

CPSC 359 – Winter 2022
Assignment 1
Traffic light control
Due: January 28th @ 11:59PM
Weight: 14% of your final mark
Maximum points: 100

Objective: In this assignment, you will design a circuit that simulates a traffic light control for cars and pedestrians. In the end you will have a system that runs on a clock that will control the flow of the system.

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Background:

A traffic light control problem concerns building a two set of interconnected traffic lights, one for cars attempting to pass through the intersection and the other signals for pedestrians if they can cross or not. The traffic light for the cars consists of three states/colors (Green, Yellow and Red) shown in Figure 1, while the light states for the pedestrian is shown in Figure 2. If the initial state of the system is green for the cars light, then it will remain green for 5 clocks/ticks before turning into yellow and remains in yellow for 2 ticks. After that, the car traffic lights will turn into red. Only when the cars light is in red, the pedestrians lights turns into green. The red light for cars will be for 4 ticks while the pedestrians lights will stay for three ticks before flipping into the red state.

We want to design a sequential circuit for the traffic light controller.

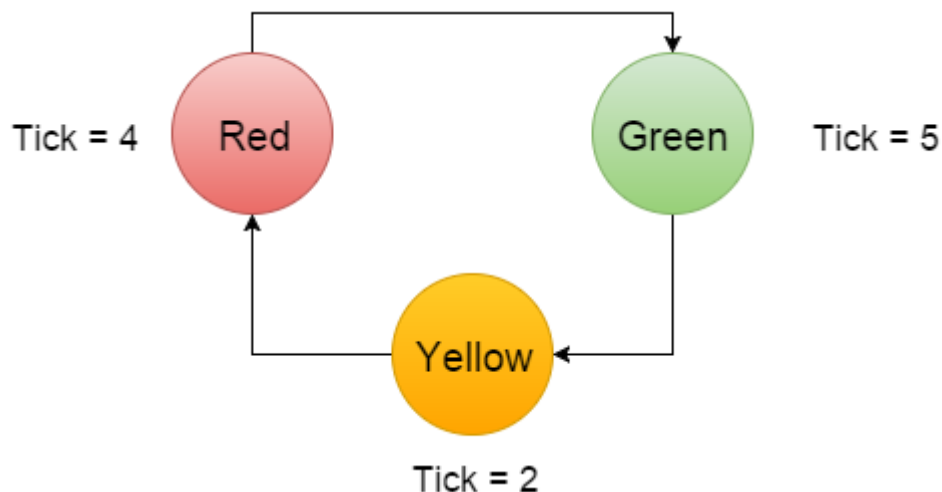


Figure 1. Cars Traffic Light States



Figure 2. Pedestrian Lights States

Rule:

- If the pedestrians light is green then the cars light is red

Components:

- **LED:** You can use the built-in LED component available in Logisim to simulate the traffic lights color.
- **Lights controller:** Build a light controller managing the states of the traffic lights for both pedestrians and the cars as discussed above.
- **Lights counter:** Counts from 0 to 11 (eleven) adding one at a rising edge of a clock, the output is in the form of 4-bit binary number as shown. Reset to 0000 (0) when the counter reaches 1011 (11).

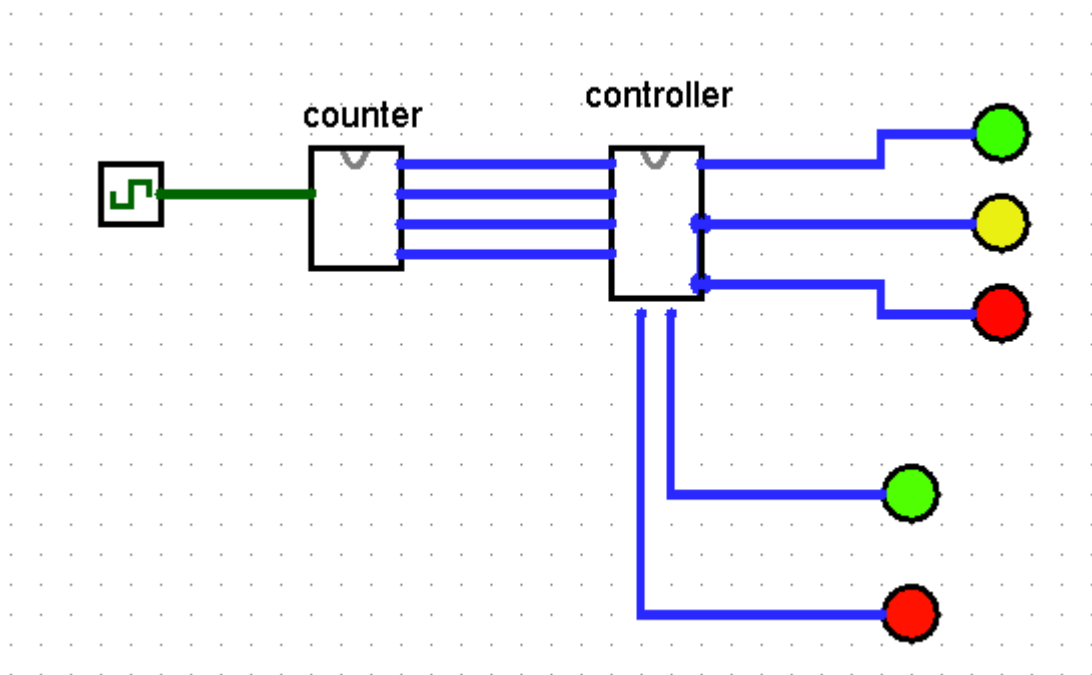


Figure 3. Circuit components

Notes:

- ✓ You will build the **states of the lights** using a sequential circuit (Finite State Machine)
- ✓ All steps for creating the **traffic light controller** must be reported in a pdf report.
- ✓ Using the available components in Logisim is not permitted except for wiring, gates, clock and **LED**.

Deliverables:

1. Design and implement the corresponding circuit in Logisim.
2. Use building blocks to create the corresponding components (Your design should be modular).
3. A description of all steps of building the **counter** and the **traffic light controller** must be included in a PDF report. These include the truth tables, the BSPs, and the minimization steps.

Marking Guide:

Lights controller	40
4-bit counter	25
Using Modules	12
Labeling	7
Building Circuit	8
Satisfying the rules	8
Total	100

Teams: You are advised to work with another student in class to complete the assignment, but you are not required to do so. Peer evaluation in teams may be conducted.

Submission: Submit your pdf report and the .circ file to the appropriate dropbox on D2L. Each team needs to make one submission only.

Late Submission Policy: Late submissions will be penalized as follows:

-12.5% for each late day or portion of a day.

Hence, no submissions will be accepted after 8 days (including weekend days) of the announced deadline

Academic Misconduct: Any similarities between submissions will be further investigated for academic misconduct. Your final submission must be your team's original work. solution sharing outside your team by any means is prohibited, including looking at someone else's paper or screen and reading out code. Any re-used code of excess of 5 lines in C and MAL (5 MAL instructions) must be cited and have its source acknowledged. Failure to credit the source will also result in a misconduct investigation.

D2L Marks

Marks posted on D2L are subject to change (up or down).