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Institut für Informatik

„Real-Timed Automata“
Exercise 5

The following exercises must be submitted 07.07.2014 *before* the lecture.

1. Is the following statement correct or not? Justify your answer!
Let $(D, \leq)$ be a quasi-order, and let $A, B \subseteq D$. Then the following holds: If $\uparrow A \subseteq \uparrow B$ and $B \subseteq A$, then $A \subseteq B$.

2. Write a proof for the following claim:
Let $(D, \leq)$ be a quasi-order, and let $A, B \subseteq D$. Then the following two assertions are equivalent:
   (a) $\uparrow A \subseteq \uparrow B$.
   (b) $A \subseteq B$, *or for every* $a \in A \backslash B$ *there exists* $b \in B$ *with* $b \leq a$.

3. Consider the semantical graph $(S, \rightarrow)$ induced by a bounded one-counter automaton $\mathcal{B}$. Hence, S is the cross product of the set of states of $\mathcal{B}$ and elements in $[0, \dots, b]$, where b is the global bound of $\mathcal{B}$. Define the order $\preceq$ on S by $(q, n) \preceq (q', n')$ iff $q = q'$ and $n \leq n'$, where $\leq$ is the usual order on $\mathbb{N}$. Prove that the transition relation $\rightarrow$ is not reflexive downward-compatible with respect to $\preceq$.