

ME 133 Winter 2022

Lab 6: *DC Motor*

Feb 17, 2022

Due: 2/25/2022

Submit a zip file named yourFirstName-Lab1.zip on Canvas with your code, a lab report (following the format in syllabus), and a short video proving the working hardware-software integration.

Exercise 1

Material required

- Arduino
- 1 x Transistor
- 1 x Diode
- 2 x Buttons
- 1 x 330 Ohm resistor
- 2 x 10k Ohm resistors

Coding together

We will learn about DC brushed motors.

Consider the circuit shown below to control a DC motor in a single direction. Most DC motors require current greater than 250mA. The maximum current of Arduino is 150mA. If motors are directly connected to the output of any pin, this can damage both the pin and the motor. To prevent damage, you need circuitry that acts as a bridge between your microcontroller and the motor. Some possibilities are transistors, H-bridges, and relays. In this lab we will use a transistor as shown below.

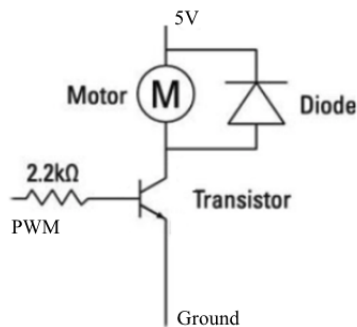


Figure 1: How to safely wire a DC motor to your microcontroller

The diode provides a safe path for the inductive kickback of the motor. If the current in the inductor is suddenly switched off, the diode will briefly supply the voltage necessary to keep the current flowing in the short term.

Assignment

Part 1

Connect two pushbuttons to the Arduino. Wire a circuit and write a program that increases (+10) the speed of the motor when the first button is pressed and decreases (-10) the speed of the motor when the second button is pressed. Be sure that the speed remains between feasible values (0-255). Display the current value of the speed variable on the serial plotter.

Part 2

For a fixed load, the shaft speed of a DC motor is proportional to the applied voltage. Wire a circuit and write a program that continuously estimates the speed of the motor and visualizes it for the user through the serial plotter (basically monitor the potential drop across the motor). To change the speed of the motor use the configuration in Part 1. If you have some, you can use a large capacitor to filter out the slowly changing variations in your output.