7th Exercise Sheet (November 27, 2013)

Advanced Topics on Weighted Tree Automata

Exercise 14 (Symbolic derivation)

Let $k \in \mathbb{N}$ and $\Sigma = \{+^{(2)}, \cdot^{(2)}, X^{(0)}\} \cup \{0^{(0)}, \ldots, k^{(0)}\}$ 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 of $\xi = \cdot(+(\cdot(X,X),5),X)$ in T.

(c) Why is there no bu-tt B such that $\tau(T) = \tau(B)$?

Exercise 15 (Top-down tree transducers with multiple initial states)

In the lecture, top-down tree transducers were defined with a single initial state. In the following we will consider the use of multiple initial states.

(a) Define the syntax of top-down tree transducers where multiple initial states are allowed.

(b) Define the induced tree transformation of a top-down tree transducer with multiple initial states. We call the class of tree transformations induced by top-down tree transducers with multiple states mTOP.

(c) Show that TOP = mTOP.

Exercise 16 (Generalized sequential machines and td-tt)

Let $G = (Q, \Sigma, \Delta, q_0, F, R)$ be a gsm. Give a td-tt that simulates the run of G on the nodes of monadic trees from root to front.