Final Lab Rubrics
CMPE 242
2020S

HL

This project is the final project for CMPE 242 embedded hardware systems. This lab counts total 20 points. In this lab, you will:

1. build a prototype system which integrates
    1.1. Embedded CPU board (for example Pie or NANO, or ARM11);
    1.2 PWM motor driver board with NEMA stepper motor and with LSM303 sensor mounted on top of the stepper motor;
1.3 ADC circuit with potential meter to allow the change of analog voltage as the input to ADC.

2. operate this prototype system by changing the opt output to the ADC input, so ADC can convert the input to the digital output, then change pwm output to the driver board to actuate stepper motor. You implementation should support both counter clockwise drive direction and clockwise drive direction. In addition,

3. The ADC data should be validated with FFT power spectrum of energy index up to 80% of the energy for the half of its highest frequency range (N/2 – 1). You can use N = 1024 for your implementation.

To submit:
1. IEEE style paper which gives hardware side design details:
1.1. System block diagram of your entire system;
1.2. schematics for the pwm, adc, and i2c sensor interface;
1.3. photos gives the details of the above circuits;
and on the software side of the design
1.4 flow chart of the algorithms (ADC, PWM and I2C);
1.5 algorithm description for the ADC, PWM and I2C;
1.6 Code snippet for the ADC, PWM and I2C;
1.7 testing and verification section that shows each of the above (ADC, PWM, I2C) are working correctly.

2. Video demo shows
2.1. Entire board details and its connection to your laptop;
2.2. ADC operation and data validation result from the laptop console;
2.3. Stepper motor drive driving stepper motor while changing OPT voltage to the ADC input, including changing the motor directions;
2.4. Console display of the LSM303 sensor output while motor is slowly spinning in counter clockwise direction and clockwise direction.

3. source code.

4. submission to my email.

(END)