Albert-Ludwigs-Universität, Inst. für Informatik
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Theoretical Computer Science - Bridging Course
Summer Term 2018
Exercise Sheet 2

for getting feedback submit (electronically) before the start of the tutorial on 5th of November 2018.

Exercise 1: Constructing DFAs *(2+2+2+2 Points)*

Construct DFAs that recognize the following languages. Drawing the state diagrams is sufficient. The alphabet is $\Sigma = \{0, 1\}$.

(a) $L_1 = \{w \mid |w| \geq 2$ and w contains an odd number of ones$\}$.

(b) $L_2 = \{w \mid w$ contains an even number of zeros$\}$.

(c) $L_3 = \{w \mid$ in w every zero is immediately followed by a one$\}$.

(d) $L_4 = \{w \mid w$ ends with 01$\}$.

Exercise 2: Maxstring

Let

$$maxstring(L) = \{w : w \in L \text{ and for all words } z \in \Sigma^* : z \neq \epsilon \Rightarrow wz \notin L\}\ .$$

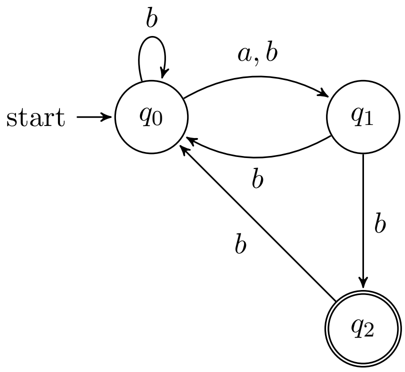
(a) What is $maxstring(L_1L_2)$, where $L_1 = \{w \in \{a, b\}^* : w$ contains exactly one $a\}$ and $L_2 = \{a\}$?

(b) Explain how to prove that the regular languages are closed under *maxstring*.

Hint: Let L be a regular language. You need to prove that $maxstring(L)$ is regular as well.

Exercise 3: From NFA to DFA *(1+2+2 Points)*

Consider the following NFA.



(a) Give a formal description of the NFA by giving the alphabet, state set, transition function, start state and the set of accept states.

(b) Construct a DFA which is equivalent to the above NFA by drawing the corresponding state diagram.

(c) Explain which language the automaton accepts.