Albert-Ludwigs-Universität, Inst. für Informatik
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Theoretical Computer Science - Bridging Course
Winter Term 2019/2020
Exercise Sheet 2

for getting feedback submit electronically by 12:15, Monday, November 04, 2019

Exercise 1: Drawing DFAs and NFAs *(8 Points)*

Consider the following three languages over the alphabet $\{0, 1\}$.

$L_1 = \{w \mid |w| \geq 2$ and w contains an even number of zeros$\}$.

$L_2 = \{w \mid w$ contains exactly two ones$\}$.

$L_3 = \{w \mid w$ has an odd number of zeros and ends with 1$\}$.

First draw a DFA for each of the languages L_1, L_2 and L_3. Then, for each of the following languages, provide an NFA that recognizes the given language.

(a) L_1^*

(b) $L_3 \circ L_2$

(c) $L_2 \cup L_3$

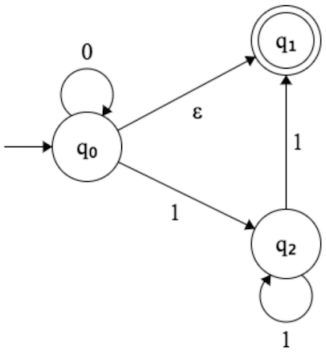
Exercise 2: Regular Languages *(4 Points)*

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.

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: NFA to DFA *(8 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 what language the automaton recognizes.