Components

- 28BYJ-48 with ULN2003 driver

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28BYJ-48

The **28BYJ-48** is a geared stepper motor. One whole revolution are around **2048 steps** (32 steps of the stepper motor with a 64:1 gear).

The voltage of those motors differ, e.g. 5V or 12V. See the sticker on the motor for clarification.

ULN2003

The **28BYJ-48** stepper motor comes often in a kit with a **ULN2003** motor driver. It has a plug for the motor, pins for the energy source of the motor, and also usually IN1-IN4 as inputs for the steps.

To provide it with power, connect the power input (labeled with **5-12V**), which should match the motor, and provide enough current for the motor. **Do not use the pins of microcontroller for this.**

Then connect 4 pins of a microcontroller with the pins IN1-IN4. You need to "walk" those pins to turn the motor, walk in the different direction to switch the rotation.

Example

For example, to create full steps, you could use a matrix:

```
const uint8_t steps[][4] = {
    {1, 0, 0, 0},
    {0, 1, 0, 0},
    {0, 0, 1, 0},
    {0, 0, 0, 1},
};

void writeStepper()
{
    digitalWrite(IN1, steps[step][0]);
    digitalWrite(IN2, steps[step][1]);
```

```
    digitalWrite(IN3, steps[step][2]);
    digitalWrite(IN4, steps[step][3]);
}
```

The variable step stores the current step position. **Make sure to never leave the array size**.

To make half steps (which are then 4096 steps per revolution), you add steps between, which activates the current and the next step.

```
const uint8_t steps[][4] = {
    {1, 0, 0, 0},
    {1, 1, 0, 0},
    {0, 1, 0, 0},
    {0, 1, 1, 0},
    {0, 0, 1, 0},
    {0, 0, 1, 1},
    {0, 0, 0, 1},
    {1, 0, 0, 1},
};
```