Formale Übersetzungsmodelle

Task 15 (Symbolic derivation)

Let $k \in \mathbb{N}$ and $\Sigma = \{+^{(2)}, \cdot^{(2)}, -^{(1)}, \mathsf{sin}^{(1)}, \mathsf{cos}^{(1)}, X^{(0)}\} \cup \{0^{(0)}, \ldots, k^{(0)}\}$ a ranked alphabet. The trees over Σ represent a subset of polynomials with natural number coefficients.

(a) Give a td-tt T that computes the symbolic derivation of a given tree.

(b) Give a derivation for $\xi = \cdot(+(\mathsf{sin}(\cdot(X, X)), 5), X)$ in T.

(c) Why is there no bu-tt B' such that $\tau(T) = \tau(B')$?

(d) Give a bu-tt B that simplifies a given tree according to the units with respect to $\cdot$ and $+$ and the absorbing nature of 0 with respect to $\cdot$, in particular, B should collapse $\cdot(\xi, 1)$, $\cdot(1, \xi)$, $+(\xi, 0)$, or $+(0, \xi)$ to ξ and $\cdot(\xi, 0)$ or $\cdot(0, \xi)$ to 0 for every $\xi \in T_\Sigma$.

(e) Why is there no td-tt T' such that $\tau(B) = \tau(T')$?

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