
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 \( \xi = \sigma(\alpha, \alpha, \alpha) \in T_\Sigma \). 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

\[
R_B = \{ \alpha \rightarrow q_0(\alpha), \quad \sigma(q_0(x_1), q_0(x_2)) \rightarrow q_1(\sigma(x_1, x_2)), \\
\alpha \rightarrow q_1(\alpha), \quad \sigma(q_1(x_1), q_1(x_2)) \rightarrow q_0(\gamma(\sigma(x_2, x_1))) \} \quad \text{and} \\
R_T = \{ q_0(\alpha) \rightarrow \alpha, \quad q_0(\sigma(x_1, x_2)) \rightarrow \sigma(q_1(x_2), q_1(x_1)), \\
q_1(\alpha) \rightarrow \alpha, \quad q_1(\sigma(x_1, x_2)) \rightarrow \sigma(\gamma(q_0(x_1)), \gamma(q_0(x_2))) \}
\]

(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.