Formal Models SS 2016: Assignment 4

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Due 14.04.2016

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}, assuming that the initial state is the only final state. 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

Show that action $(a.Q + b.a.Q) \mid\mid (b.R + b.b.R) \xrightarrow{b} a.Q \mid\mid R$ can be executed by subsequently applying the semantical rules of PA.

Exercise 15

Draw the LTS for the model of the railroad crossing presented in the lecture (slide 28). Find out whether accidents can happen in the model or not, and justify your answer.

Exercise 16

Let $\oplus$ denote an alternative PA-operator for non-deterministic choice. The semantics of $\oplus$ are defined as follows:

$$R^1_\oplus: \quad \frac{P \xrightarrow{a} P'}{(P \oplus Q) \xrightarrow{a} (P' \oplus Q)} \qquad R^2_\oplus: \quad \frac{Q \xrightarrow{a} Q'}{(P \oplus Q) \xrightarrow{a} (P \oplus Q')}$$

Assume that $+$ is replaced by $\oplus$ in the model of the railroad crossing from Exercise 19. Under this assumption, find the shortest possible sequence of transitions which yields a state where an accident can happen. You do not have to draw all states but only those which are needed for the solution of this exercise.