ECE 3710 Lab 7 – Fall 2018

Due Date: Week of October 29 at the beginning of your lab section

Objectives

The purpose of this lab is learn how to interface a stepper motor and a piezo-electric buzzer to the microcontroller.

Overview

For this lab, you will build an "analog" timer with a second hand that counts down from up to 59 seconds and sounds a buzzer on time-out.

Preparation

1. Come with the following:

    a. ECE 3710 Lab Kit

    b. STM32L476 Discovery Board

    c. Textbook

2. Read Chapter 16 of the textbook.

3. Read the datasheet for the 28BYJ-48 stepper motor included in your lab kit.

4. Read the datasheet for the ULN2003A stepper motor driver included in your lab kit.

5. Read the datasheet for the MuRata PKM22EPPH4001 piezo-electric buzzer included in your lab kit.

6. Complete the Pre-Lab section and come to lab prepared to pass-off to your TA.

Requirements

1. Design a wall-clock style analog timer that meets the following specifications

    a. Print-outs of a clock face you can use are available in ENLAB 255. Also, see the last page of this document. Feel free to fashion your own clock face if you prefer.

    b. The 4x4 keypad is used to program the initial number of seconds. The user types in a number between 1 and 59, followed by the '#' key.

    c. The second hand, which is attached to the stepper motor, "winds" clockwise to the specified value.

    d. Once the time is "wound", pressing '#' again starts the timer. The timer will count down, moving the second hand counter-clockwise until it reaches zero, at which time a 1-second-duration buzzer will sound. Pick an appropriate frequency for your buzzer.

    e. The keypad can then be used to key in a new initial value. Keypresses at other times will be ignored.

    f. Attach a second hand to the stepper motor rotor (hint: a paper clip or pen will work fine).

Pre-Lab Pass-off

1. Draw a schematic diagram of the timer system, including stepper motor (and driver), buzzer, keypad, and microcontroller. Remember to consider current limitations of the various devices. **Pass off your schematic to the TA at the beginning of your lab section.**

Procedure

1. Write pseudocode for a microcontroller C program that accomplishes the described task. Give special consideration to timing for the stepper motor and the buzzer (hint: SysTick and/or other timers will be useful here).

2. Implement your timer system based on your schematic diagram and pseudocode.

3. Pass off your working system to the TA.

Documentation

Prepare your lab report following the same style and rubric that you've followed in previous labs.