TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science Institute for Theoretical Computer Science, Chair for Automata Theory

Selected Topics in Automata and Logic

Exercise Sheet 6

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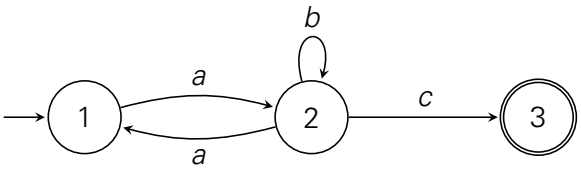
Exercise 1

Let $\mathcal{A} = (\{1, 2, 3\}, \{a, b, c\}, \{1\}, \Delta, \{3\})$ be the deterministic finite one-way automaton defined by the following transition relation.



Using the construction from Theorem 2.8 in the lecture construct a formula φ in first-order logic with DTC such that $L(\varphi) = L(\mathcal{A})$.

Exercise 2

Give a two-way 2-head automaton that accepts the language L_m from the lecture.

Exercise 3

A multihead automaton is called *one-way* if the heads are not allowed to move to the left, i. e. $\Delta \subseteq Q \times (\Sigma \cup \{\triangleright, \triangleleft\})^k \times Q \times \{0, 1\}^k$. Give non-deterministic one-way multihead automata that accept the *complements* of the following languages.

a) L_m as defined in the lecture

b) $\{w\overleftarrow{w} \mid w \in \{a, b\}^*\}$

Exercise 4

Let $\mathcal{A}$ be a deterministic k-head automaton that accepts a language $L(\mathcal{A})$. Show that there is a deterministic k-head automaton $\bar{\mathcal{A}}$ that accepts $\overline{L(\mathcal{A})}$.

What happens if we add the requirement that both $\mathcal{A}$ and $\bar{\mathcal{A}}$ should be one-way?