Assignment 8 – Timed automata and TCTL

Exercise 1 (6 points)

A fancy desktop lamp has no on-off switch, but a metal stand. If the user touches the stand, the lamp will turn on; if the stand is touched twice in quick succession, the lamp will turn off. If the user touches and holds the stand, the lamp will behave as follows: If it is off, it will turn on at the same volume at which it was last turned off. Then, it will increase the light intensity in steps of 10% until it reaches its full capacity; from there, it will decrease the intensity, again in steps of 10%, until it is off.

a) Download and install the UPPAAL model checker (http://www.uppaal.org/). You have to register for that. Take a look at the examples provided with the distribution.

b) Construct a distributed UPPAAL model consisting of two timed automata, one for the stand and one for the lamp. (Note that the informal specification above leaves certain behavioral aspects undefined; if you spot such an issue, make a reasonable engineering assumption, document it, and continue.) Simulate your model to assure that it behaves as expected.

c) Write some CTL formulas stating the correctness of your model, and verify them with UPPAAL.
Consider the following six timed automata:

Give for each automaton a TCTL formula that distinguishes it from all other ones. It is only allowed to use the atomic propositions $a$, $b$ and $c$ and clock constraints.