SS 2014 04.06.2014

Exercises to the lecture
Concurrency Theory
Sheet 7

Roland Meyer, Viktor Vafeiadis Delivery until 10.06.2014 at 12h

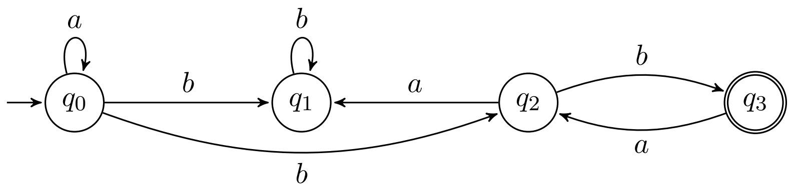
Exercise 7.1 (Bounded round TSO-reachability)
Describe the general case for the bounded round TSO-reachability problem that was described in the lecture: Given a concurrent program P with $n \in \mathbb{N}$ threads and a bound $k \in \mathbb{N}$ on the number of rounds that each thread can make, explain how to construct a program P' so that the following holds:

A program counter pc is TSO-reachable in P iff pc is SC-reachable in P'.

Note: you do not have to give a formal construction. It is sufficient to list the additional global variables needed, explain their meaning and how they are used by P'.

Exercise 7.2 (Donward-closure of regular languages)

a) Compute $\mathcal{L}(A)\downarrow$ for the following automaton A:



b) Give a general procedure that computes $\mathcal{L}(A)\downarrow$ for a finite state automaton A.

Exercise 7.3 (Conditionals in lossy channel systems)
We extend lossy channels with a transition that, given a channel c and a word $w \in \Sigma^*$, checks if c contains w as a subword:

$$q_1 \xrightarrow{\text{check } w \text{ in } c} q_2$$

We extend the transition relation to $\rightsquigarrow$ by adding the following rule:

$$(q_1, W) \rightsquigarrow (q_2, W) \qquad \text{if} \qquad q_1 \xrightarrow{\text{check } w \text{ in } c} q_2 \text{ and } w \leq W(c)$$

Given an extended lossy channel system $L = (Q, q_0, C, M, \rightarrow_L)$, construct a lossy channel system $L' = (Q', q_0, C, M, \rightarrow_{L'})$ with $Q \subseteq Q'$ where the following holds for all $q_1, q_2 \in Q$:

$$(q_1, W) \rightsquigarrow^* (q_2, W') \text{ in } L \qquad \text{if and only if} \qquad (q_1, W) \rightarrow^* (q_2, W') \text{ in } L'.$$

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