

Dynamic Systems and Controls

Prelab 11

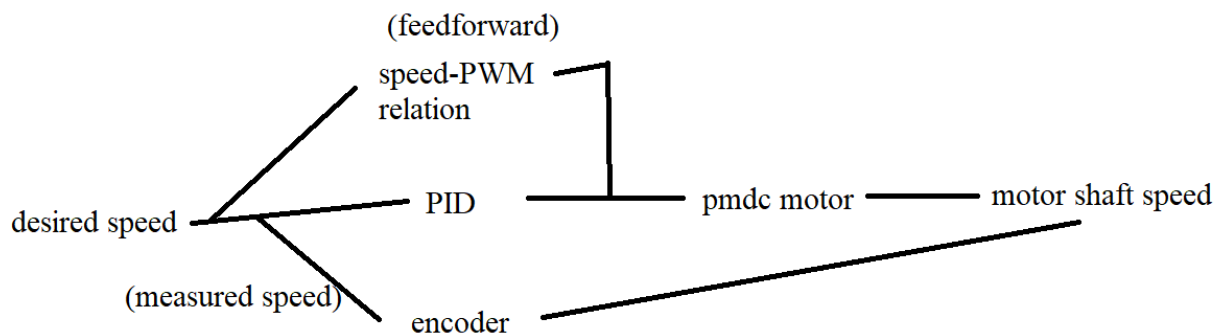
Kieran Cosgrove

1.

Speed (rad/s)	Pwm experimental (int)	Pwm simulation (int)	Difference (%)
260	180	174	3.39%
300	200	197	1.51%
334	220	217	1.37%
370	240	238	0.84%
390	255	249.4	2.22%

In general, the simulation results are quite close to the experimental data, with the biggest difference of 3.4%

2. By using the torque-speed curve, you can trace the desired speed to a specific torque value. Using the motor constant, the current required for this specific torque can be found. By multiplying the current by the motor resistance, the desired motor voltage can be found. Taking this voltage and dividing it by a range of 5 volts and a PWM scale of 255, the PWM value can be output. Therefore, inputting a desired speed into the Arduino code will yield a PWM control of the motor giving you the speed you want.



3.

Advantages of closing the loop includes a more accurate motor shaft speed, as predictions/simulations always have some error/difference as seen in question 1. The disadvantage is the huge added complexity and room for issues to arise, including adding another possible instability depending on the environment & system.