RSA Lab #9: Finite State Machines with Magnetometer & Accelerometer

# Part A: DC Motor with Optical Encoder

For Part A, I simply reused the program from Lab 8, Part C.

1. This is from Lab 8 Part C DC Motor with Encoder. You can re-use your program from Lab 6.

See GitHub: <https://github.com/ykokeb1/rsa_stuff/tree/main/Arduino/lab9a>

# Part B: Position Control

For this part of the lab, I was able to control the position of a DC motor by essentially having it mimic the knob of a potentiometer. I was able to observe the response of the DC motor by modifying the Kprop constant used in my program.

1. Make a circuit and program to use the Arduino to control the position of a DC motor, creating a servomotor system. Extend your program from Part A that uses interrupts to decode the signal from the motor’s encoder to increment or decrement the encoder as the motor spins. Include a circuit drawing in your report.

See GitHub: <https://github.com/ykokeb1/rsa_stuff/tree/main/Arduino/lab9b>

1. How does changing Kprop change the response of the system? Then figure out roughly what value of Kprop is too low; where does the response become too sluggish? And figure out roughly what value of Kprop is too high; where does the response become too jittery?

Reducing the constant Kprop caused the response of the system to become sluggish. Increasing the constant Kprop caused the response to jitter. I found the smallest Kprop value obtained before the system was irregularly sluggish was ~0.7 V/rad. The largest Kprop value I obtained before the system was irregularly jittery was ~7 V/rad.

# Part C: DC Motor with Encoder

Finally, I modified the program from the previous part of the lab to display the step response using the Serial Plotter, for two different values of the Kprop constant.

1. Finally, change your program to view the step response of the system. Display the response for a duration of 4s on the Arduino IDE’s Serial Plotter. Close and reopen the Serial Plotter window so the x-axis re-starts at 0; include screen shots of the Serial Plotter window with the step response of the system for these two conditions. Superimpose labels with units to both axes on the screen shots.

Chart, line chart

Description automatically generated

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Description automatically generated

See GitHub: <https://github.com/ykokeb1/rsa_stuff/tree/main/Arduino/lab9c>