Formale Übersetzungsmodelle

Task 24 (Baker's Theorem for TOP*)*

Baker's Theorem for TOP states a sufficient criterion for the composition of two top-down tree transformations to remain in TOP:

> **Theorem** [Bak79, Thm. 1]. Let T_1 and T_2 be td-tt. Then $\tau(T_1) \circ \tau(T_2) \in \mathsf{TOP}$ if the following two conditions hold:
>
> 1. T_1 is deterministic or T_2 is linear;
> 2. T_1 is total or T_2 is nondeleting.

Let $T_1 = (Q, \Sigma, \Delta, I_1, R_1)$ and $T_2 = (P, \Delta, \Omega, I_2, R_2)$ be td-tt.

(a) Construct a td-tt T such that $\tau(T_1) \circ \tau(T_2) = \tau(T)$ if the above conditions hold.

(b) Prove that $\tau(T_1) \circ \tau(T_2) = \tau(T)$.

(c) Give two td-tt T_1' and T_2' that fulfill Condition 1 but not Condition 2. For each td-tt use the minimum number of rules necessary.

(d) Construct the instance T' (for T_1' and T_2') of the td-tt T defined in Task 24 (a).

(e) Give a tree transformation (s, t) such that $\neg((s, t) \in \tau(T_1') \circ \tau(T_2') \iff (s, t) \in \tau(T'))$.

Task 25 (Top-down tree transducer with regular look-ahead)

Let $T = (Q, \Sigma, \Delta, I, R)$ be a top-down tree transducer with regular look-ahead.

(a) Give a formal definition of the derivation relation of T.

(b) Give a formal definition of the tree transformation induced by T.

References

[Bak79] B. S. Baker. "Composition of top-down and bottom-up tree transductions". In: *Information and Control* 41.2 (1979), pp. 186–213. issn: 0019-9958. doi: 10.1016/S0019-9958(79)90561-8.

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