9. Übung (07. Dezember 2017)

# Formale Übersetzungsmodelle

***Task 20** (ln-BOT = ln-TOP)*

Let $\Sigma = \{\sigma^{(2)}, \alpha^{(0)}\}$, $\Delta = \{\sigma^{(2)}, \gamma^{(1)}, \alpha^{(0)}\}$ be ranked alphabets, and $\xi = \sigma(\sigma(\alpha, \alpha), \alpha) \in T_\Sigma$. Consider the linear non-deleting bu-tt $B = (\{q_0, q_1\}, \Sigma, \Delta, \{q_0\}, R_B)$ and the linear non-deleting td-tt $T = (\{q_0, q_1\}, \Sigma, \Delta, \{q_0\}, R_T)$ where

$$\begin{aligned} R_B = \{\ & \alpha \to q_0(\alpha), \quad \sigma(q_0(x_1), q_0(x_2)) \to q_1(\sigma(x_1, x_2)), \\ & \alpha \to q_1(\alpha), \quad \sigma(q_1(x_1), q_1(x_2)) \to q_0(\gamma(\sigma(x_2, x_1)))\ \} \quad \text{and} \end{aligned}$$

$$\begin{aligned} R_T = \{\ & q_0(\alpha) \to \alpha, \quad q_0(\sigma(x_1, x_2)) \to \sigma(q_1(x_2), q_1(x_1)), \\ & q_1(\alpha) \to \alpha, \quad q_1(\sigma(x_1, x_2)) \to \sigma(\gamma(q_0(x_1)), \gamma(q_0(x_2)))\ \} \end{aligned}$$

(a) Give a linear non-deleting td-tt $T'$ such that $\tau(B) = \tau(T')$.
Give derivations of $B$ and $T'$ on $\xi$.

(b) Give a linear non-deleting bu-tt $B'$ such that $\tau(T) = \tau(B')$.
Give derivations of $T$ and $B'$ on $\xi$.

***Task 21** (h-TOP = HOM **and** r-TOP = REL)*

(a) Prove by construction that h-TOP = HOM.

(b) Prove by construction that r-TOP = REL.

**Hint:** Define relatedness for a top-down tree homomorphism (relabeling) and a bottom-up tree homomorphism (relabeling). Show that the respective transducers induce the same tree transformation if they are related (Lemma). Use the Lemma to obtain the equivalence of the respective classes.


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