Formal Models SS 2020: Assignment 2

Based on Video "Lecture 13. March 2014" on our webpage.

Institute for Formal Models and Verification, JKU Linz

Due 26.03.2020

Guideline:

- To indicate that you solved an exercise, tick it off in our MOODLE course until **10am on the day of the exercise (26.03.2020)**. Unmarking and marking exercises later is **not** possible.
- **Upload your solved exercises in the Moodle course. Generate a single PDF file, which contains all solved exercises, your name, and your matriculation number. Upload the PDF file - do not generate a ZIP!** Not following the format leads to deduction of points!
- We will randomly select and correct solved exercises.
- A sample solution will be provided.

Exercise 5

Draw an FA A with input-alphabet $\Sigma := \{a, b\}$ having *exactly* 3 states such that...

1. ...A is non-deterministic and incomplete.
2. ...A is deterministic and incomplete.
3. ...A is non-deterministic and complete.
4. ...A is deterministic and complete.

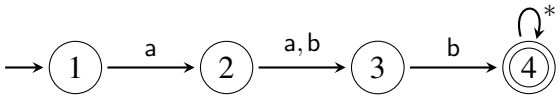
Justify each of your solutions.

Exercise 6

Let $A = (S_1, I_1, \Sigma_1, T_1, F_1)$ be an arbitrary FA. Given the formal definition of an automaton $\mathbb{A}_{\emptyset}(A)$ consisting of the following components:

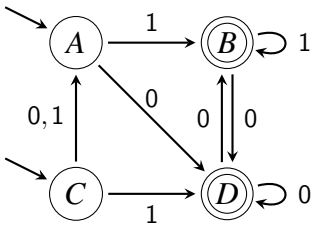
$$\begin{array}{lll} S = S_1 \cup \{\emptyset\} & & I = I_1 \\ \Sigma = \Sigma_1 = \{a, b\} & & F = F_1 \\ T(s, a, s') & \text{iff} & T_1(s, a, s') \vee ((\neg(|s \xrightarrow{a} | > 0)) \wedge s' = \emptyset) \end{array}$$

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



Exercise 7

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 8

Given A with states $S = \{A, B, C\}$, alphabet $\Sigma = \{a, b\}$, initial/final states $I = \{A, B\}$, $F = \{C\}$, and transitions $T = \{(A, a, A), (A, a, B), (B, a, C), (C, a, A), (A, b, B), (B, b, C)\}$. Draw A and draw the automaton K, which describes exactly the complement language to the language described by A.