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Introduction to Model Checking
Winter term 08/09

– Series 5 –

Hand in on November 28 before the exercise class.

Exercise 1 (4 points)

Let $\mathcal{A}_1$ and $\mathcal{A}_2$ be NBA over the same alphabet Σ. Prove (without using GNBAs) that there exists a NBA $\mathcal{A}$ such that

$$\mathcal{L}_\omega(\mathcal{A}) = \mathcal{L}_\omega(\mathcal{A}_1) \cap \mathcal{L}_\omega(\mathcal{A}_2).$$

Exercise 2 (2 + 2 points)

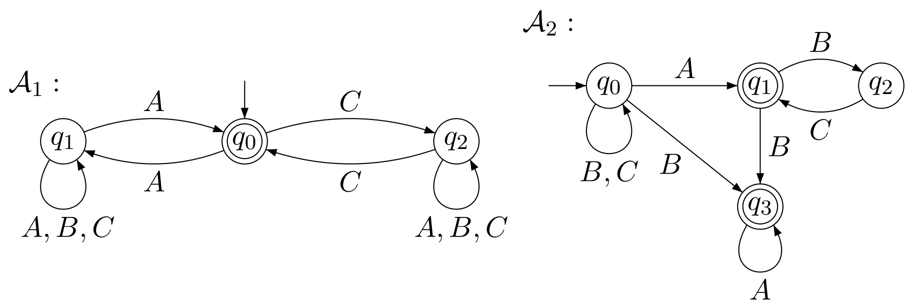
Find nondeterministic Büchi automata that accept the following ω regular languages:

a) $L_1 = \{\sigma \in \{A, B\}^\omega \mid \sigma \text{ contains } ABA \text{ infinitely often, but } AA \text{ only finitely often}\}$

b) $L_2 = \mathcal{L}_\omega\left((AB + C)^*((AA + B)C)^\omega + (A^*C)^\omega\right)$

Exercise 3 (1 + 2 points)

Consider the following NBA $\mathcal{A}_1$ and $\mathcal{A}_2$ over the alphabet $\Sigma = \{A, B, C\}$:



Find ω regular expressions for the languages accepted by $\mathcal{A}_1$ and $\mathcal{A}_2$, respectively.

Exercise 4 (4 points)

Prove or disprove the following equivalences for ω-regular expressions:

a) $(E_1 + E_2).F^\omega \equiv E_1.F^\omega + E_2.F^\omega$

b) $E.(F_1 + F_2)^\omega \equiv E.F_1^\omega + E.F_2^\omega$

c) $E.(F.F^*)^\omega \equiv E.F^\omega$

d) $(E^*.F)^\omega \equiv E^*.F^\omega$

Here, E, E_1, E_2, F, F_1, F_2 denote regular expressions with $\varepsilon \notin \mathcal{L}(F) \cup \mathcal{L}(F_1) \cup \mathcal{L}(F_2)$.