ECE 376 - Homework #10

Timer1 Capture & Compare - Due Monday, November 18th

Timer1 Capture

Write a C program to measure your reflex time to 100ns using Timer1 Capture interrupts

- Start the game by pressing RB0. PORTA is turned off when the game starts.
- When pressed, the PIC waits a random time from 4.00 to 7.00 seconds
- After that wait, the lights on PORTA turn on
  - The time of the lights turning on is recorded using Capture1 interrupts
  - Run a wire from PORTA to RC2 to record the rising edge
- When the lights turn on, press RB0 again
  - The time of RB0 is recorded using Capture 2 interrupts
  - Run a wire from RB0 to RC1 to record the rising edge
- The time delay is your reflex time

1) Give a flow chart for this program

2) Write the C code using Timer1 Capture interrupts

3) Validate your code
- The delay is between 4.00 and 7.00 seconds
- If you press RB0 two seconds after the light turns on, the time reported is 2.000 000 0 (ish)
- If you press RB0 five seconds after the light turns on, the time reported is 5.000 000 0 (ish)

4) Record two or more reaction times. From your data, determine
- Your mean reflex time
- The standard deviation of this time, and
- The 90% confidence interval for your reaction time

Timer1 Compare

- Step-by-step programming...
- Can you tell the difference between 329.618Hz (E4) and 329.288Hz (0.1% low)?

5) Write a program which plays two notes then pauses for one second:

- 329.618Hz (E4) plays on RC2 for 500ms using Timer1 Compare1 interrupts,
- It pauses for 200ms, then
- 349.228Hz (F4) plays on RC2 for 500ms
- It pauses for 1000ms, then
- Repeats

Check that the two notes play (it should be easy to hear the difference)

6) Modify this code so that when you press RB0, the code flips a coin

- COIN = TMR1 & 1 should work
- If the coin is heads, play the same note twice in a row
- If the coin is tails, play note E4 then F4

Check that two notes play, with the second being random (sometimes E4, sometimes F4)

7) Modify this code so that you can then guess if the notes are the same or different

- RB1 means the notes are different
- RB0 means the notes are the same
- After the two notes, the code waits for you to press RB1 or RB0
- If you are correct, a counter is updated and displayed (RIGHT += 1)
- If you are incorrect, a counter is updated and displayed (WRONG += 1)

Check that the code is working:

- Two notes play, with the second being the same or different randomly
- When you press a button, it tallies your correct / incorrect responses accordingly

8) Modify this code so that it plays

- 329.618Hz (E4) and
- 329.288Hz (0.1% low)

Run the experiment 10 or more times and record your correct / incorrect results.

9) Use a chi-squared test to determine if you were guessing or if you could really hear a 0.1% difference

- p = 1/2 if you're guessing