



Arduino Lesson ()

Use of Stepper Motor

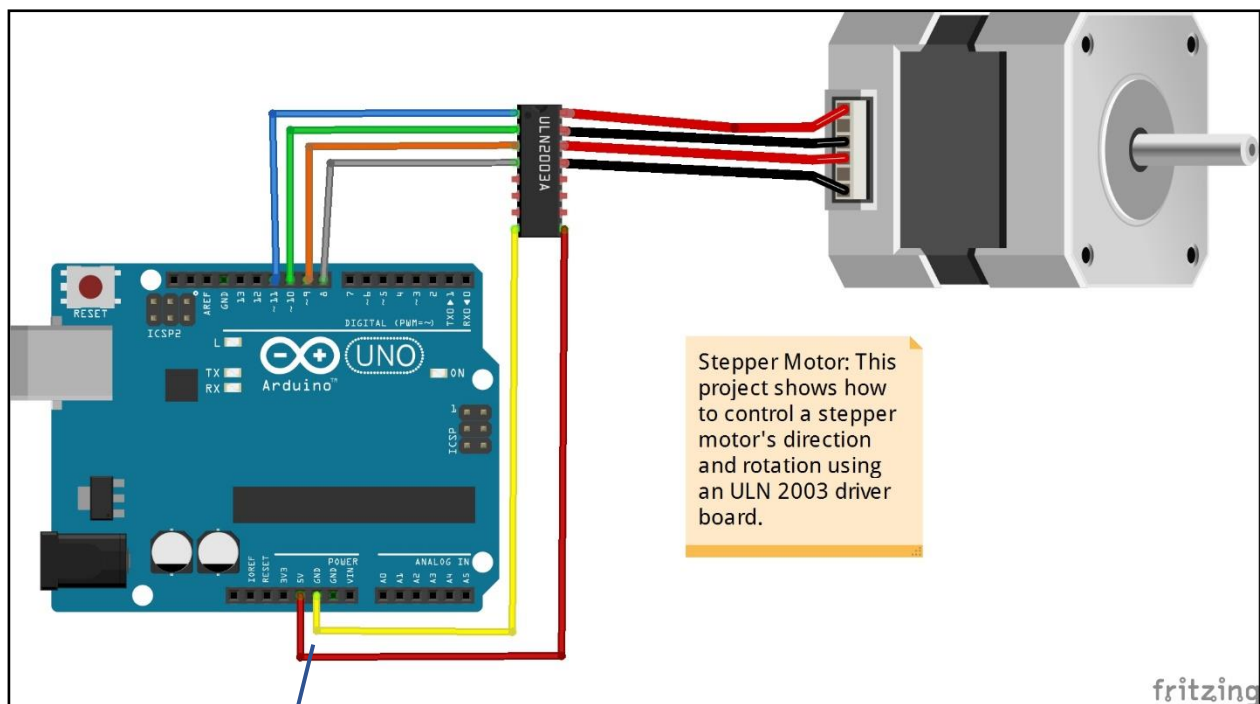
Name: _____ () Class: _____ Date: _____

Objectives: At the end of this lesson, you would be able to

1. Connect a stepper motor to the Arduino microcontroller
2. Write sketches to control the stepper motor circuit

Apparatus:

- 01 Arduino UNO microcontroller
- 01 USB cable
- 01 28-BYJ48 stepper motor
- 01 ULN 2003 driver board
- 06 female-male jumper wires
- 01 power module (for 5V dc supply)
- 01 breadboard
- 01 9V battery



Above diagram created with fritzing.org software

Use a separate 5V voltage supply!

Note:

- The motor may become hot.
- It is advised to use a separate 5V dc source for stepper motor (instead of powering it from the microcontroller using 5V & GND).

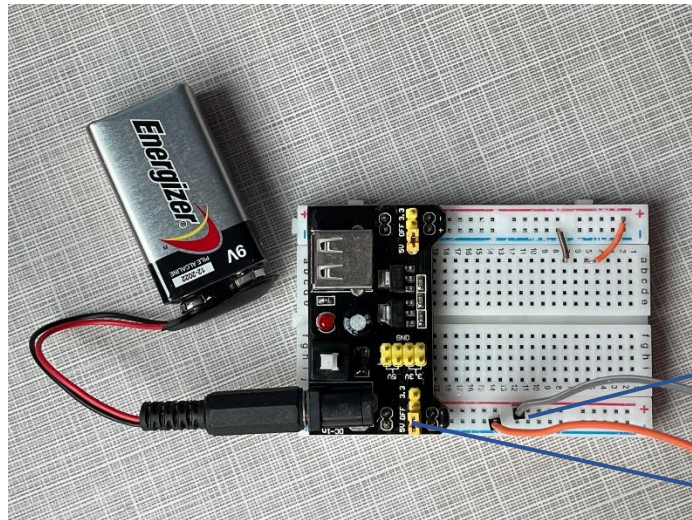


Top view



Bottom view

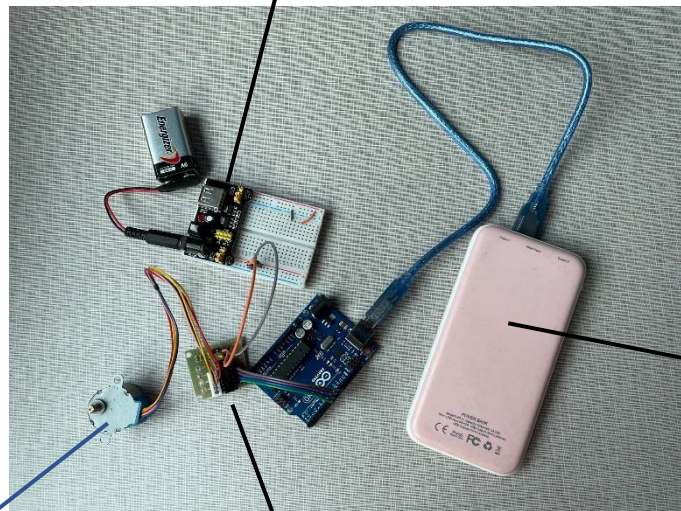
**28-BYJ48
stepper motor**



**5V voltage
supply**
(power module
mounted on a
breadboard)

2 wires to
driver board

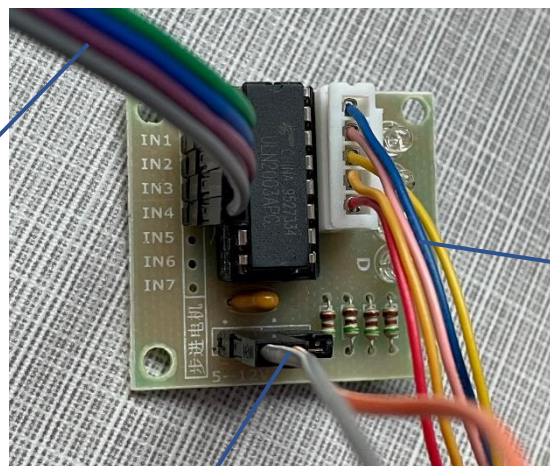
yellow cap
over 5V pins



**voltage supply
for Arduino
microcontroller**
(power bank)

Driver board

4 wires to
Arduino
microcontroller



5 wires from
stepper motor

2 wires to
5V supply

Assignment: Set up a stepper motor circuit with a driver board

1. Plug the Arduino Uno into the USB port on the laptop installed with Arduino software.
2. Select **Tools** → **Board**: scroll down to select "**Arduino Uno**"
3. and select **Port**: "COM#"
4. Connect the stepper motor to the ULN 2003 driver board using the cable (5 wires) provided with the white connector (align the 2 notches).
5. Connect the driver board to the digital pins of the Arduino microcontroller using 4 female to male jumpers.

driver board		Arduino microcontroller
IN1	→	D8
IN2	→	D9
IN3	→	D10
IN4	→	D11

6. Connect the power input terminals (+ and -) of the driver board (at 5-12V label) to the 5V voltage supply of the power module (5V and GND respectively) mounted on a breadboard using 2 female to male jumpers. [Alternately, connect a female-female & male-male jumper.]
7. Verify and upload the sketch.
8. Observe how the stepper motor turns.
9. Modify the sketch to vary the motor rotation with:
 - *speed of rotation, direction of rotation & fraction of revolution*

References:

- <https://dronebotworkshop.com/stepper-motors-with-arduino/>
- Video <https://youtu.be/odjQ4i-9aa4> (to connect cables)

Assignment: Sample sketch

```
#include <Stepper.h>

// Number of steps per revolution of INTERNAL motor in 4-step mode
#define STEPS_PER_MOTOR_REVOLUTION 32

// Steps per OUTPUT SHAFT of gear reduction
#define STEPS_PER_OUTPUT_REVOLUTION 32 * 64 // 2048

// create an instance of the stepper class, specifying the number of steps of the motor
// and the pins it's attached to
// The pin connections need to be pins 8,9,10,11 connected to Motor Driver IN1, IN2, IN3,
// IN4
// Then the pins are entered here in the sequence 1-3-2-4 for proper sequencing

Stepper small_stepper (STEPS_PER_MOTOR_REVOLUTION, 8, 10, 9, 11);
int Steps2Take;

void setup()
{
}

void loop()
{
    small_stepper.setSpeed(1); // SLOWLY Show the 4 step sequence

    Steps2Take = 4; // Rotate CW
    small_stepper.step(Steps2Take);

    Steps2Take = STEPS_PER_OUTPUT_REVOLUTION / 3; // Rotate CW 1/3 turn
    small_stepper.setSpeed(100); // 100 turn slowly
    small_stepper.step(Steps2Take);

    delay(1000);

    Steps2Take = - STEPS_PER_OUTPUT_REVOLUTION / 3; // Rotate CCW 1/3 turn (-ve)
    small_stepper.setSpeed(700); // 700 turn quickly
    small_stepper.step(Steps2Take);
}
```