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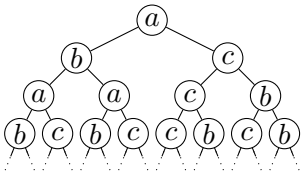
Warm-up Questions 13
Discussions: July 22th, 2015

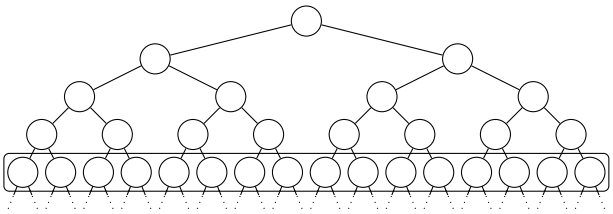
Automata, Games, and Verification

Please send a mail to `agv15@react.uni-saarland.de` if you can't make it to the discussion session.

1. Consider the Büchi tree automaton $\mathcal{A}$ and the $\{a, b, c\}$-labeled input tree given below. How does the marked level in the corresponding run tree look like?

$$\mathcal{A} = (\{a, b, c\}, \{A, B, C, D\}, A, \{(A, a, B, C), (B, b, A, D), (C, c, C, D), (D, a, B, D), (D, c, A, A), (D, b, D, B)\}, \{B, C, D\})$$





☐ $A\ D\ C\ D\ A\ D\ A\ A\ C\ D\ B\ D\ A\ A\ A\ D$
☐ $D\ C\ B\ A\ D\ A\ D\ C\ B\ D\ A\ D\ B\ C\ D\ C$
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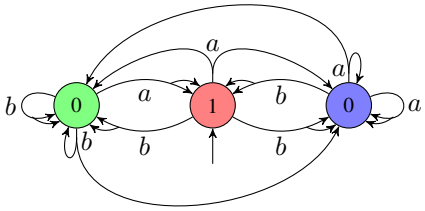
☐ $A\ D\ C\ D\ A\ D\ A\ A\ C\ D\ D\ B\ A\ A\ A\ D$

2. Consider the parity tree automaton below, where we denote a transition (q, σ, q_1, q_2) by an outgoing edge that splits up to the two target states. Further, the edge relation is symmetric, i.e., if $(q, \sigma, q_1, q_2) \in T$ then also $(q, \sigma, q_2, q_1) \in T$ for all $q, q_1, q_2 \in Q$ and $\sigma \in \Sigma$. Which of the following input trees t_i for $0 \leq i \leq 5$ are accepted by the automaton?



☐ $t_0 \in \{t \in T_{\{a,b\}} \mid$ every branch of t has only finitely many b's$\}$
☐ $t_1 \in \{t \in T_{\{a,b\}} \mid$ every branch of t has only finitely many a's$\}$
☐ $t_2 \in \{t \in T_{\{a,b\}} \mid$ every branch of t has only b's$\}$
☐ $t_3 \in \{t \in T_{\{a,b\}} \mid$ every branch of t has only a's$\}$
☐ $t_4 \in \{t \in T_{\{a,b\}} \mid$ every branch of t has infinitely many a's$\}$
☐ $t_5 \in \{t \in T_{\{a,b\}} \mid$ every branch of t has infinitely many b's$\}$

3. Let $\mathcal{A}$ be some arbitrary nondeterministic parity tree automaton. Which of the following statements is true? There exists a deterministic parity tree automaton $\mathcal{A}'$ such that

☐ $\mathcal{L}(\mathcal{A}') \supseteq \mathcal{L}(\mathcal{A})$
☐ $\mathcal{L}(\mathcal{A}') \supseteq \mathcal{L}(\mathcal{A}) \wedge (\mathcal{L}(\mathcal{A}') \neq \emptyset \Rightarrow \mathcal{L}(\mathcal{A}) \neq \emptyset)$
☐ $\mathcal{L}(\mathcal{A}') \subseteq \mathcal{L}(\mathcal{A})$
☐ $\mathcal{L}(\mathcal{A}') \subseteq \mathcal{L}(\mathcal{A}) \wedge (\mathcal{L}(\mathcal{A}) \neq \emptyset \Rightarrow \mathcal{L}(\mathcal{A}') \neq \emptyset)$