Formal Models SS 2018: Assignment 2

Institute for Formal Models and Verification, JKU Linz

Due 22.03.2018

To indicate that you solved an exercise and that you can present it in the exercise group, tick it off in our MOODLE course until **8am on the day of the exercise**. Unmarking and marking exercises at the begin of the exercise class is **not** possible.

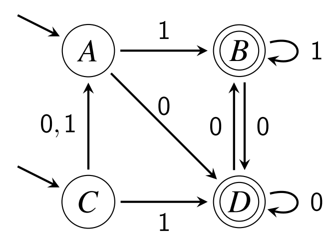
Exercise 5

Let A_1 be an *arbitrary* FA and $\mathbb{P}(A_1) := (S, I, \Sigma, T, F)$ be the power automaton of A_1. Describe in your own words the formal definition of $\mathbb{P}(A_1)$, including all of its components, cf slide 6. Are the following propositions true? Justify your answer based on the formal definition of a power automaton.

- $|I| = 1$
- $|S' \xrightarrow{a}| = 1$ for all $S' \in S$ and for all $a \in \Sigma$.

Exercise 6

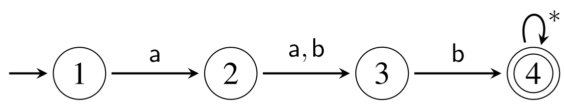
Draw the power automaton $\mathbb{P}(A)$ for FA A as shown on the right. What is the maximum number of states $\mathbb{P}(A)$ can have in theory? Justify your answer.



Exercise 7 Let A be an arbitrary FA. Given the formal definition of an automaton $\mathbb{A}_{\emptyset}(A)$ consisting of the following components:

$$\begin{array}{lll} S = S_1 \cup \{\emptyset\} & & I = I_1 \\ \Sigma = \Sigma_1 & & F = F_1 \\ T(s,a,s') & \text{iff} & T_1(s,a,s') \vee ((\neg(s \xrightarrow{a})) \wedge s' = \emptyset) \end{array}$$

Draw $\mathbb{A}_{\emptyset}(A)$ for A:



Exercise 8

Suppose we want to define an automaton A which is composed of two automata A_1 and A_2, such that $L(A) = L(A_1) \cup L(A_2)$.

Can this automaton be constructed using the formal definition of the product automaton (slide 4) with

$$F = F_1 \times S_2 \cup S_1 \times F_2?$$

Either give a proof or present a counter example.