Formale Übersetzungsmodelle

Exercise 10 (Powerset Construction)

Let $\Sigma = \{\alpha^{(0)}, \sigma^{(2)}\}$ be a ranked alphabet. Consider the bottom-up finite state tree automaton $N = (\{q_0, q_1\}, \Sigma, \Sigma, \{q_0\}, R)$ where R is given by

$$\alpha \to q_0(\alpha) \qquad \text{and} \qquad \sigma(q_i(x_1), q_j(x_2)) \to q_{(1-k)}(\sigma(x_1, x_2))$$

for every i, $j \in \{0, 1\}$, and $k \in \{i, j\}$.

(a) Determine the tree language of N.

(b) Use the powerset construction to give a deterministic bottom-up finite state tree automaton N_{det} such that $\tau(N) = \tau(N_{\text{det}})$.

Exercise 11 (gsm and bu-tt)

Assume r.a. Σ and Δ. Let $G = (Q, \Sigma^{(0)}, \Delta^{(0)}, q_0, F, R)$ be a gsm. Give a bu-tt M (with input alphabet Σ and as output alphabet some $\Gamma \supseteq \Delta$) such that for every $(w, v) \in \tau(G)$, and every $\xi \in T_\Sigma$ with $\text{yield}(\xi) = w$, there is some $\zeta \in T_\Gamma$ such that $(\xi, \zeta) \in \tau(M)$ and $\text{yield}(\zeta) = v$.

Exercise 12 (Recognizable tree languages)

Recall from the lecture the class $\text{REC}(\Sigma)$ of recognizable tree languages. Show that $\text{REC}(\Sigma)$ is closed under

(a) union,

(b) intersection, and

(c) inverse tree homomorphisms.

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