Lab Assignment #5

Overview

For this lab you will use the LPC1769 and an analog joystick to implement a controller for a hobby servo motor.

Hobby servo motors are controlled with a PWM signal with a period of 20 ms and a pulse width of between 1 to 2 ms. The servo shaft can rotate over an angle of 180° with the angular position determined by the pulse width: 0° for 1 ms, 180° for 2 ms, and all other angle proportionally in between. For example, a pulse width of 1.5 ms would move the shaft to the 90° position.

An analog joystick is a lever connected to two potentiometers, one for the x-axis and the other for the y-axis. The terminals of each potentiometer are connected to power and ground so that the wiper will output a voltage between power and ground proportional to the x or y position of the lever. Note that although the lab's joysticks have the power rail labeled as "5 V", it will actually operate over a wide range of voltages; use the LPC1769's 3.3 V supply instead.

Use the LPC1769's analog-to-digital subsystem to read the x-axis of the joystick and generate a PWM signal for a servo motor such that the pulse width can be smoothly adjusted between 1 ms and 2 ms depending on the position of the joystick. Although the lab has a few servo motors, there aren't enough for everyone. Just focus on generating the proper PWM signal and display it on your oscilloscope.

Additional requirements for 3 person teams

Use both the x and y-axis of the joystick to generate two PWM signals, one for each axis.

What to demo

Show the PWM signal on the oscilloscope with the period and pulse width measured at the following joystick positions:

- Minimum, 1 ms pulse width
- Center, 1.5 ms pulse width
- Maximum, 2 ms pulse width

What to put in the report

1. The objectives of the lab assignment (essentially, the overview above, but in your own words)
2. Details of your final solution
   a. The hardware schematic
   b. The software source code
3. Oscilloscope snapshots of the PWM waveforms when the joystick is at the minimum, centered, and maximum position, with the period and pulse width measured
4. The major (EE, CpE, or other) and individual contributions of each team member

Due date

April 5th