Stepper Motor

Name: _____

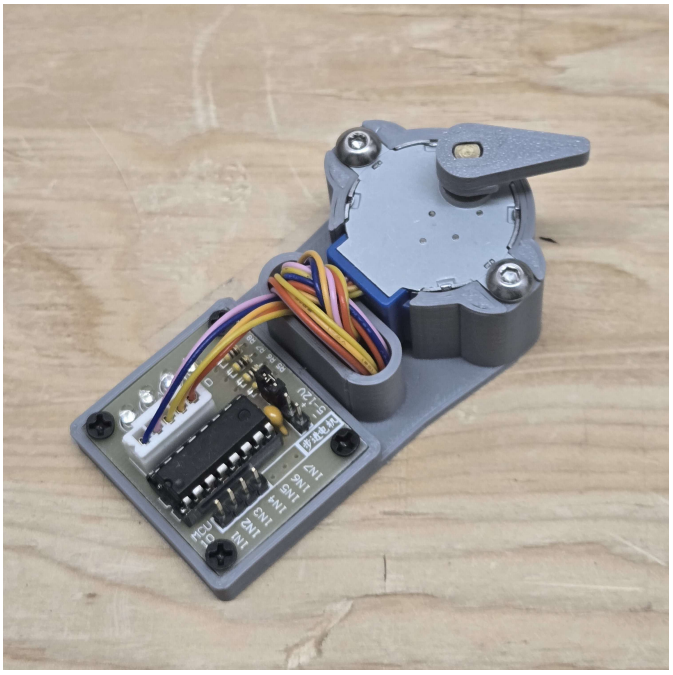

Figure 1: 28BYJ-48 Motor and ULN2003 Controller

Stepper motors like the 28BYJ-48 are perfect for applications requiring precise control of angular position.
They are commonly used in devices such as 3D printers, robots, and motorized cameras.

Objective

Control the speed and position of a stepper motor using an Arduino.

What you'll need:

- 1 x Arduino Uno Board
- 1 x 28BYJ-48 Stepper Motor
- 1 x ULN2003 Controller
- Connecting wires

Circuit

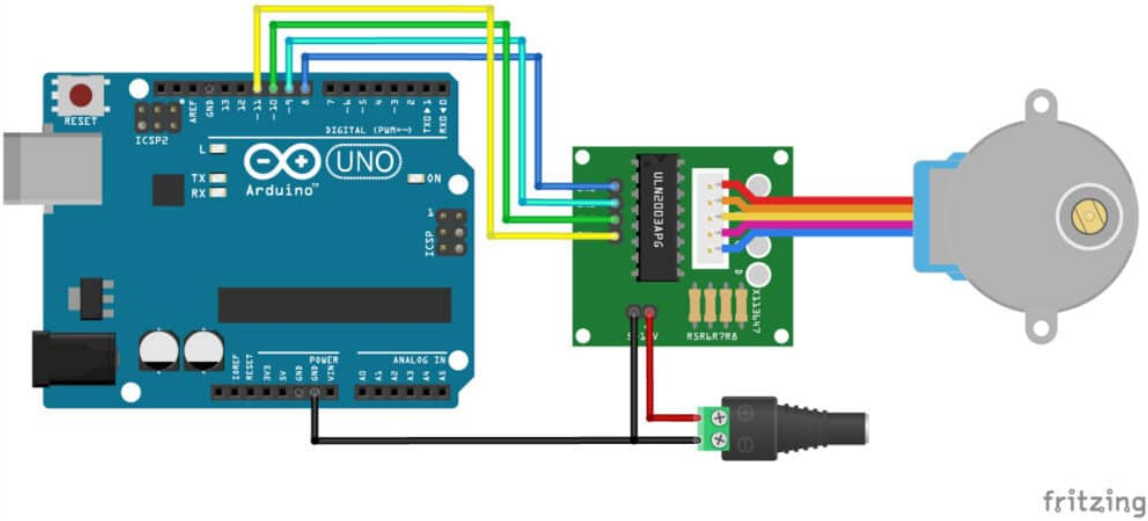

Figure 2: Stepper Motor Circuit

Motor Connections

1. **Power (VCC)**: Connect the VCC pin of the ULN2003 driver to the 5V pin on the Arduino.
2. **Ground (GND)**: Connect the GND pin of the ULN2003 driver to one of the GND pins on the Arduino.
3. **Control Pins**:

The control pins IN1, IN2, IN3, and IN4 of the ULN2003 driver are connected to the digital pins on the Arduino as follows:

ULN2003	Arduino
IN1	8
IN2	9
IN3	10
IN4	11

Example: Basic Rotation

At the beginning of your program, import the `Stepper.h` library.

```
#include <Stepper.h>
```

Create a Stepper object and define the control pins.

```
//                steps IN1  IN2 IN3  IN4
Stepper myStepper(2038,   8,  10,  9,  11);
```

> `2038` is the number of steps per revolution for the motor.

At startup, set the motor speed:

```
myStepper.setSpeed(10); // Speed in revolutions per minute
```

To rotate the motor, use the following command in the loop function:

```
myStepper.step(1024); // Makes 1024 steps clockwise
```

Exercises

1. Create a program that rotates the motor at different speeds.
2. Create a program that makes the motor move through a complete cycle clockwise and counterclockwise, with pauses of 500 ms between each half-revolution.
3. Develop a program that controls the motor with a potentiometer to adjust the rotation speed.