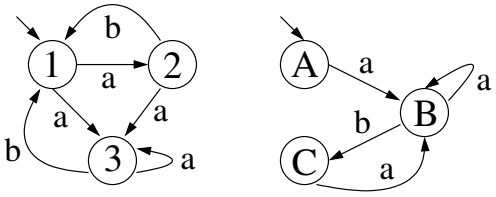
Model Checking WS 2011: Assignment 4

Institute for Formal Models and Verification, JKU Linz

Due 10.11.2011

Exercise 13

Is relation $\{(1,A),(1,C),(2,B),(3,B),(3,C)\}$ a *strong bisimulation* over the LTS shown on the right? Justify your answer.



Exercise 14

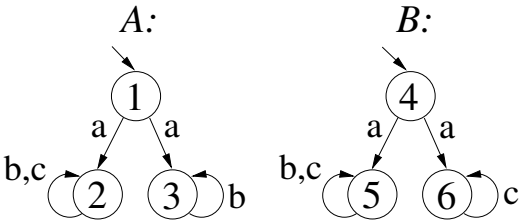
Given LTS A and B as shown on the right,...

a) ...compute the *maximal strong simulation* $\lesssim$ over $A \dot{\cup} B$.

b) ...compute the *maximal strong bisimulation* $\approx$ over $A \dot{\cup} B$.

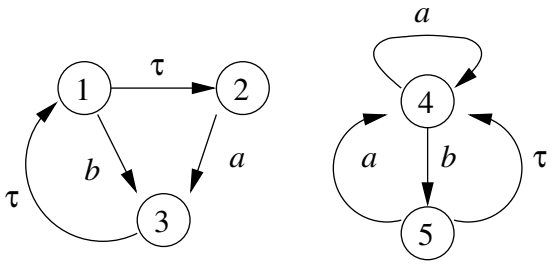
c) Check whether $1 \lesssim 4$, $4 \lesssim 1$ and $1 \approx 4$.

d) Is $L(A) = L(B)$?



Exercise 15

Compute the *maximal weak simulation* $\lesssim$ over the LTS shown on the right.



Exercise 16

Let $L := (S, I, \Sigma, T)$ be an LTS with states S. Let $\Psi : \mathbb{P}(S \times S) \to \mathbb{P}(S \times S)$ be the operator defined on slide 38, i.e. $\Psi(\lesssim) := \{(r,t) \in (S \times S) \mid r \lesssim t \text{ or } \exists s \in S : [r \lesssim s \text{ and } s \lesssim t]\}$ for relation $\lesssim \subseteq S \times S$.

a) Prove that if $\lesssim$ is a simulation then $\Psi(\lesssim)$ is also a simulation.

b) Given a relation $\lesssim \subseteq S \times S$, is $\Psi(\lesssim)$ always a transitive relation? Justify your answer.