Stepper Motor Angle Controller using DM556 and Arduino

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Brief Introduction

This project demonstrates how to control the angular position of a stepper motor using an Arduino and DM556 stepper driver. The user inputs a target angle (0° to 90°) via the Serial Monitor, and the motor rotates precisely to that angle. Additionally, entering 'q' resets the motor back to the 0° position.

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Table of Contents

Stepper Motor Angle Controller using DM556 and Arduino

Features

- Input angle between 0° to 90° via Serial Monitor

- Precise control of stepper motor rotation using microstepping

- Reset command to bring the motor back to 0°

- Real-time feedback on motor movement

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About the Stepper Motor & DM556 Driver

Stepper Motor:

- Typically moves in discrete steps (e.g., 1.8° per step)
- High accuracy, suitable for robotics and CNC machines
- Controlled using step and direction signals

DM556 Stepper Driver:

- Digital stepper driver that supports microstepping
- Accepts STEP (PUL+) and DIRECTION (DIR+) signals
- Works with 2-phase and 4-phase stepper motors

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Hardware Requirements

Component	Quantity
Arduino Uno/Nano	1
DM556 Stepper Driver	1
Stepper Motor	1
Power Supply (1236V)	1
Jumper Wires	As needed
Breadboard (optional)	1

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Software & Libraries

- Arduino IDE
- Arduino.h (Built-in with Arduino IDE)

No external libraries are required.

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Installation & Setup

1. Connect STEP_PIN (PUL+) to Arduino digital pin 6.

2. Connect DIR_PIN (DIR+) to Arduino digital pin 8.

3. Ensure DM556 is powered via external supply.

4. Ground DM556 and Arduino together.

5. Upload the code via Arduino IDE.

6. Open Serial Monitor (baud rate: 9600).

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Code Explanation

Includes & Definitions:

- STEP_PIN, DIR_PIN: Pins connected to DM556 for controlling step and direction.

- MICROSTEPS: User-defined microstepping multiplier.

- TOTAL_STEPS: Total microsteps for one full revolution (360°).

Function: stepMotor():

- Sets motor direction and pulses the STEP pin to move motor.

Function: rotateToAngle():

- Validates angle, computes step count, rotates motor, and updates position.

Function: resetToZero():

- Calls rotateToAngle(0) to bring motor back to home position.

loop() Logic:

- Reads Serial input, parses angle or 'q', and executes rotation/reset accordingly.

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Main Logic & Equation

Key Equation:

steps = (angle_difference) × (TOTAL_STEPS / 360)

Where:

- angle_difference is the change in angle

- TOTAL_STEPS is the total microsteps per full 360° rotation

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Usage

1. Upload code to Arduino.

2. Open Serial Monitor (9600 baud).

3. Input a target angle (e.g., 45) and press Enter.

4. The motor rotates to that angle.

5. Enter 'q' to reset the motor to 0°.

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Output Example

```
Enter a target angle (0 to 90) or 'q' to reset to zero:

Rotating to angle: 45.00

Moved to absolute angle: 45.00

Enter a target angle (0 to 90) or 'q' to reset to zero:
```

Customization

- Change rotation range: Modify angle limit in rotateToAngle()

- Adjust speed: Tweak delayMicroseconds() in stepMotor()

- Expand to full 360°: Increase range check from 090 to 0360°

- Different motor or microsteps: Update STEPS_PER_REV and MICROSTEPS