Model Checking WS 2015: Assignment 5

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Due 17.12.2015

Exercise 25

Let A_1, A_2 and A_3 be LTS defined as follows:

- $A_1 := (\{1,2\}, \{1\}, \{a_1, t, s\}, \{(1, a_1, 2), (2, t, 1), (1, s, 2)\})$.
- $A_2 := (\{1,2,3\}, \{1\}, \{a, b, t\}, \{(1, b, 2), (2, a, 3), (3, t, 1)\})$.
- $A_3 := (\{1,2\}, \{1\}, \{t, s\}, \{(1, s, 2), (2, t, 1)\})$.

Determine the set of local and global symbols for A_1, A_2, A_3.

Exercise 26

Given the following two LTS:

$A_1 = (\{1,2\}, \{1\}, \{a, t\}, \{(1, a, 1), (1, t, 2), (2, t, 1), (2, a, 2)\})$

$A_2 = (\{A, B\}, \{B\}, \{b, t\}, \{(A, b, A), (B, b, A), (B, t, B), (A, t, B)\})$

Draw the LTS for $A_1 \,|||\, A_2$.

Exercise 27

Let A, B and C be LTS defined as follows:

- $A := (\{1,2,3,4\}, \{1\}, \{a,t,s\}, \{(1,a,2),(2,t,3),(3,a,4),(4,s,4)\})$.
- $B := (\{1,2,3\}, \{1\}, \{b,t,s\}, \{(1,b,2),(2,t,2),(2,b,3),(3,s,1)\})$.
- $C := (\{1,2,3\}, \{1\}, \{a,b,t,s\}, \{(1,a,1),(1,b,1),(1,t,2),(2,a,2),(2,b,2),(2,s,3)\})$.

Given LTS A, B and C as defined above, $(A \mid\mid B) \times C$ describes a model checking problem where C is the "checker automaton".

Draw the state graph G for $(A \mid\mid B) \times C$ *without* applying partial order reduction but – as usual – *with* on-the-fly generation of reachable states.

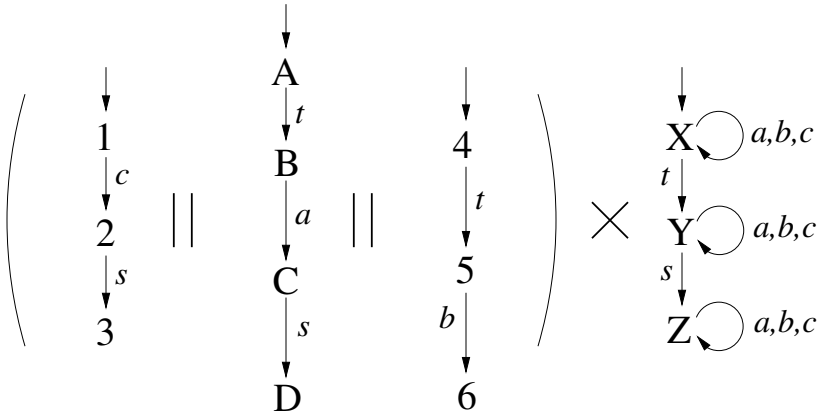
Exercise 28

Given the state graph G for $(A \mid\mid B) \times C$ from Exercise 28.

a) Find all traces of *maximum* length in G.

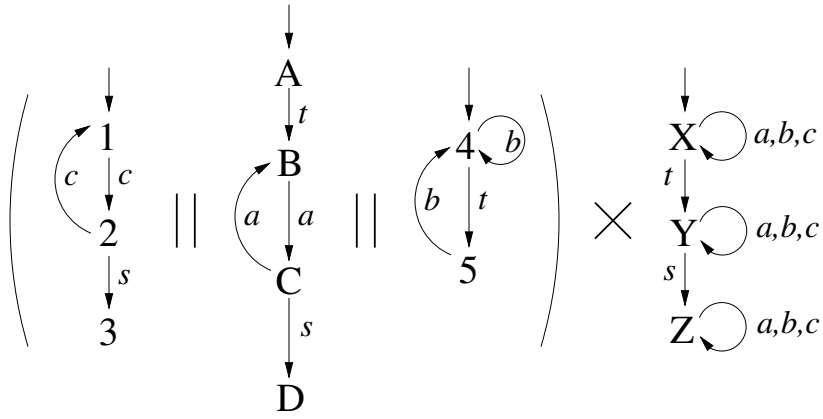
b) Which of the traces of a) are locally-equivalent? How many equivalence classes are there (see definition on slide 96)?

Exercise 29



For the model checking problem given above, perform reachability analysis *with* on-the-fly generation of states *and* partial order reduction and draw the resulting LTS. If there are multiple choices for local expansion, then choose the *rightmost* among all components in the asynchronous composition which are ready for local expansion.

Exercise 30



For the model checking problem given above, perform reachability analysis *with* on-the-fly generation of states *and* partial order reduction and draw the resulting LTS. If there are multiple choices for local expansion, then choose the *rightmost* among all components in the asynchronous composition which are ready for local expansion.