Formale Baumsprachen

Task 9 (td-det fta)

Let $\Sigma = \{\sigma^{(2)}, \alpha^{(0)}, \beta^{(0)}, \gamma^{(0)}\}$. Give a nondeterministic bu-ta which accepts exactly the language of all $\xi \in T_\Sigma$ containing a β-leaf somewhere between an α- and a γ-leaf, reading leaves left-to-right or right-to-left. Try to use as few states and transitions as possible.

Task 10 (Nondeterministic td-ta)

For each of the following tree languages, give a td-ta which accepts exactly that language. Which of these languages can be accepted by some deterministic td-ta?

(a) $\Sigma = \{\sigma^{(2)}, \alpha^{(0)}, \beta^{(0)}\}$ and $L = \{\xi \in T_\Sigma \mid \xi \text{ contains at least one } \alpha \text{ and one } \beta\}$.

(b) $\Sigma = \{\sigma^{(2)}, \alpha^{(0)}, \beta^{(0)}\}$ and $L = \{\xi \in T_\Sigma \mid \xi \text{ contains an even number of } \alpha \text{ symbols}\}$.

(c) $\Sigma = \{\alpha^{(1)}, \beta^{(1)}, \gamma^{(1)}, \epsilon^{(0)}\}$ and
$L = \{\xi \in T_\Sigma \mid \xi \text{ contains an } \alpha \text{ somewhere above a } \beta \text{ or a } \beta \text{ somewhere above a } \gamma\}$.

Task 11 (regular tree grammars)

Let $\Sigma = \{\sigma^{(2)}, \gamma^{(1)}, \alpha^{(0)}\}$ be a ranked alphabet. Give regular tree grammars G_1 and G_2 with

(a) $L(G_1) = \{\xi \in T_\Sigma \mid \xi \text{ contains exactly one } \sigma\}$ and

(b) $L(G_2) = \{\xi \in T_\Sigma \mid \xi \text{ contains the pattern } \sigma(\_, \gamma(\_)) \text{ at least twice}\}$.