

# ECE 376 - Homework #8

Timer 2 Interrupts. Due Monday, March 28th

## Measuring Time to 0.1ms with Timer2 Interrupts

1) Write a routine for a count-down timer with a resolution of 0.1ms (repeat homework #4 but now with interrupts)

- Time is measured to 0.1ms using Timer2 interrupts
- Each interrupt, pin RC0 is toggled (outputting a 5kHz square wave on RC0)
- Each interrupt (every 0.1ms), TIME is decremented to zero, stopping at zero
- TIME is displayed on the LCD display to 1ms: xx.xxxx
- When you press RB0, the time is reset to 5.0000 seconds
- When you press RB1, the time is reset to 10.0000 seconds
- When you press RB2, the time is reset to 15.0000 seconds
- When you press RB3, the time is reset to 20.0000 seconds

Check the accuracy of your stopwatch

- Measure the frequency on RC0 when sent to a speaker using a cell phone app (Frequency Counter works)

## Generating Frequencies with Timer2 Interrupts

2) Write a routine which turns plays your PIC into a 1-string banjo using Timer2 interrupts

- Play note D3# (155.56Hz) on pin RC0 when button RB0 is pressed
- Check the accuracy of your music note using your cell phone (or whatever else you have on hand)

Problem 3-7) Build an embedded system which uses

- Timer2 interrupts,
- The LCD display, and
- Collects data you can analyze using statistics

Some suggestions are

- Vertical Leap: Measure how high you can jump with your air-time measured to 1ms
- Reflex Time: Turn on a light from 3 to 10 seconds after you press RB0. Measure the time it takes you to press RB0 after the light turns on. Measure time to 0.1ms using Timer2 interrupts.
- Measure the capacitance of a capacitor by charging the capacitor to 5V and then measuring the time it takes to discharge across a 10k resistor to 2.5V. Measure time to 1ms.
- Roulette Wheel: Use Timer2 interrupts to drive the stepper motor to simulate a Roulette wheel. Stop on a numbers 1..8 (0 / 25 / 50 / ... / 150 / 175 steps) at random at a rate of 10ms/step. Use Timer2 interrupts to drive the stepper motor in the background.
- Random Number Generator: Count really fast using Timer2 interrupts. The time you press a button determines the random number generated.
- Other...

3) Requirements: Explain what the inputs are / what the outputs are / and how they relate. Also explain how Timer2 interrupts will be used in your embedded system.

4) C-Code and flow chart.

5) Data. Your raw data (at least two data points)

6) Statistical Analysis: Analyze your data to determine

- The 90% confidence interval, or
- Who in your group can jump the highest (with what probability level), or
- Something else (your pick - just use some statistics to analyze your data)

7) Demo (in person during Zoom office hours or in a video)