One Way Traffic Controller with Pedestrians

In this part of the Lab you will upgrade the traffic controller of Part 1 by including pedestrian crossings which, due to the location of the intersection, may not occur frequently. A pedestrian waiting on the sidewalk of either street, A or B, could press a controller button any time in order to be able to cross the corresponding street, Figure 3.

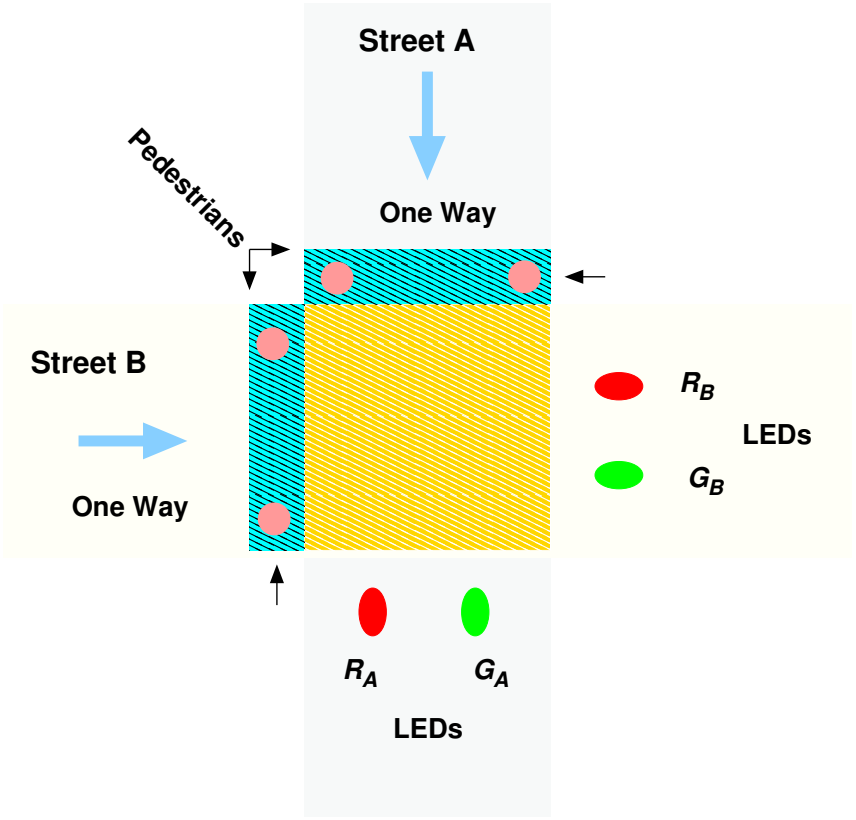

Figure 3: Intersection Lights for the One Way Streets A and B, including Pedestrians

- To modify the controller, the following rules should be followed for safety:

– A pedestrian crossing lasts 60secs; during this time a pedestrian light on the corresponding street A or B is on, and will be turned off afterwards.

– One pedestrian request from either street should be handled at a time, first-come-first-served.

– If there are simultaneous requests from pedestrians on both streets, then priority is given to pedestrians on street A.

– During pedestrian crossing, new requests on the same street are ignored.

– Upon pedestrian request on street A (or B), the controller completes its current red or green light cycle, then turns on the pedestrian light and, at the same time, stops traffic on street A (or B) for 60secs.

– During pedestrian crossing on street A (or B), traffic on the other street B (or A) continues as usual.

– After crossing on street A (or B), the controller will return street A (or B) to a safe traffic state, i.e. synchronized with the traffic state on street B (or A).

You should use two dip switches for the pedestrians on each street. You should connect the switches on an Arduino hat, available in the Lab, and the hat itself should be plugged on top of the Arduino board. Also, you should be able to use the built-in LED of the Arduino Uno as the pedestrian light, should be OK as only one crossing is allowed at a time.

Approach

1. Validate intuitively (not formally) that the above pedestrian crossing rules are safe.
2. Describe the modified controller by timing diagrams which include traffic on streets A and B, and the pedestrian crossings.
3. Modify your Arduino sketches (programs) to implement the upgraded traffic controller
4. Verify and test your design.