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LEHRSTUHL FÜR INFORMATIK 2
RWTH Aachen · D-52056 Aachen · GERMANY
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Introduction to Model Checking
Winter term 2013/2014

– Series 4 –

Hand in on November 20th before the exercise class or in the box in front of the chair's secretary's office.

Exercise 1 (2 points)

Let P be an LT property. Prove: $\mathit{pref}(\mathit{closure}(P)) = \mathit{pref}(P)$.

Exercise 2 (2 points)

Let LT properties P and P' be equivalent, notation $P \cong P'$, if and only if $\mathit{pref}(P) = \mathit{pref}(P')$. Prove or disprove: $P \cong P'$ if and only if $\mathit{closure}(P) = \mathit{closure}(P')$.

Hint: you may use results from the previous exercise.

Exercise 3 (4 points)

Let P and P' be liveness properties over AP. Prove or disprove the following claims:

(a) $P \cup P'$ is a liveness property,

(b) $P \cap P'$ is a liveness property.

Answer the same question for P and P' being safety properties.

Exercise 4 (2 points)

Let P denote the set of traces of the form $\sigma = A_0 A_1 A_2 \ldots \in \left(2^{AP}\right)^\omega$ such that

$$\overset{\infty}{\exists}\, k.\ A_k = \{a, b\} \quad \wedge \quad \exists n \geq 0.\ \forall k > n.\ (a \in A_k \Rightarrow b \in A_{k+1}).$$

Consider the following fairness assumptions with respect to the transition system TS outlined on the right:

a) $\mathcal{F}_1 = (\{\{\alpha\}\}, \{\{\beta\}, \{\delta, \gamma\}, \{\eta\}\}, \emptyset)$.
Decide whether $TS \models_{\mathcal{F}_1} P$.

b) $\mathcal{F}_2 = \Big(\{\{\alpha\}\}, \{\{\beta\}, \{\gamma\}\}, \{\{\eta\}\}\Big)$.
Decide whether $TS \models_{\mathcal{F}_2} P$.

Justify your answers!