Quantitative Verification Session 2

November 2, 2017

Timed Automata

Region Construction

Exercise 1. Draw the region automaton simulating the timed automaton in Figure 1.

For your reference, the semantics of the region automaton are given below. Let $\mathcal{R}$ be the set of regions, ℓ, ℓ' be locations in TA and $R, R' \in \mathcal{R}$. We use g to denote clock constraints, a to denote an action and $Y \subset \mathbb{X}$ to denote the set of clocks which are reset.

- there is a transition $(\ell, R) \xrightarrow{a} (\ell', R')$ whenever there exists a transition $\ell \xrightarrow{g,a,Y} \ell'$ in the TA with $R \subseteq \llbracket g \rrbracket$ and a transition $R \xrightarrow{Y} R'$ in the region graph

- there exists a transition $(\ell, R) \xrightarrow{\varepsilon} (\ell, R')$ whenever there exists transition $R \xrightarrow{\varepsilon} R'$ in the region graph
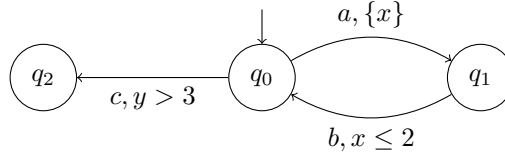

Figure 1

Modeling Practice

Exercise 2. Consider an autonomous elevator which operates between two floors. The requested behavior of the elevator is as follows:

1. The elevator can stop either at the ground floor or the first floor. When the elevator arrives at a certain floor, its door automatically opens. It takes at least 2 seconds from its arrival before the door opens but the door must definitely open within 5 seconds.

2. Whenever the elevator's door is open, passengers can enter. They enter one by one and we (optimistically) assume that the elevator has a sufficient capacity to accommodate any number of passengers waiting outside.

3. The door can close only 4 seconds after the last passenger entered. After the door closes, the elevator waits at least 2 seconds and then travels up or down to the other floor.

Use the actions 'up' and 'down' to model the movement of the elevator, 'open' and 'close' to describe the door operation and the action 'enter' which means that a passenger is entering the elevator. Model the elevator in UPPAAL as a timed automaton.

Source: http://www.ru.is/kennarar/luca/GSSI/TUTORIALS/tutorial-ta1.pdf