

Project 1

Due Date: October 16@10:59:59AM

Project Description

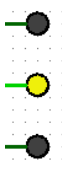
Finally, putting some of your newfound knowledge to practical use! You will use **AND**, **OR**, and **NOT** (inverter) gates as well as logic and the system clock to simulate a traffic light. Do not use other gates (**XOR**, **NAND**, etc), as they will not be needed.

Requirements

You are to create a circuit using Logisim that will simulate a traffic light. To do this, you will use **AND** and **OR** gates as well as inverters. The system clock will run the simulation automatically. The circuit should simulate a four-way intersection with four traffic lights, two for a road running North/South and two more for a road running East/West.

Some details:

- The circuit should display the four traffic signals with appropriate red, yellow, and green lights. For example, here is one signal with the yellow light on:



- The colored lights can be made with LEDs. These are found under the **Input/Output** menu option. Change the colors using the dialog box that is displayed in the left pane.
- The lights should switch from green to yellow to red and then back to green.
- Two of the traffic signals will have the same lights on at the same time. This is for the opposite direction of travel on the same road.
- The signals on the two roads should cycle as follows:

N/S Road	E/W Road
Green	Red
Yellow	Red
Red	Red
Red	Green
Red	Yellow
Red	Red

Other combinations, such as Yellow/Yellow or Yellow/Green, should not happen, as those could result in a nasty crash.

- Use the system clock to run the simulation automatically. There are options under the **Simulate** menu that allows you to control the clock.

- Clean up your completed circuit so that it is neat and so that one can clearly see that it is a simulation of a road intersection.

Notes

So how do you go about doing this?

Start by making just **one** traffic light (traveling North, for example). In order to do this, you need two bits, which is large enough for four combinations. We only need three combinations: red, yellow, and green. Assign a code to each color; for example, 00 is green, 01 is yellow, and 10 is red. Now come up with a Boolean expression for when given two bits, the proper light comes on. Then wire this up with two input bits. Once you have one working traffic light for one road you can add additional wires to make a second one on that same road (traveling South).

The next step is to change the input to clocks. This will automatically toggle ones and zeroes for the input.

Following similar steps, add in the traffic signals for the other, East/West road. Now you may need three bits of input, because you have six different possible outcomes (see chart, above).

Project Submission

Submit your final circuit as a `.circ` file in Canvas by the due date. Remember that you can submit it up to a day late for a 15% penalty.

Note that this is due the week of October break. Plan your time accordingly.

Learning not accompanied by pain will be forgotten.
– Rich Pattis, Carnegie Mellon, at SIGCSE 3/2/06