TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science Institute of Theoretical Computer Science, Chair of Automata Theory

Automata and Logic

Winter Semester 2018 / 2019

Exercise Sheet 10

9th January 2019

Infinite Words and Büchi-Automata

PD Dr.-Ing. habil. Anni-Yasmin Turhan, Dipl.-Math. Francesco Kriegel

Exercise 10.1 Show that, for each sequence $(r_n)_{n\geq 0}$ of real numbers, there exists some infinite subsequence that is either strictly increasing, strictly decreasing, or constant.
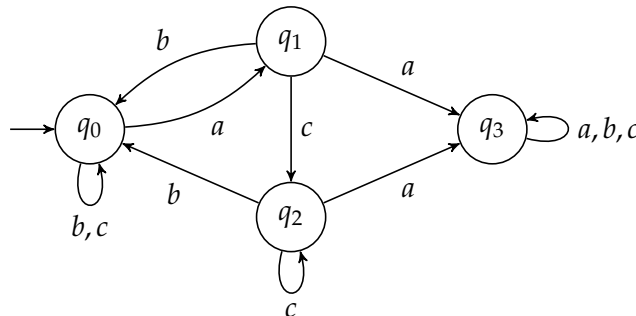
Hint. If you do not want to show the claim directly, you could use Ramsey's Theorem.

Exercise 10.2 Define $\Sigma := \{a, b\}$, and let $L \subseteq \Sigma^\omega$ be the ω-language recognized by the following Büchi-automaton.
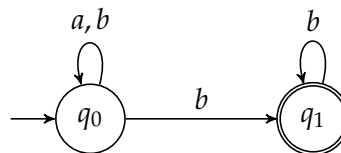
Use the method from Corollary 4.22 to construct a Büchi-automaton that recognizes the complement language $\Sigma^\omega \setminus L$.

Exercise 10.3 Let $\Sigma := \{a, b, c\}$ and consider the following transition system.

We derive four Muller automata $\mathcal{A}_1$, $\mathcal{A}_2$, $\mathcal{A}_3$, and $\mathcal{A}_4$ by selecting corresponding sets of final states $\mathcal{F}_1$, $\mathcal{F}_2$, $\mathcal{F}_3$, and $\mathcal{F}_4$, respectively, as follows.

(a) $\mathcal{F}_1 := \{\{q_0, q_3\}, \{q_3\}\}$

(b) $\mathcal{F}_2 := \{\{q_0, q_1\}, \{q_2\}\}$

(c) $\mathcal{F}_3 := \{\{q_0, q_1, q_2\}\}$

(d) $\mathcal{F}_4 := \{\{q_0\}, \{q_0, q_1\}, \{q_2\}, \{q_0, q_1, q_2\}\}$

For each index $i \in \{1, \dots, 4\}$, determine the ω-language $L_\omega(\mathcal{A}_i)$.