ECE 376 - Homework #8

Timer2 & INT Interrupts - Due Monday, Marth 25th

Stoplight with 1ms Accuracy

1) Revise your previous code for a PIC controlled stoplight to use Timer2 interrupts to set the timing:

- Set up Timer2 interrupts for every 1ms
- Each interrupt, toggle pin RC0 (outputting a 500Hz square wave)
- On the LCD display, display the running time with a resolution of 1ms

Assume PORTC displays the E/W and N/S lights:

7	6	5	4	3	2	1	0
-	R	Y	G	-	R	Y	G
E/W				N/S			

The stoplight cycles every 14 seconds

Duration	E/W	N/S	PORTC
5s	G	R	0x14
2s	Y	R	0x24
5s	R	G	0x41
2s	R	Y	0x42

2) Validate your program works

- Timer2 interrupt is being called every 1.00ms (RC0 outputs 500Hz)
- The G / Y / R lights are on for 5s / 2s / 7s in each direction

Generating Frequencies with Timer2 Interrupts

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

- Play note frequency of music note E4 (329.63Hz) 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)

(over)

Hungry-Hungry Hippo!

Problem 4-9) Write a program which uses INT and Timer2 interrupts to play a game of Hungry-Hungry Hippo

- The game has three players: A, B , and C
 - Player A presses RB0
 - Player B presses RB1
 - Player C presses RB2
- The game starts when someone presses their button. Once pressed
 - All player scores are reset to zero and
 - A 10 second timer starts (controlled with Timer2)
- When the game is on, INT interrupts count how many times each player presses their button
 - Rising edge interrupts
- Once the game is over (10 seconds runs out), you quit counting button presses.
- As the game is running, display
 - The scores for player A, B, and C, and
 - The time remaining in the game with a resolution of 1ms
- 4) Write a flow-chart for this program
 - note: you should have five flow charts: one for the main routine, one for each interrupt
- 5) Write the corresponding C code
- 6) Validate your code
 - Pressing a button starts the game (scores are reset to zero, time is set to 10.000 seconds0
 - When the game is on, pressing each player's button scores a point
 - Timer2 is running at 1ms (500Hz is output on a pin if you toggle it inside the Timer2 interrupts)

Fun with Hungry-Hungry Hippo:

7) Determine the 90% confidence interval for how many points you score when playing the game

- Play two or more games (population A)
- Find the mean and standard deviation of your score
- Determine the 90% confidence interval using a student-t test.
- 8) Collect a second set of data (use your off-hand, have someone else play the game, etc.)
 - Determine the 90% confidence interval for this data set (population B)
- 9) Determine probability that A will beat B
 - The next time you play (individual)
 - Over a 1000 game match (population)