Kyle English
SENG 5831

Lab 1

Assumptions:

- Toggle int input is in milliseconds
- Toggle int is for the whole period. ie. full cycle time the led is on once AND off once
- Toggle Count increments anytime the led turns on OR off (so 120 counts at 1HZ for an LED)

1. (input 1000ms) Feel pretty good about my results. After one minute using the for loop to toggle the led my counts were: Red - 60, Yellow - 119, Green - 122. It's difficult to use the menu because the for loop is thread blocking so using the menu would be at best delayed.

2. (input 1000ms) Still fairly good about my results. The Red interrupt you can't toggle exactly to 1ms so it makes sense that it's off by a little bit. After 60 seconds, the toggle counts were: Red - 118, Yellow - 120, Green: 122. Since that's really just off by one if my toggle was counting to 60, I feel good about my results.

3. (input 1000ms) For this one, I'm modifying the input to make it what you meant. If you input 500ms, my yellow led would want to trigger every 250ms which isn't possible with the 100ms interrupt. Busy wait in Green Results: Red - 108, Yellow - 119, Green - 122. Busy wait in Yellow Results: Red - 16, Yellow - 120, Green - 123. These results make sense. With the busy wait in the Green Compare Match Interrupt (which fires once a second in this instance), so the interrupt blocks 90 out of 1000 ms. Depending on the timing of the Green interrupt, this will either block the yellow interrupt one out of 10 times, or none (in this case it was none). This will block the Red interrupt 9 out of 100 times which is roughly what we saw in the results. With the busy wait in the Yellow Interrupt (which fires once every 100ms), is then blocking 90 out of every 100ms (or 9 out of 10) which doesn't block the green or yellow interrupts at all, and only blocks the red one. It blocks the red one 9 out of every 10 times the interrupt fires, so the red value is roughly cut down by 9.

4. (input 1000ms) Busy wait in Green Results: Red - 106, Yellow - 118, Green - 123. Busy wait in the Yellow Results: Red - 0, Yellow - 114, Green - 123. With the busy wait in the Green (runs once a second) so the interrupt blocks 110 out of 1000ms. The red toggle dips a bit and the yellow may have dipped ever so slightly, but not much. With the busy wait in the yellow, the green fires normally no problem, but the Red doesn't get a chance to fire since once the yellow interrupt is finished running, it has another interrupt fired already since the yellow fires every 100ms but now takes 110ms+ to run. This doesn't affect the green led but also renders the menu unusable.

5. (input 1000ms) Busy wait in Green Results: Red - 60, Yellow - 73, Green - 122. Busy wait in the Yellow Results: Red - 0, Yellow - 24, Green - 122. With the busy wait in the Green, it runs for 510 out of 1000ms and so it cuts down roughly half of the red and yellow toggles. With the busy wait in the yellow, once again the red doesn't get a chance to fire. Since the yellow fires every 100ms but now runs for 510ms+, it cuts down the number of yellow toggles by a factor of 5. The green is unaffected.

6. (input 1000ms) Busy wait with sei() in Green Results: Red - 60, Yellow - 120, Green - 121. Busy wait with sei() in Yellow Results: Red - 0, Yellow - 118, Green - 120. With the busy wait and the sei() in the green, the yellow is now unaffected because it can interrupt during the green interrupt. The red is affected, but only because the toggling of the light is in the while loop and not in the interrupt itself. Since the green is blocking for 510 out of 1000ms, the Red toggle is cut in half because the while loop gets run half as often. With the busy wait and the sei() in the yellow, the yellow and green remain unaffected, but once again the red doesn't toggle. This is the same as what happened with the green, except now the yellow actually interrupts itself and the while loop never gets a chance to run, so the red led doesn't toggle.