SS 2018 11.04.2018

Exercises to the lecture
Algorithmic Automata Theory
Sheet 1

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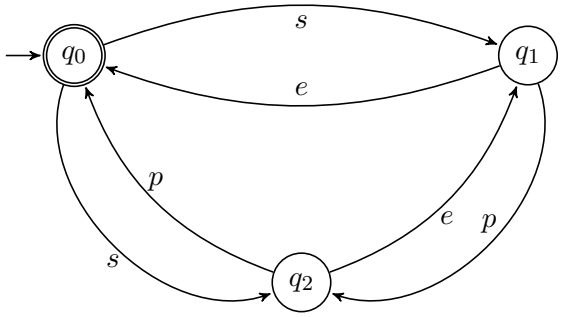
Peter Chini Delivery until 23.04.2018 at 12:00

Exercise 1.1 (Regular expression to NFA)
Transform the regular expression $a^*.b^+ \cup (a.b^*)^*$ into an NFA A without ε-transitions.

Exercise 1.2 (NFA to regular expression)
Find a regular expression for the language of the following automaton:



Exercise 1.3 (Arden's Lemma)
Consider the following extension of Arden's Lemma: If $U, V \subseteq \Sigma^*$ and $\varepsilon \in U$ then all solutions $L \subseteq \Sigma^*$ of the equation $L = UL \cup V$ are precisely the languages in the set $\mathcal{L} = \{U^*V' \mid V \subseteq V' \subseteq \Sigma^*\}$.

Prove the extension by solving a) and b) below:

a) Show that if L is a solution of $L = UL \cup V$ then $L \in \mathcal{L}$.

b) Show that every $L \in \mathcal{L}$ satisfies $L = UL \cup V$.

Exercise 1.4 (Languages and Formulas)

a) Find a WMSO-formula φ such that $L(\varphi) = \Sigma^* a \Sigma^* b^+$.

b) What is the language described by $\exists y \forall x \forall z \colon (x < y \wedge y < z) \rightarrow \neg P_a(x) \wedge P_b(y)$?

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