

EE 2920 - Week 4 Lab: Line Sensor Interfacing

1 dedicated lab period, 2 lab periods to complete

Name: _____

Objectives

- Interfacing to a Line sensor
- Use analog discovery to capture waveforms

Prelab

- Review the QTR-1RC sensor document
- Solder pins to your sensors

student
check off

Assignment

- Part 1: a) Interface 1 sensor to the MSP432 Launchpad
b) Create a program to measure the decay time of the sensor
Display the time on the LCD
c) Use the program to characterize the sensor
Ave time to toggle with a light surface at 0.25in
Ave time to toggle with a dark surface at 0.25in
d) Determine a sample time to use as a threshold

9 lines for main
3 lines for pin config fn
8 lines for LCD setup fn
9 lines for measurement fn
3 lines for LCD update fn

- Part 2: a) Validate your characterization using an oscilloscope
1. Capture a series of line sensor outputs with a white surface approximately 0.125, 0.25, 0.5, 0.75, and 1.0 inch above the sensor.
 2. For each oscilloscope capture, indicate the time (in seconds) at which the MSP432 Launchpad would recognize the 1 to 0 transition.
- b) Create a program to display either "Light" or "Dark" on the LCD display depending on the surface seen by the sensor (0.25in)

8 lines for main
*3 lines for pin config fn
*8 lines for LCD setup fn
11 lines for measurement fn
8 lines for LCD update fn

- Part 3: a) Interface 2 sensors to the MSP432 Launchpad
b) Display L/R/BOTH on the LCD depending on when each sensor sees a light surface. (0.25in)

Check Off

You must demonstrate your working design(s) prior to the end of the 2nd lab period

- Demo your Part 1 50% _____
- Demo your Part 2 15% _____
- Demo your Part 3 15% _____

Lab Report (informal)

- Due at 4:00 pm, 1 day after the second lab period – in the box outside my office
- Include this cover sheet
- Include a properly documented informal lab report. 20% _____

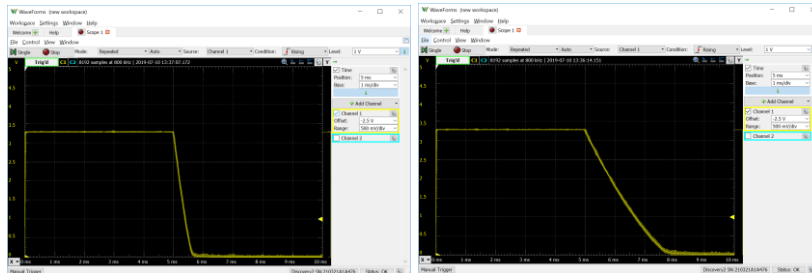
Strategy

**** Create a program Flow Diagram for each part ****

** I suggest you create 3 different programs – do not overwrite prog x to make prog y **

Part 1: Wire the output to an MSP pin. A) Drive the pin as an output/1 to discharge the capacitor. B) switch the pin to an input and start counting (50us-100us steps). C) Wait for the input value to become a 0 and stop the count. Display the count on the LCD. **Verify the operation with an oscilloscope.** Test with both a light and dark piece of paper.

For example if you read: Count for light – 300us, Count for Dark – 1000us → threshold of 650us



light – 260us, dark – 1000us. This would suggest a threshold of 630us

Part 2: Use your code to read the pin after the delay threshold measured in Part 1. If 0 → light, if 1 → dark

Part 3: Add another sensor. Characterize it using program 1. Copy and modify program 2 to include both sensors.