WS 2019/2020 06.11.2019

Exercises to the lecture
Semantics
Sheet 1

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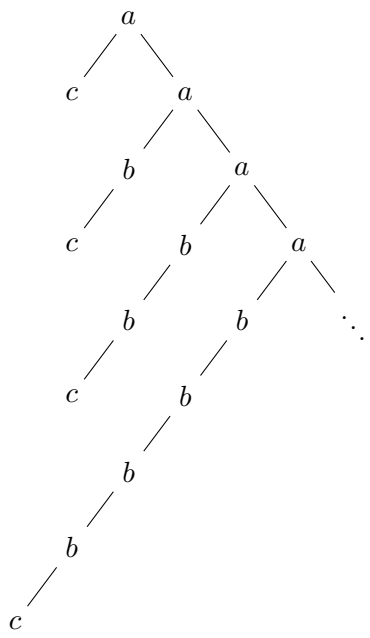
Exercise 1.1 (Higher Order Recursion Schemes)
Construct a Higher Order Recursion Scheme that creates a tree



Hint: Remember the HORS from the lecture

Exercise 1.2 (Closures of APTAs)
We show the closure of APTAs under $\cup, \cap, \overline{\ }$.

1.2.1 Show that APTAs are closed under union.

1.2.2 To show that APTAs are closed under complement, we take several steps. Let $\mathcal{A} = (\Sigma, Q, \delta, q_0, \Omega)$ be APTA and t a Σ labelled tree.

1. Show that there is a parity game $\mathcal{G}(\mathcal{A}, t) = (V_0, V_1, E, \Omega_{\mathcal{G}})$ with positions
$$V_0 = dom(t) \times Q, \qquad V_1 = dom(t) \times 2^{\{1,\dots,m\} \times Q}$$
such that Eve (Player 0) has a winning strategy iff $t \in L(\mathcal{A})$.
2. Construct an APTA $\overline{\mathcal{A}}$ with a game $\mathcal{G}(\overline{\mathcal{A}}, t) = (V_0, V_1, E', \Omega'_{\mathcal{G}})$ such that Eve wins $\mathcal{G}(\overline{\mathcal{A}}, t)$ iff Ana wins $\mathcal{G}(\mathcal{A}, t)$.

1.2.3 Conclude that APTAs are closed under intersection.