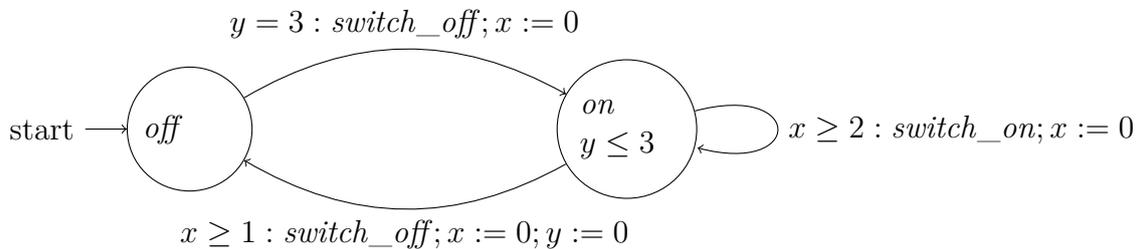


“Model checking”

Prof. Dr. Marcel Kyas

Assignment 7, January 13, 2010

Exercise 25 (12 Points) Consider the timed automaton *LightSwitch* displayed below.



1. Determine the transition system $TS(\text{LightSwitch})$. Only include delay transitions of maximum duration.
2. Determine the region transition system $RTS(\text{LightSwitch}, \text{true})$.
3. Check whether *LightSwitch* is time-lock free.
4. Check whether *LightSwitch* is non-zeno.

Exercise 26 (6 Points) The logic of UPPAAL is somewhat restricted in its expressiveness. First, to express timing properties appropriate clocks need to be present in the system of timed automata to verify. Second, negation is not allowed at the level of path formulae. To express properties involving such features the given system of timed automata has to be augmented either by adding suitable clocks with invariants and guards or by adding a separate observer automaton with a distinguished location indicating violation of the property (the so-called “bad state”) and extra communication with the system to verify.

Formalise the following properties in the logic of UPPAAL, possibly preparing the system to verify as outlined above:

1. The location ℓ is never visited for more than 5 seconds.
2. The data variable v has never the value 3.
3. There exists a path in which first the location ℓ_1 and then the location ℓ_2 is visited.
4. There is *no* path in which first the location ℓ_1 and then the location ℓ_2 is visited.
5. There exists a path in which first the location ℓ_1 is visited for 2 seconds and then the location ℓ_2 for 3 seconds.

Handing in this Assignment Please submit your hand-written solutions on paper no later than January 20, 2010, 18:00 (before the tutorial).

The models shall be placed in a directory that carries the last name of one of the group members. Add a `README` file, or better, a `Makefile`, that explains or automates the modelling and checking procedures. Explain, how to interpret the results of model checking in an accompanying PDF or ASCII file.

Put all this into a tape archive that shares the name with the directory and send it by e-mail to marcel.kyas@fu-berlin.de. Use “Model checking 09 Series 8 *your last names*” as the subject line.