

One Way Traffic Controller

In this Lab assignment you will design and emulate a traffic controller at the intersection of two One-Way streets *A* and *B*, as shown in Figure 1, under the following requirements:

- The traffic is controlled by a pair of Red and Green lights on each street.
- No left or right turns are allowed on either street.
- For some reason, there are no yellow lights installed.
- Initially, the lights were supposed to turn around every 60sec. However, a 10sec delay RED was imposed for safety reasons.
- To alleviate the lack of yellow lights, a 10sec pale GREEN was also required for warning.
- Note the 10sec delay RED is extra, whereas the 10sec pale GREEN is within the green cycle.
- There is also a turn ON and turn OFF signal for maintenance. The turn ON signal will initialize the controller, start on Street *A*, with Light *B* RED. The turn OFF signal should be safe, meaning it should terminate the controller at the end of its current cycle, perhaps freezing two Lights to RED, or turning OFF all lights.

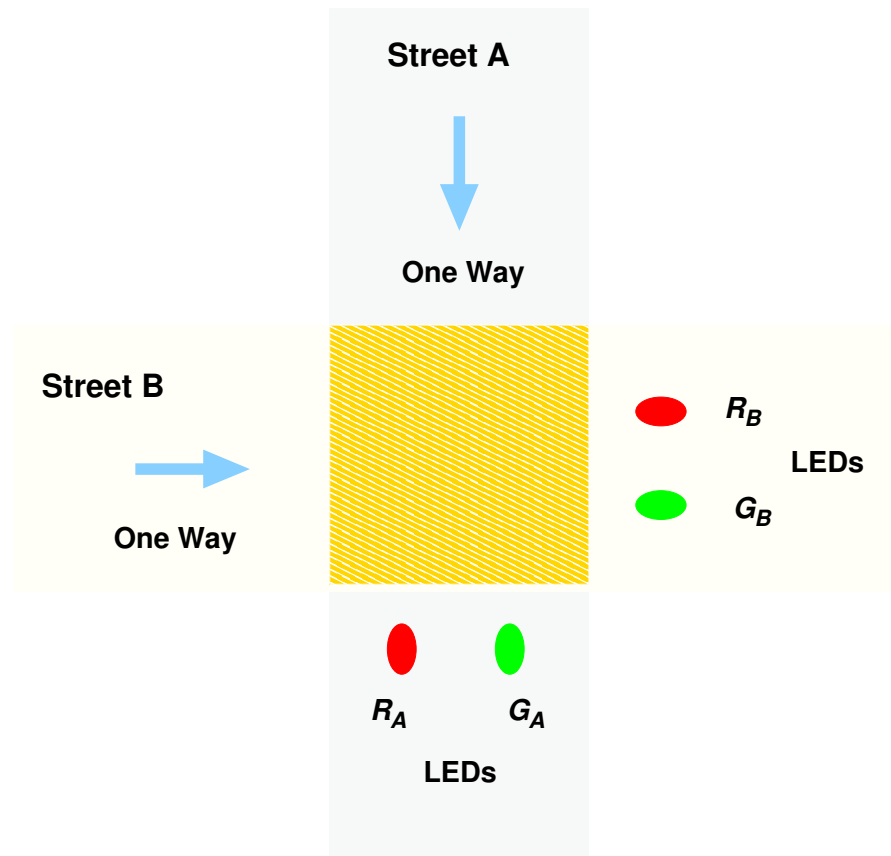


Figure 1: Intersection Lights for the One Way Streets A and B

If R_A , R_B , G_A , G_B denote boolean variables corresponding to the ON/OFF status of the traffic signals, then always

$$R_A \oplus G_A = 1 \quad R_B \oplus G_B = 1 \quad \text{and} \quad G_A \vee G_B = 0$$

A snap shot of the traffic controller timing diagram is shown in Figure 2, where the horizontal axis indicates relative timings and the vertical axis relative light brightness.

You will use the Arduino and Raspberry pi boards to implement the 1-way traffic cotroller. Four LED's, arranged in GREEN - RED pairs, will represent the traffic lights on streets A and B, respectively. You should connect the LEDs on available Arduino pins as appropriate.

You should implement the turn ON/OFF signal using a switch connected to an Arduino pin. You could also possibly use a signal coming from the Raspberry pi to terminate the controller.



Figure 2: Timing Diagram of Traffic Control

Approach

1. Describe the traffic controller functionality using well documented flow diagrams.
2. Design and code arduino sketches (codings) to implement the controller.
3. Verify, test and demo your design.
4. Your assignment report should provide a brief but complete narrative of your traffic controller design.