LAB 4 – 3300L

Fall 2024 / Dr. Van Blerkom

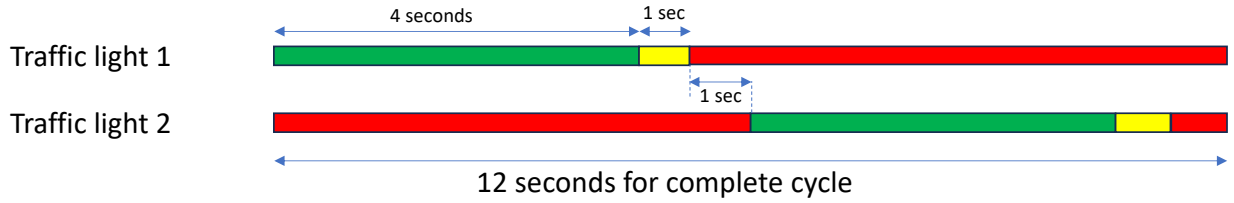
For this lab, we will build a traffic light controller with a crossing-walk timer. We will use the two tri-color LEDs on the Digilent board to indicate the state of the two traffic lights, and we will also display the walk timer on the 7-segment display.

The specifications for the traffic light are as follows:

1. Traffic light 1 should be green for 4.0 seconds
2. Then traffic light 1 should turn yellow for 1.0 seconds
3. Then both traffic lights should be red for 1.0 seconds
4. Repeat 1 through 3 for the traffic light 2

Of course, while one traffic light is green or yellow, the other traffic light should be red.

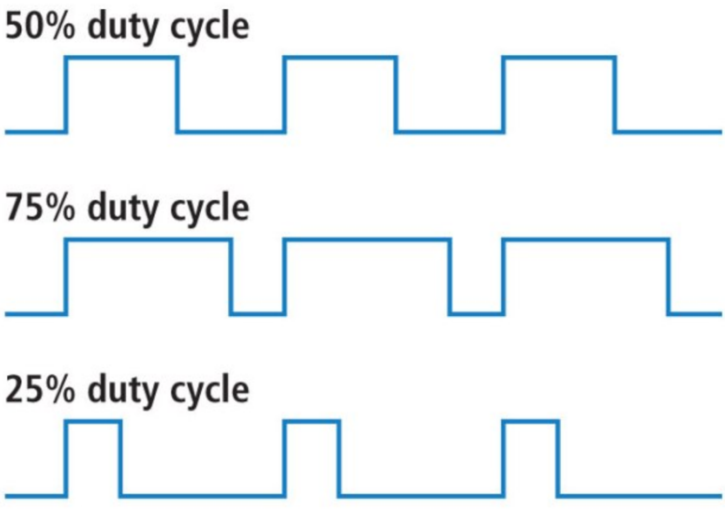
The timeline should look like this:



The 7-segment display should display the seconds and tenths of seconds remaining before the other light turns green, to show pedestrians how much time is left to cross the road. So, the display will start at 6.0 seconds when the light changes, and will then countdown to 0.0, and repeat again.

The tri-color LEDs contain three colors that can be driven independently – red, green and blue. To create yellow, we need to turn on red and green at the same time. Also, we want to adjust the brightness of the LEDs by using a PWM (pulse-width modulated) signal and adjusting the duty cycle of the signal. (If we just turn them on a full power, they will be too bright, and the colors are not as clear.) Use the following table for the PWM output to drive the LEDs:

Color	Red LED	Green LED	Blue LED
RED	25% PWM	0	0
YELLOW	12.5% PWM	12.5% PWM	0
GREEN	0	25% PWM	0



50%, 75%, and 25% Duty Cycle Examples

https://learn.sparkfun.com/tutorials/pulse-width-modulation/all

The Github assignment repository will contain starter code with the module to create PWM signals that you can use to drive your LEDs. It will also contain a module that will create a pulse every 0.1 seconds. You can use this pulse to enable a counter to keep track of the time from 0 to 12 seconds. From the counter value you can decide which lights should be set to which color, and what value to output for the walk timer.

You can reuse your modules from earlier labs to drive the seven-segment display and convert the binary counter value to a decimal value to output the walk timer.