Applied Automata Theory (WS 2012/2013) Technische Universität Kaiserslautern

Exercise Sheet 6

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Exercise 6.1 Atomic Presburger-Definable $\subseteq$ Semilinear

Show that $\mathrm{Sol}(t_1 = t_2)$ and $\mathrm{Sol}(t_1 < t_2)$ are semilinear.
Hint: note that $t ::= 0 \mid 1 \mid x \mid t + t$ *with* $x \in V$.

Exercise 6.2 Parikh Images of Context Free Languages

Compute the Parikh image $\Psi\left(\mathsf{L}\left(\{S, S'\}, \{a, b\}, \{S \to aSbS' \mid \epsilon,\ S' \to SbS'a \mid \epsilon\}, S\right)\right)$.

Exercise 6.3 ω-regular $\subseteq$ NBA

Show that every ω-regular language is accepted by an NBA. This amounts to solving:

(a) For NBA A and B, describe how to obtain an NBA C with $\mathsf{L}(C) = \mathsf{L}(A) \cup \mathsf{L}(B)$.

(b) For NFA A s.t. $\mathsf{L}(A) \cap \Sigma^+ \neq \emptyset$, describe how to obtain an NBA B with $\mathsf{L}(B) = \mathsf{L}(A)^\omega$.

(c) For NFA A and NBA B, describe how to obtain an NBA C with $\mathsf{L}(C) = \mathsf{L}(A) \cdot \mathsf{L}(B)$.

Exercise 6.4 NBA $\subseteq$ ω-regular

Show that every language accepted by an NBA is ω-regular.
Hint: The finite union will range over the set of final states.