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Hand in until December 13th, 2018
15:59 via the post boxes
Discussion: December 17/18th, 2018

Tutorial for Cyber-Physical Systems - Discrete Models
Exercise Sheet 8

The goal of this sheet is to become familiar with the notion of a linear-time property as such (and, for the most part, not in relation to an already given transition system, as in the previous exercise sheet).

Exercise 1: Linear-Time Properties

Assume $AP = \{a, b\}$. For each of the following properties P,

(a) formalize P as a set of traces using set comprehension
(for example: "always a" can be formalized as $\{A_1 A_2 A_3 \cdots \mid \forall i.\, a \in A_i\}$),

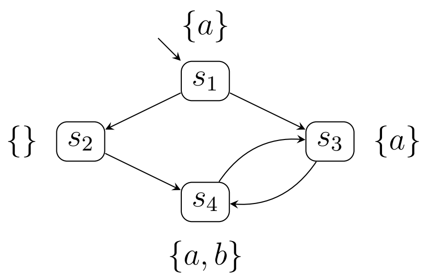
(b) formalize P as a set of traces using ω-regular expressions
(for example, $(\{a\} + \{a, b\})^\omega$),

(c) give an example of a trace that satisfies P,

(d) give an example of a trace that does not satisfy P,

(e) give all states of the transition system below that satisfy P, and

(f) state whether or not the transition system below satisfies P.



(P_1) Always (at any point of time) a or b holds.

(P_2) Always (at any point of time) a and b holds.

(P_3) Never b holds before a holds.

(P_4) Every time a holds there will be eventually a point of time where b holds.

(P_5) At exactly three points of time, a holds.

(P_6) If there are infinitely many points of time where a holds, then there are infinitely many points of time where b holds.

(P_7) There are only finitely many points of time where a holds.