The American University in Cairo
Computer Science and Engineering Department

CSCE 2301/230 – Project 2 - Spring 2019

In this project, you are required to implement a traffic light controller for an intersection between a main road and a side road. Both roads have Red, Yellow and Green traffic light. Pedestrians have the option of pressing a "WALK" button to turn all lights Red and cause a single walk light to illuminate. Moreover, there is a sensor on the side road which tells the controller if there are cars still on the Side road, as shown in the figure below. You may assume that the 4 walk buttons placed at each street corner are hooked into the traffic light controller using a wired-OR. That's why you may assume that the controller only needs a single input called "WALK-REQUEST".
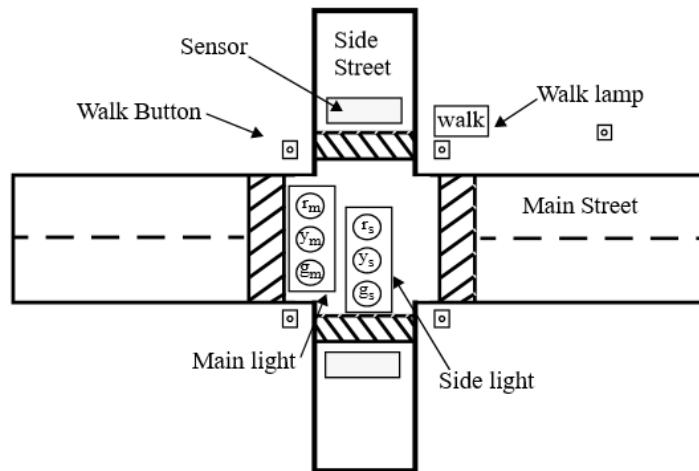

Figure 1: Diagram for intersection with corresponding lights.

Table 1: Default Timing Parameters.

Interval Name	Symbol	Parameter Number	Default Time (sec)	Time Value
Base Interval	t_{BASE}	00	6	0110
Extended Interval	t_{EXT}	01	3	0011
Yellow Interval	t_{YEL}	10	2	0010

The sensor is placed near the intersection and remains constantly high if several cars pass over it, rather than quick pulses, provided the cars are close enough together. This input is named "Sensor".

Traffic lights are timed on 3 parameters (in seconds), the base interval (t_{Base}), the extended interval (t_{Ext}), and the yellow light interval (t_{Yel}). The default values listed in Table 1 are to be loaded into registers in the FPGA on reset.

The operating sequence of this intersection begins with the Main street having a Green light for 2 lengths of t_{Base} seconds. Next, the main lights turn to Yellow for t_{Yel}, and switches to the side street green light. The side street is green for t_{Base} and its yellow is held for t_{Yel}. Whenever a stoplight is green or yellow, the other street's stoplight is red. Under normal circumstances, this cycle repeats continuously.

The controller can deviate from the typical loop by 2 ways. First, a Walk button allows pedestrians to submit a walk request. The internal Walk Register should be set on a button press and the controller should service the request after the main road yellow light by turning all lights to red, and the walk line to on. After a walk of t_{EXT} seconds, the traffic lights should return to its usual routine by turning the side street green. The walk button should be ignored during the walk service.

The second deviation is the traffic sensor. If it is high at the end of the first t_{Base} length of the main street green, the light should remain green only for an additional t_{EXT} seconds, rather than the full t_{Base}. Also, if the sensor is high during the end of the side street green, it should remain green for an additional t_{EXT} seconds.

Guidelines:
- Work in a group of 2-3 students.
- Deadline: May 17th , 2019, 11:59PM.
- Submission: Email (subject: DDI Project 2 Submission) to ael and your TA. Your email must list the members of the group.
- You should share : - Your working program source files. - Report of at most three pages (other than the cover) to discuss your program design, and report the problems in your program (if any).