PL 6.1 – DA32435 – Dyab Asdi – 19305

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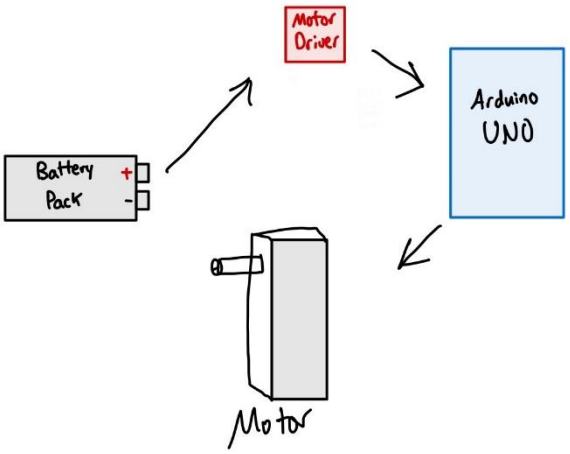
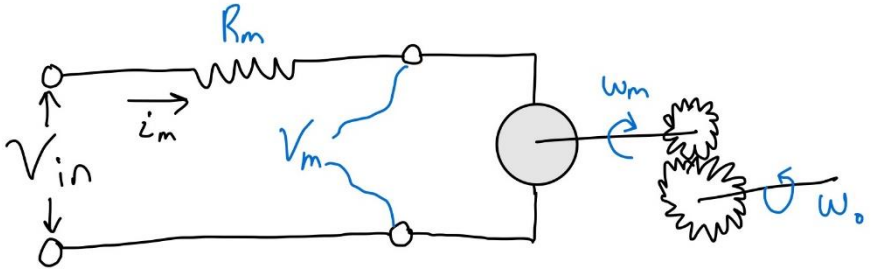
1)

Schematic of PMDC Control System



Electrical Circuit of PMDC



During this lab, we will need to measure a few important values of the system before analyzing the data. We need to be able to measure the voltage input, as well as the resistance of the motor (constant), and the shaft speed omega m (w_m). We can measure the voltage input through the Arduino, the resistance of the motor by using a multimeter, and the shaft speed using an encoder system that outputs a voltage to the Arduino which can be read and plotted. We can create a dataset of these values at various voltage inputs and conduct our data analysis using the dataset.

2) From our PWM output from the Arduino, we can measure the Vin (voltage in). We must test for multiple different voltages, and as a result, measure the different shaft speeds, and motor currents for each PWM output from the Arduino.

   From these values, we can calculate the back-emf, Vm, which we can then graph vs the shaft speed. The slope of this linear regression model will provide us the motor constant, r_m.

3) Now that we know the motor constant and have the shaft speed, we can calculate the dampening friction of the system by plotting the torque of the motor vs shaft speed, giving us a slope roughly equivalent to the dampening friction, Bm.

   Once we obtain these values, we can create a torque speed curves for various input voltages. The theoretical torque-speed curve starts at position on the y-axis Ts which equals (r_m/Rm)*Vin. It then has a negative slope of [(r_m^2/Rm)+Bm]*w_m. We use the corresponding values at each voltage input for the motor constant and dampening friction value from our linear regression models that we created.

4) I have installed the Sparkfun TB6612FNG library.