Applied Automata Theory (SS 2011) Out: Wed, June 22 Due: Wed, June 29

Exercise Sheet 9

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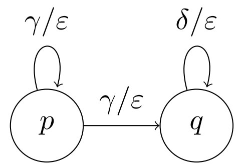

Figure 1: Pushdown system P

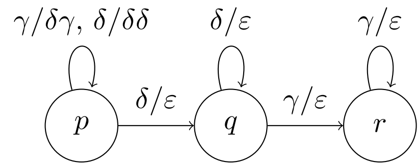

Figure 2: Pushdown system P'

Exercise 9.1

Use the algorithm from the lecture to determine the set $\mathrm{pre}^*(C)$ in the pushdown system P in Figure 1, where $C = \{(q, w) \in \{\gamma, \delta\}^* \mid |w| \text{ is even}\}$.

Exercise 9.2

Using the algorithm from the lecture, determine the set $\mathrm{pre}^*(\{(r, \varepsilon)\})$ in the pushdown system P' in Figure 2.

Exercise 9.3

In an example in the lecture, the *lazy* variant of the algorithm to compute $\mathrm{pre}^*(C)$ was mentioned. Here, in the automaton A_{i+1}, the relation $\rightarrow_{i+1} = \rightarrow_i \cup \rightarrow'$ is defined by

$$s_{q_1} \overset{\gamma}{\longrightarrow}{}' s \quad \text{iff} \quad s_{q_2} \overset{w}{\longrightarrow}_i s \quad \text{and} \quad q_1 \overset{\gamma/w}{\longrightarrow} q_2 \quad \text{and} \quad s \rightarrow_i^* s' \text{ for some } s' \in S_F,$$

where $A_i = (S, S_I, \rightarrow_i, S_F)$ and $A_{i+1} = (S, S_I, \rightarrow_{i+1}, S_F)$. Does this variant work in general? If so, explain why. Otherwise, present a counter-example.

Exercise 9.4

Using a method of your choice, determine the set of configurations from which an infinite accepting run is possible in the following Büchi-pushdown system: