Albert-Ludwigs-Universität, Inst. für Informatik
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Theoretical Computer Science - Bridging Course
Summer Term 2020
Exercise Sheet 2

for getting feedback submit electronically by 12:15, Tuesday, May 26, 2020

Exercise 1: Drawing DFAs *(7 Points)*

Construct DFAs that recognizes the following languages. The alphabet set is $\Sigma = \{0, 1\}$.

1. $L_1 = \{w \mid w \text{ is any string except 11 and 111}\}$.
2. $L_2 = \{w \mid w \text{ contains at least two 0s and at most one 1}\}$.
3. Construct a DFA which accepts the language $L_2 \backslash L_1 = \{w \mid w \in L_2 \text{ and } w \notin L_1\}$.

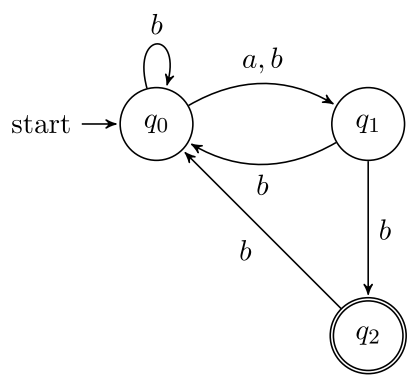
Exercise 2: Closure under Set Difference *(6 Points)*

Let L, L_1, L_2 be regular languages. Show that both $\overline{L} := \Sigma^* \setminus L$ and $L_1 \cap L_2$ are regular as well by constructing the corresponding DFAs. Deduce that $L_1 \backslash L_2$ is also regular.

Remark: *No need for drawing state diagrams. Show how a DFA for the language in question can be constructed presuming the existence of DFAs for L, L_1, L_2.*

Exercise 3: From NFA to DFA *(7 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.