Aufgabe 4:   Ampelsteuerung

(8 pts (+6 conceptual exercise), submission deadline Wed. 12/3/08 8:00pm)

Develop a controller application for the traffic lights of a pedestrian crossing in a file *ampel.c*. The lights directed towards the cars is represented by the leds RED0, YELLOW0 and GREEN0, the lights for the pedestrians are represented by the leds RED1 and GREEN0 (yellow not used). The led BLUE1 shall signal the pedestrians, that a switching request has been accepted and that the lights will change as soon as possible. The control shall function as follows:

- The green phase of the car lights lasts for at least 10 seconds. If a switching request occurs before the minimum green phase has elapsed, the switching will be delayed until passing of the 10 seconds, otherwises the lights will change immediately.

- A switching request is issued by pressing BUTTON0. The led BLUE1 shall be activated to acknowledge the request unless the button is currently deactivated. Upon start of the switching process, this led will be turned off. BUTTON0 is deactivated starting with the receipt of a switching request until the pedestrian lights have turned red again.

- During the switching process, the car lights first turn red. After a delay of 2 seconds the pedestrian lights turn green. The green phase of the pedestrian lights shall last for exactly 5 seconds, then the switching process will revert until the car lights show green. Intermediate states shall correspond to those of a usual traffic light.

- The intermediate states *yellow* and *yellow-and-red* of the car lights shall be shown for 500ms each.

- During idle times the microcontroller shall be put in a sleep mode. BUTTON0 shall be configured such that an external interrupt will wake the microcontroller upon press of the button. Running alarms will also wake the microcontroller. Also consider, that timer interrupts may wake the microcontroller without the actual expiry of an alarm. Configuration of the timer is handled by the timer module, and the resolution of timer interrupts is not known to the application.

- During green phases of either lights, the (minimum) remaining time of the green phase shall be displayed on the 7-segment displays in steps of a second.

- You may use the modules led and 7seg of the SPiCboard library in addition to the functions `sb_timer_setAlarm` and `sb_timer_cancelAlarm` of the timer module.