Technische Universität München **Winter term 2013/2014**
I7
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Automata and Formal Languages – Exercise sheet 11

Exercise 9.1

Safra's construction allows to obtain a Rabin automaton from a Büchi automaton. We show how to use Safra's construction for complementating Büchi automata.

(a) *Complementation of a Rabin automaton:* How can one obtain a Streett automaton accepting the complement of some language accepted by a Rabin automatan?

(b) *From Streett to Büchi automata:* Let $\mathcal{A}$ be a Streett automaton with n states and m accepting pairs. Give a nondeterministic Büchi automaton with $\mathcal{O}(n2^m)$ states for $L(\mathcal{A})$.

Hint: Note that $\left|Q \cup (Q \times 2^{\{1,\dots,m\}} \times 2^{\{1,\dots,m\}})\right|$ is in $\mathcal{O}(n2^m)$.

(c) *Complexity upper bound:* What is the complexity of this algorithm performing complementation of Büchi automata with Safra's construction?

(d) *Complexity lower bound:* What lower bound can we deduce on Safra's construction?

Exercise 9.2

Let $\mathcal{A}$ be a deterministic Büchi automaton. Let us denote $\mathcal{A}'$ the automaton obtained by applying a (finite-word automaton) minimization procedure on this automata.

(a) What can we say about the ω-language accepted by $\mathcal{A}'$?

(b) Does this provide a minimal deterministic Büchi automaton?