Formale Baumsprachen

Task 29 (representation lemma and implementation lemma)

Let $\mathcal{A} = (\mathcal{P}(\Sigma), \Sigma, S, \delta, F)$ be an S weighted tree automaton where $\Sigma = \{\sigma^{(2)}, \gamma^{(\gamma)}, \alpha^{(0)}, \beta^{(0)}\}$, $S = (\mathcal{P}(\Sigma), \cup, \cap, \emptyset, \Sigma)$, $F = \mathrm{id}_Q$, and

$$\delta_\tau(q_1 ... q_{\mathrm{rk}(\tau)}, q) = \begin{cases} \Sigma & \text{if } q \subseteq q_1 \cup ... \cup q_{\mathrm{rk}(\tau)} \cup \{\tau\}, \\ \emptyset & \text{otherwise.} \end{cases} \qquad \text{for every } \tau \in \Sigma$$

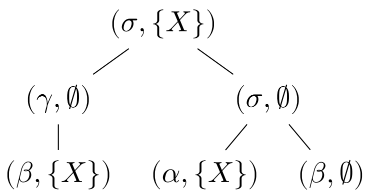
(a) Is S locally finite?

(b) **Representation lemma.** Give a Σ-algebra (Q, θ) and a mapping $f: Q \to S$ such that $r_\mathcal{A} = f \circ h_Q$.

(c) **Implementation lemma.** Show that $f \circ h_Q \in \text{bud-Rec}(\Sigma, S)$.

Task 30 (semantics of formulas in weighted MSO)

Let $\Sigma = \{\sigma^{(2)}, \gamma^{(1)}, \alpha^{(0)}, \beta^{(0)}\}$, $\mathcal{V} = \{X\}$, and let $\xi \in T^{v}_{\Sigma_\mathcal{V}}$ be as follows



(a) Evaluate $[\![\forall x. \neg \mathrm{label}_\beta(x) \vee 2]\!]_\mathcal{V}(\xi)$ using the semiring $(\mathbb{N}, +, \cdot, 0, 1)$.

(b) Evaluate $[\![\forall x. \neg \mathrm{label}_\beta(x) \vee (\mathrm{label}_\beta(x) \wedge 2)]\!]_\mathcal{V}(\xi)$ using the semiring $(\mathbb{N}, +, \cdot, 0, 1)$.

(c) Evaluate $[\![\exists Y. \forall x. \neg(x \in Y) \vee (x \in Y \wedge x \in X)]\!]_\mathcal{V}(\xi)$ using the semiring $(\mathbb{N}, +, \cdot, 0, 1)$.

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