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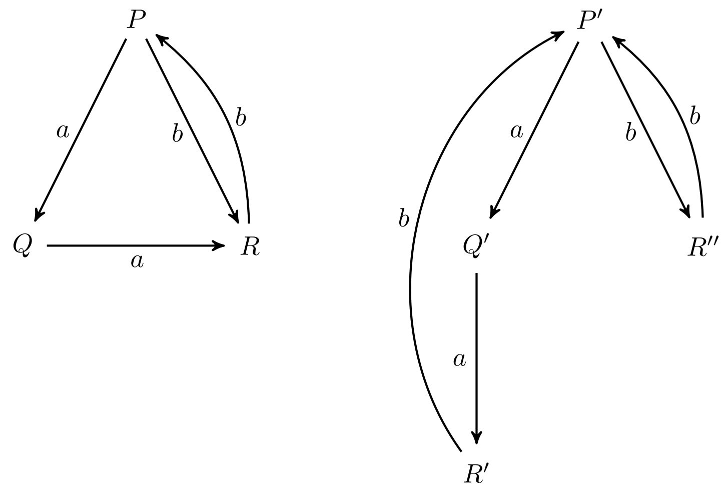
Concurrency Theory WS 2015/2016

— Series 7 —

Hand in until January 11th before the exercise class.

Exercise 1 (Strong Bisimulation) (1+1+1 Points)

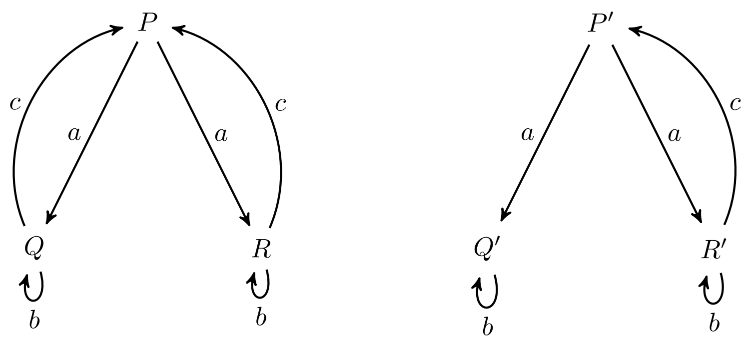
Consider the following LTS:



1. Give the smallest strong bisimulation of the above LTS.
2. Give the smallest strong bisimulation $\mathcal{R}$, such that at least $P \mathrel{\mathcal{R}} P'$.
3. Prove or disprove: $\mathcal{R}$ is an equivalence relation.

Exercise 2 (Trace Equivalence and Strong Bisimulation) (2 Points)

Consider the following LTS:



1. Show that $P' \equiv P$, where $\equiv$ denotes trace equivalence!
2. Give $\sim$! Does $P \sim P'$ hold?

Exercise 3 (CCS Congruence) (3 Points)

1. Provide an example of two processes which are trace equivalent, but not completed trace equivalent
2. Prove or disprove: Completed trace equivalence is a CCS congruence.
3. Recall the rule for sequential composition introduced in sheet 1, exercise 2. Check whether trace equivalence is a congruence for sequential composition.

Exercise 4 (Coinduction) (2 Points)

Let A be a finite set and A^ω be the set of all *infinite* sequences of symbols in A. For $w \in A^\omega$ we denote the first symbol in w by $w[0]$ and the remaining sequence by w', i.e. $w = w[0] \cdot w'$, where $w[0] \in A$ and $w' \in A^\omega$. A relation $\sim \subseteq A^\omega \times A^\omega$ is called a bismulation (on infinite sequences) if it satisfies the following property: For $u, v \in A^\omega$ it holds that if $u \sim v$ then $u[0] = v[0]$ and $u' \sim v'$.

Show for the largest bimsimulation $\sim \subseteq A^\omega \times A^\omega$ that for all $u, v \in A^\omega$, we have $u = v$ if and only if $u \sim v$ holds.