Formal Models SS 2020: Assignment 4

Based on Video "Lecture 27. March 2014" on our webpage.
Institute for Formal Models and Verification, JKU Linz

due 23.04.2020

Guideline:

- To indicate that you solved an exercise, tick it off in our MOODLE course until the following deadline:

  10am on the day when the exercises due (10am 23.04.2020)

  Unmarking and marking exercises later is **not** possible.

- Upload your solved exercises in the Moodle course.

  Generate a single PDF file with all solved exercises, your name, and your matriculation number.

  Upload the PDF file - do not generate a ZIP!

  Not following this format will lead to the deduction of points!

- We will randomly select and correct solved exercises and provide a sample solution.

Exercise 13

Let $A = coin.(tea.A + coin.coffee.A)$ and $B = coin.tea.B + coin.coin.coffee.B$ be PA systems modelling two versions of a simple beverage vending machine. Justify your answers in the following.

a) Draw the LTS for A and B.

b) Interpret A and B as finite automata A_{FA} and B_{FA}, where only the initial state is final. Is $L(A_{FA}) = L(B_{FA})$?

c) Does the behaviour of A and B differ from the perspective of a user when buying a drink?

Exercise 14 Draw the LTS for PA system: $P = a.c.Q + a.(a.P + b.Q)$, $Q = a.b.P + c.P$

Exercise 15 Draw the LTS for PA system: $P = b.b.R + a.Q$, $Q = c.a.Q + b.R$, $R = b.P + b.c.R$

Show that transition $Q \xrightarrow{b} R$ can be executed by applying the semantical rules of PA presented in the lecture.

Exercise 16 Design a PA system modelling a vending machine for the following tram tickets:

maxi ticket (4 Euro), midi ticket (2 Euro) and mini ticket (1 Euro).

Your machine should accept as input 1 Euro or 2 Euro coins (modelled by the action $coin(X)$ with $X \in \{1,2\}$), reacts to pressing *cancel* or *ticket* and then either produces one of the three tickets (*maxi*, *midi*, *mini*) or returns the deposited money (action $return(X)$ with X all the entered money $X \in \{1,2,3,4\}$).

Hints: Start with the initial state $P(0)$ denoting zero balance. You probably want to introduce "cancelling" and "ticket states" since it is not possible to react to an input and produce an output at the same time. Illegal inputs can just be ignored.