ALBERT-LUDWIGS-
UNIVERSITÄT FREIBURG

Prof. Dr. Andreas Podelski
Matthias Heizmann
Christian Schilling

May 27th-28th, 2014

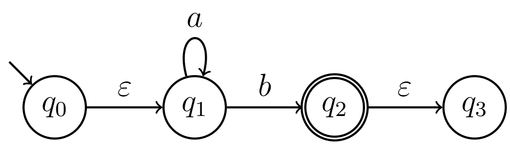
2. Presence Exercise Sheet for the Lecture

Computer Science Theory

WITH PROPOSALS FOR SOLUTIONS

Exercise 1: Automata conversions

(a) Convert the following ε-NFA to an NFA.

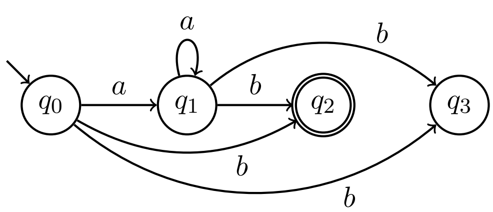


(b) Remove all redundant states (i.e., unreachable states and sink states) from the NFA resulting from (a).

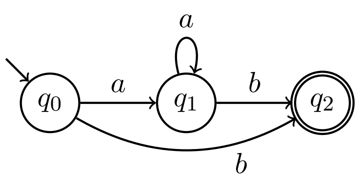
(c) Convert the NFA resulting from (b) to a DFA.

.... Sketch of solution ....

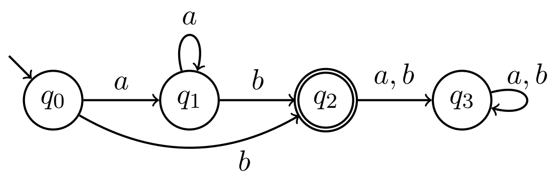
(a) Applying the conversion algorithm results in:



(b) We remove the redundant sink state q_3.



(c) The automaton is already deterministic, so we need no powerset construction here. We only have to add a sink state.



Exercise 2: Context-free grammars
Consider the alphabet $T = \{\rangle, \langle, a\}$. Construct context-free grammars which generate

(a) $L = \{\langle^n a^m \rangle^n \mid m, n \in \mathbb{N}, m > 0\}$

(b) $L = \{\langle^n a^m \rangle^n \mid m, n \in \mathbb{N}, m \text{ is odd}\}$.

.... Sketch of solution ....

In both cases we have $G = (N, T, P, S)$ with $N = \{S, A\}$, $T = \{\rangle, \langle, a\}$ as defined above.

(a)

$$P = \{ \; S \to \langle S \rangle \mid A \\ A \to AA \mid a \; \}$$

(b)

$$P = \{ \; S \to \langle S \rangle \mid A \\ A \to AAA \mid a \; \}$$