Assignment 4

Schoelen EET122, Spring 2020 Remote

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Week5: Start 04/30/20 - End 05/07/20

Objectives:

1. Continue to gain familiarity with KiCad schematic capture by doing more KiCad tasks

2. Continue to gain knowledge of circuits by building and debugging.

3. More exposure to synchronous circuits: Shift Register

4. Fundamentals of stepper motors

This lab uses a parallel load, parallel out shift register (74LS194) to drive a stepper motor (students don't have a stepper motor, so we will use LEDs for the motor drive indicators). The "motor" will be driven with two classic stepper motor drive sequences: Wave Drive and Full Step Drive.

Read / Watch:

Stepper Motors

Watch: https://www.youtube.com/watch?v=TWMai3oirnM
Watch: https://www.youtube.com/watch?v=eyqwLiowZiU
Read: https://www.electronics-tutorials.ws/sequential/seq_5.html

Do:

Use the Lab4 Discussion board if you need help.

Note: Students do not have a stepper motor in their kits. For this lab use four LEDs in place of the motor connections.

1. Read the following PCC lab exercise: http://spot.pcc.edu/~dgoldman/labs/eetdig-2-3.pdf. Use this lab as a guide.
2. Complete a KiCad schematic of Figure4 in the PCC lab exercise linked above. Add active high LEDs (with a 1k series R) for each of the motor drive signals. Use Arduino for +5V, GND and Clock (clock is pin D8 on the Arduino, use week1 Arduino sketch). NOTE: Use +5V for the +12V connection on the SN754410.
3. Do a simple sketch of your breadboard layout before you build. I want all students to have the LEDs in the same order for the build. The order shall be (from left to right on the breadboard):
    a. M1A - M2A - M1B - M2B.
4. Build the circuit on a breadboard.
5. Review the datasheet for the 74194. You will need to understand the modes of the 74194 (S1,S0).
    a. S1 S0: 1 1 is parallel load
    b. S1 S0: 1 0 is shift left
6. Perform Procedures 1 and 2 in the PCC lab exercise linked above.
    a. Video of the LEDs procedure 1 Wave Drive
    b. Video of the LEDs procedure 2 Full Step Drive
    c. That's all that is required from the procedures 1 and 2
7. Deliverables are to be uploaded to D2L for grading.

For the deliverable use this this naming convention please: LastNameFirstName_L4

***** This is a one week Lab *****

Deliverables to be uploaded to D2L for grading

1. Upload the completed KiCad schematic: both the .pro and the .sch

2. Scan or shoot a picture of your pre-layout sketch

3. Two videos: one for Wave Drive and one For Full Step Drive

4. A conclusion