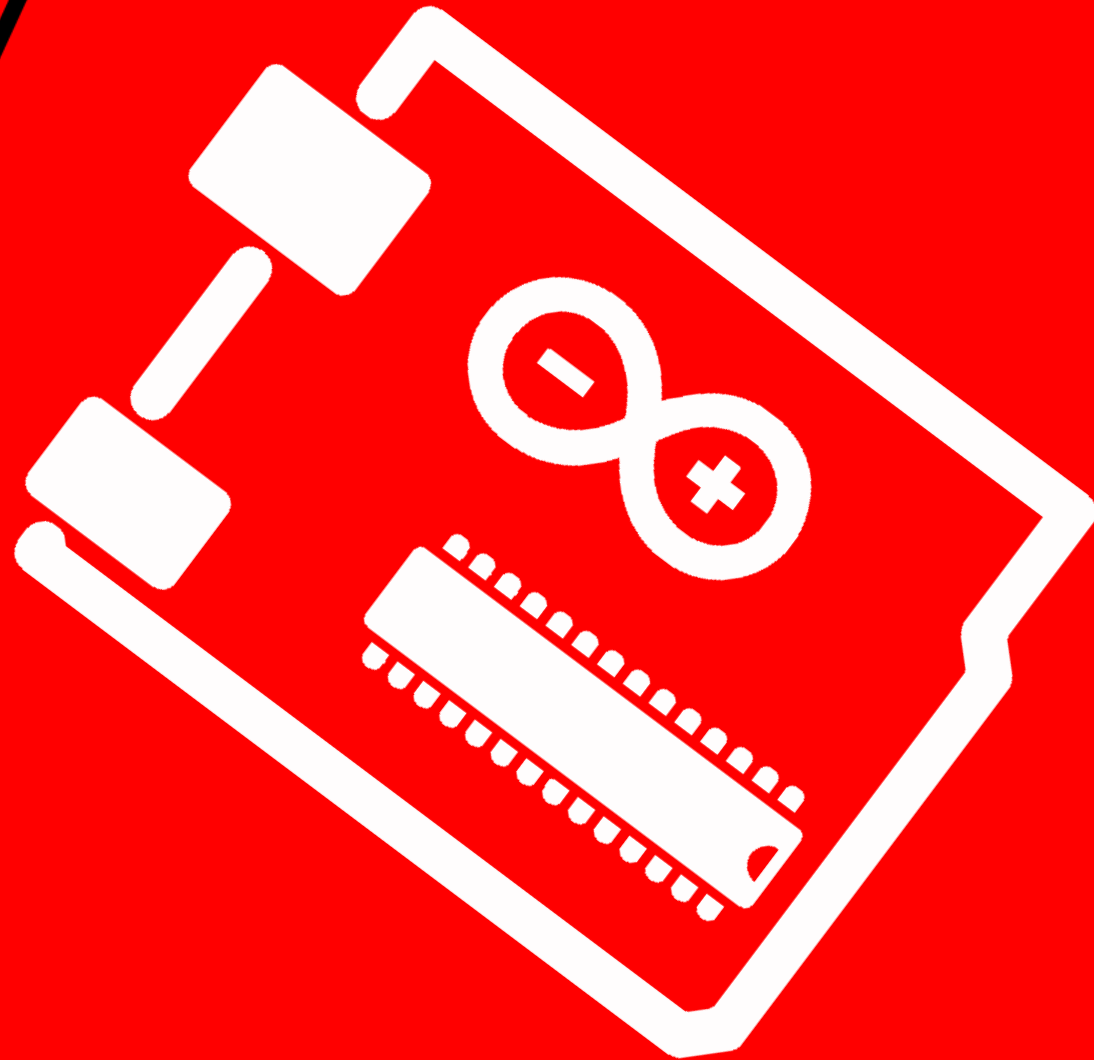




Robotics Club - Workshop 1



Robotics Club - Workshop 1



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- 2. Introduction to Arduino**
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- 4. Components of Arduino**
- 5. Sensors and Actuators**
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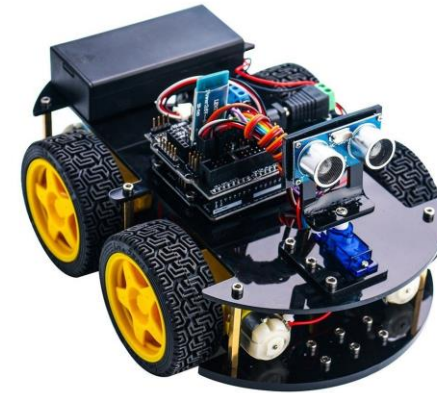
1. What is a Robot?



Humanoid Robot



Stationary Robot



Mobile Robot



1. What is a Robot?



Environmental



Sensor



Controller



Actuator





2. Introduction to Arduino

- **What is Arduino?**

Arduino is an open-source platform used for building electronics projects. It consists of both a programmable circuit board (microcontroller) and software (Arduino IDE) to program it.





2. Introduction to Arduino

- **Why Learn Arduino?**

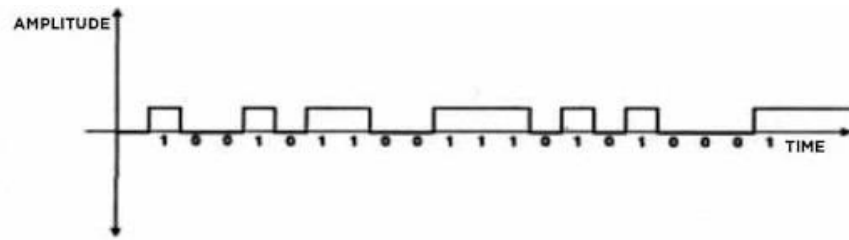
Arduino makes electronics easy to learn because it allows users to control hardware with simple code. It's widely used in DIY projects, education, and even in professional prototyping.



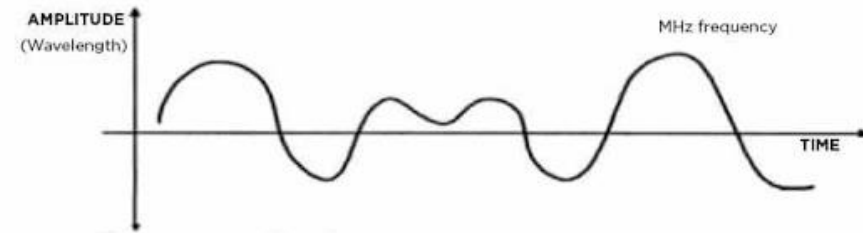


3. Digital vs Analog

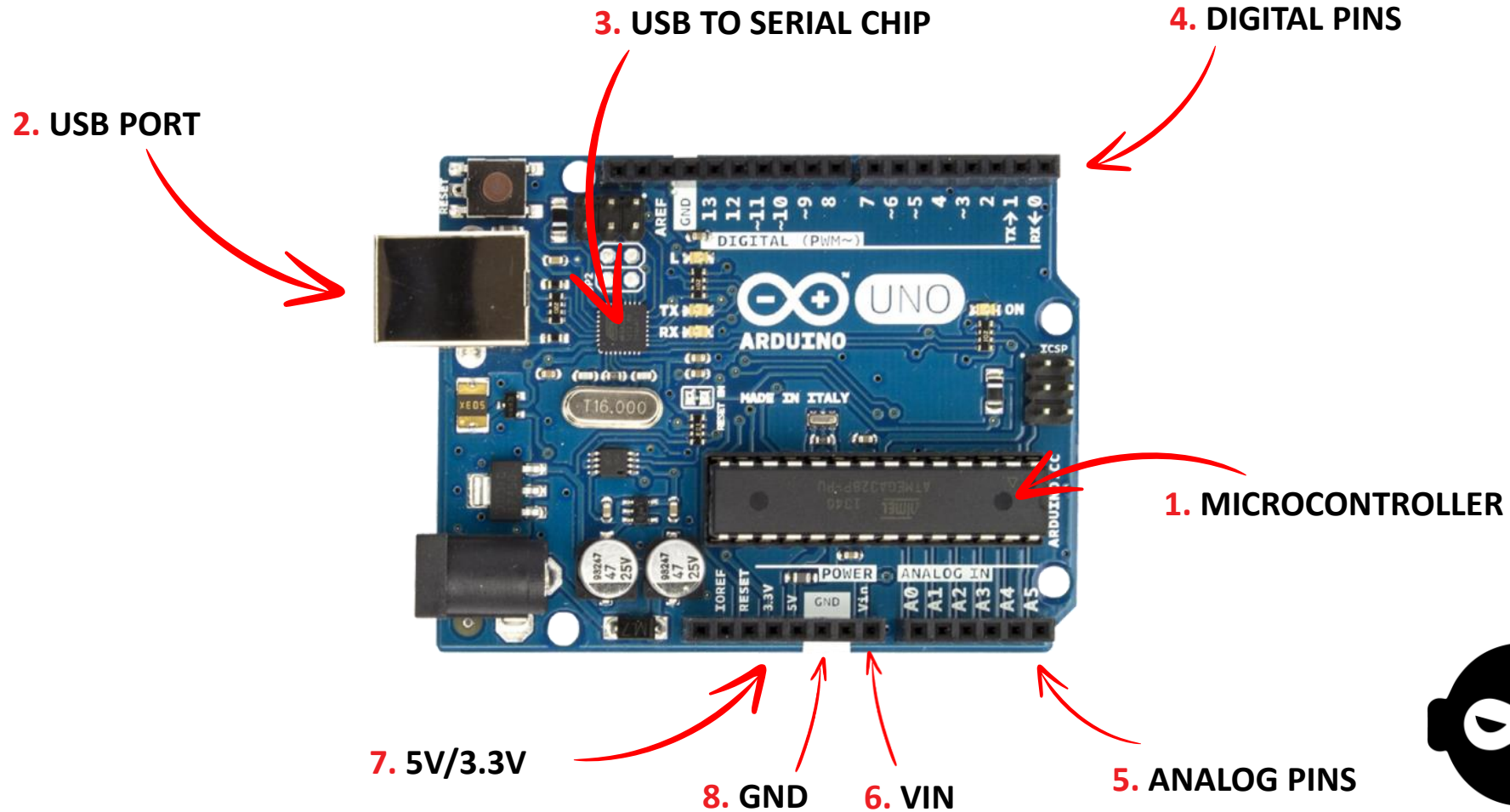
Digital Signal



Analog Signal



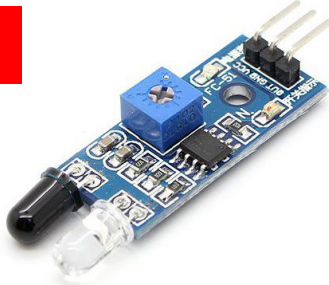
4. Components of Arduino



5. Sensors and Actuators

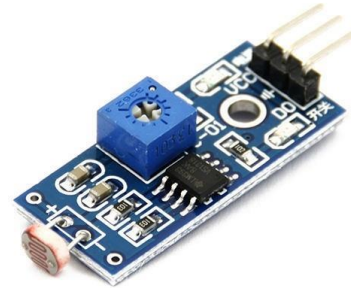


1



IR (InfraRed) Sensor

2



LDR (Light Dependent Resistor) Sensor

3



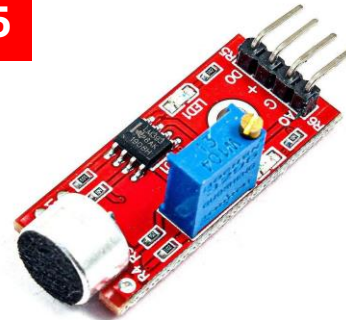
Touch Sensor

4



Ultrasonic Sensor

5



Sound Sensor

6



Joystick Module





6. Setting Up First Project

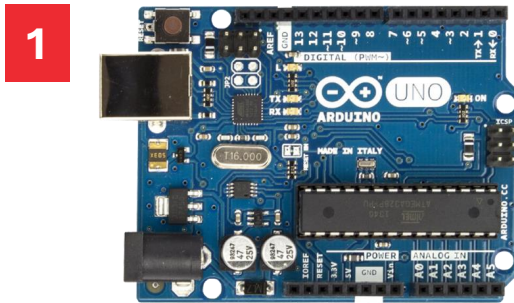
- **Step 1: Understanding the Components**
- **Step 2: Circuit Setup**
- **Step 3: Code**
- **Step 4: Upload the Code**



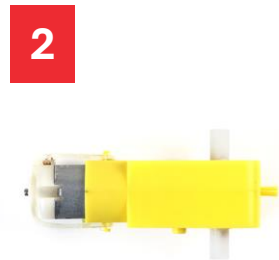
6. Setting Up First Project



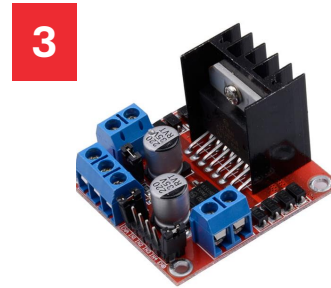
▪ Step 1: Understanding the Components



Arduino board



DC Motor



L298N Motor Driver Module



Jumper wires



USB cable



Mobile Robot Chassis Kit



Battery

6. Setting Up First Project



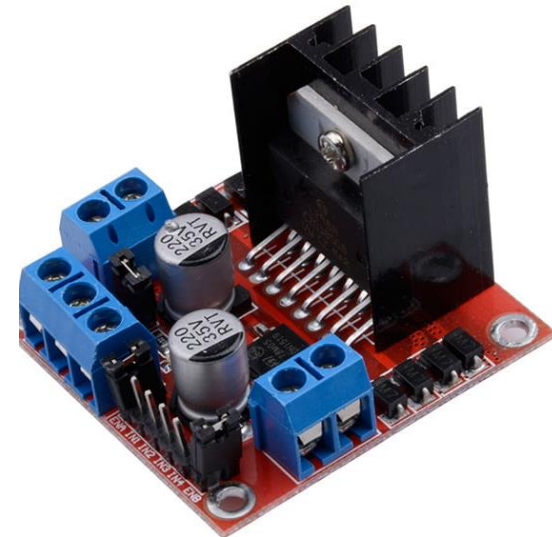
- **Step 1: Understanding the Components**

1. Why Motor Driver Module?

A **Motor Driver** is an electronic component that controls the operation of DC motors, allowing you to **control the speed and direction** of the motors using a low-power microcontroller, like an Arduino.

The **L298N** is a dual **H-Bridge motor driver**.

An H-Bridge is a circuit that allows you to control the direction of a DC motor.



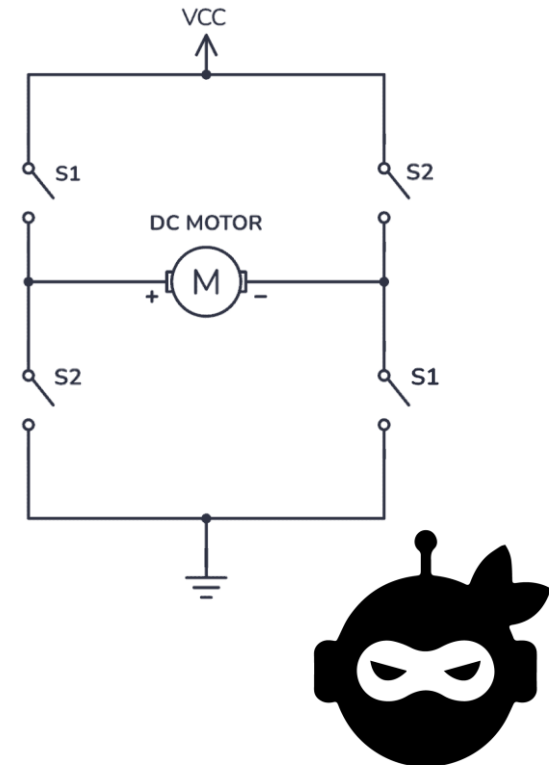


6. Setting Up First Project

- **Step 1: Understanding the Components**

H-Bridge DC Motor Control

For controlling the rotation direction, **we just need to inverse the direction of the current flow through the motor**, and the most common method of doing that is by using an H-Bridge. An H-Bridge circuit contains four switching elements, transistors or MOSFETs, with the motor at the center forming an H-like configuration. By activating two particular switches at the same time we can change the direction of the current flow, thus change the rotation direction of the motor.



6. Setting Up First Project

▪ Step 1: Understanding the Components

2. Pins and Connections of L298N

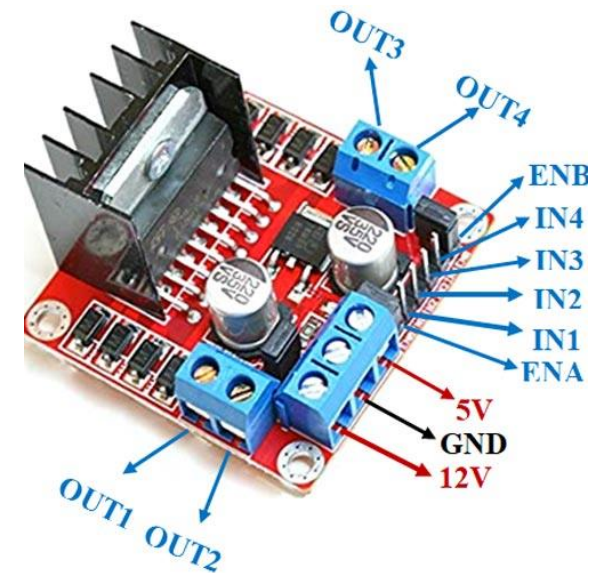
[1] Input Control Pins:

[A] IN1 and IN2 (for Motor 1)

[B] IN3 and IN4 (for Motor 2)

Role: Control the direction of Motor 1 / Motor 2 (forward/reverse).

Depending on the **HIGH/LOW** combination of **IN1**, **IN2**, **IN3** and **IN4**, **Motor 1** / **Motor 2** can move forward or backward.



6. Setting Up First Project

▪ Step 1: Understanding the Components

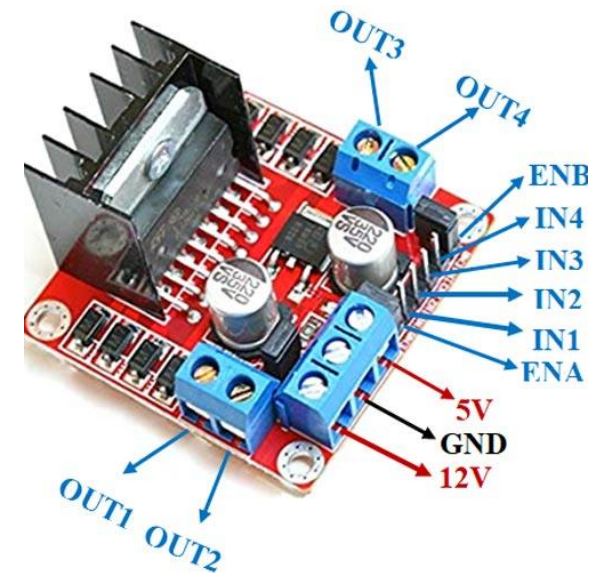
2. Pins and Connections of L298N

[2] Enable Pins (Speed Control):

These pins control the speed of the motors using **PWM signals** from the Arduino.

[A] ENA (Enable A): This pin enables or disables Motor 1. By connecting it to a PWM pin on the Arduino and using **analogWrite()**, you can control the speed of Motor 1.

[B] ENB (Enable B): This pin enables or disables Motor 2. It can also be connected to a PWM pin to control Motor 2's speed.



6. Setting Up First Project

- **Step 1: Understanding the Components**

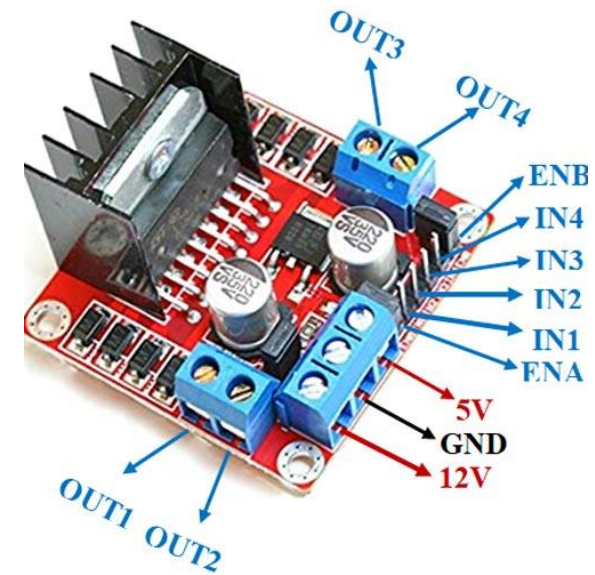
2. Pins and Connections of L298N

[3] Power Pins:

- [A] 12V
- [B] GND (Ground)
- [C] 5V

[4] Motor Control Pins:

- [A] OUT1 and OUT2
- [B] OUT3 and OUT4



6. Setting Up First Project



▪ Step 1: Understanding the Components

3. How the L298N Works

Motor Direction

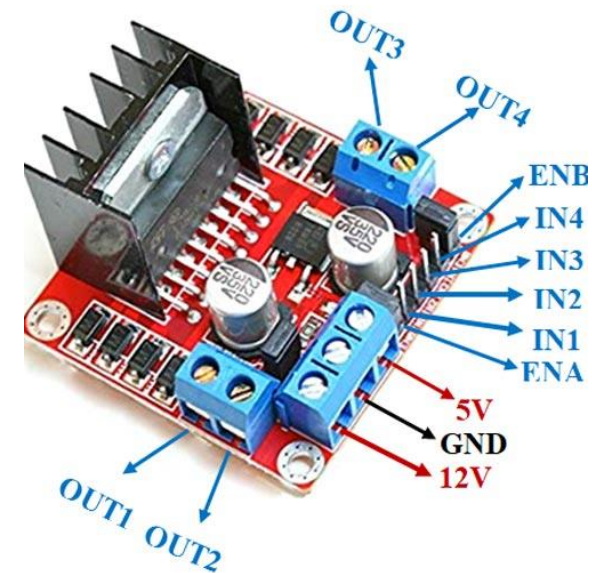
Each motor has two input pins (e.g., IN1/IN2 for Motor 1). By setting one pin HIGH and the other LOW, you control the direction in which the motor spins. For example:

IN1 HIGH, IN2 LOW → Motor moves forward.

IN1 LOW, IN2 HIGH → Motor moves backward.

Motor Speed

The ENA and ENB pins are used to control the speed of the motors using **PWM**. By applying a PWM signal (with a value between 0 and 255) to these pins, you can vary the motor speed. A value of 0 turns the motor off, and 255 runs it at full speed.





6. Setting Up First Project

▪ Step 2: Circuit Setup

Right Motor (Motor 1)

- IN1 (Motor 1) ← Arduino Pin 3
- IN2 (Motor 1) ← Arduino Pin 4
- ENA (Motor 1) ← Arduino Pin 2 (PWM Pin)
- OUT1 and OUT2 ← Motor 1 Pin 1-2

Left Motor (Motor 2)

- IN3 (Motor 2) ← Arduino Pin 5
- IN4 (Motor 2) ← Arduino Pin 6
- ENB (Motor 2) ← Arduino Pin 7 (PWM Pin)
- OUT3 and OUT4 ← Motor 2 Pin 1-2

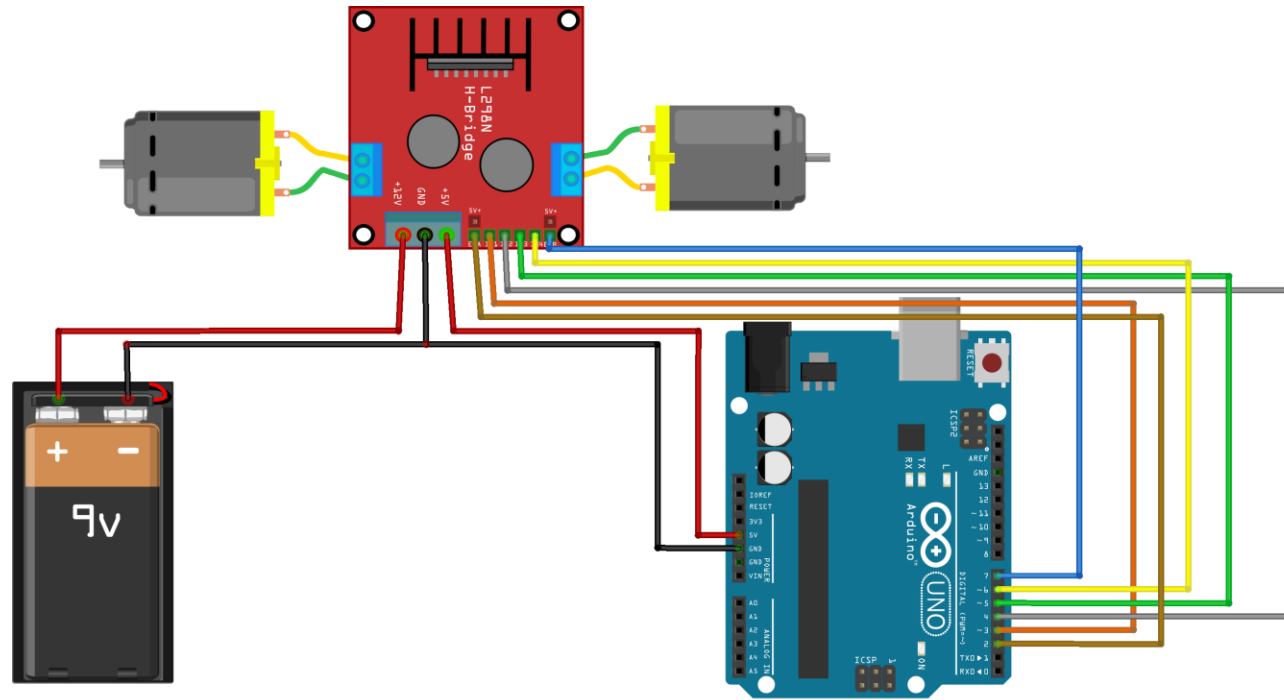
Battery

- The positive terminal ← 12V pin on the L298N.
- The negative terminal ← GND pin on the L298N and Arduino.
- 5V terminal ← Arduino Pin 5V/VIN



6. Setting Up First Project

- **Step 2: Circuit Setup**





6. Setting Up First Project

- **Step 3: Code**

```
// Define motor control pins
int rightmotor1 = 3;    // First pin for the right motor
int rightmotor2 = 4;    // Second pin for the right motor
int leftmotor1 = 5;     // First pin for the left motor
int leftmotor2 = 6;     // Second pin for the left motor

// Define motor enable pins (controls motor speed)
int en_right_motor = 2; // Enable pin for the right motor (PWM)
int en_left_motor = 7;  // Enable pin for the left motor (PWM)
```





6. Setting Up First Project

- **Step 3: Code**

```
void setup() {  
  // Set motor pins as outputs  
  pinMode(rightmotor1, OUTPUT);  
  pinMode(rightmotor2, OUTPUT);  
  pinMode(leftmotor1, OUTPUT);  
  pinMode(leftmotor2, OUTPUT);  
  
  // Set enable pins as outputs (to control speed)  
  pinMode(en_right_motor, OUTPUT);  
  pinMode(en_left_motor, OUTPUT);  
}
```





6. Setting Up First Project

- **Step 3: Code**

```
void loop() {  
  // Call different movement functions with a delay in between  
  Forward();    // Move forward  
  delay(500);   // Wait for 500 ms  
}
```





6. Setting Up First Project

- **Step 3: Code**

```
// Function to move forward
void Forward() {
    digitalWrite(rightmotor1, HIGH); // Set right motor forward
    digitalWrite(rightmotor2, LOW);
    digitalWrite(leftmotor1, HIGH); // Set left motor forward
    digitalWrite(leftmotor2, LOW);
    analogWrite(en_right_motor, 100); // Set speed of right motor
    analogWrite(en_left_motor, 100); // Set speed of left motor
}
```





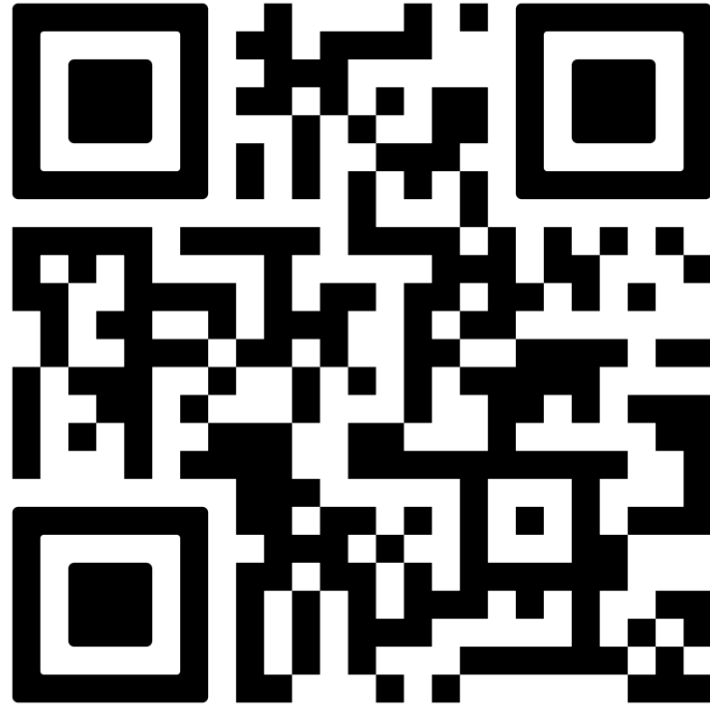
6. Setting Up First Project

- **Step 4: Upload the Code**
 - Open the Arduino IDE.
 - Connect the Arduino board.
 - Select the correct board and port:
 - Go to **Tools > Board** and select the correct Arduino model.
 - Go to **Tools > Port** and select the COM port.
 - **Copy and paste the code** into the Arduino IDE.
 - Click the **Upload button**.

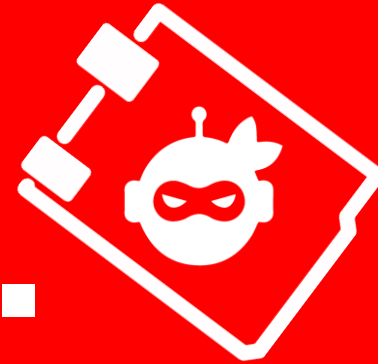




Drive Link



Thank You.



Youssef Adel

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