8. Übung (30. November 2017)

Formale Übersetzungsmodelle

Task 18 (decomposition of TOP*)*

Let $\Sigma = \{\gamma^{(1)}, \alpha^{(0)}\}$ and $\Delta = \{\sigma^{(2)}, O^{(1)}, E^{(1)}, \alpha^{(0)}\}$ be ranked alphabets and $\xi = \gamma(\gamma(\alpha)) \in T_\Sigma$.

(a) Give a td-tt T such that $\tau(T)$ transforms every tree in T_Σ into a tree in T_Δ such that each γ is replaced by σ where the subtree of γ is copied and, starting with O at the top, alternately O and E are inserted before each symbol.
Give a derivation of T for ξ.

(b) Give a top-down tree homomorphism H and a linear top-down tree transducer T' such that $\tau(T) = \tau(H) \circ \tau(T')$.
Give derivations of H and T' for ξ.

Task 19 (generalized sequential machines and top-down tree transducers)

GSM is the class of string transformations $\tau \subseteq \Sigma^* \times \Delta^*$ that are be induced by some gsm.

(a) Give formal definitions for the syntax and derivation relation of a gsm, and the string transformation induced by a gsm.

(b) Prove by construction that GSM is closed under composition.
Hint: Use a product construction where the right hand side of a rule of the first gsm is processed by the second gsm (pipelining).

Let $G = (Q, \Sigma, \Delta, q_0, F, R)$ be a gsm.

(c) Give a gsm G^R such that $\tau(G^R) = \{(w_l^R, w_r^R) \mid (w_l, w_r) \in \tau(G)\}$ where w^R denotes the reverse of w.

(d) Give a td-tt that simulates the run of G on the nodes of monadic trees from root to front.

http://www.orchid.inf.tu-dresden.de *Tobias.Denkinger@tu-dresden.de*