Assignment 10: CCS

ETH Zurich

1 Labelled Transition Systems

1. Consider the following defining CCS equations:

$$\begin{aligned} \mathrm{CM} &\stackrel{\mathsf{def}}{=} \mathit{coin}.\overline{\mathit{coffee}}.\mathrm{CM} \\ \mathrm{CS} &\stackrel{\mathsf{def}}{=} \overline{\mathit{pub}}.\overline{\mathit{coin}}.\mathit{coffee}.\mathrm{CS} \\ \mathrm{UNI} &\stackrel{\mathsf{def}}{=} (\mathrm{CM} \,|\, \mathrm{CS}) \setminus \{\mathit{coin}, \mathit{coffee}\} \end{aligned}$$

   Use the rules of the SOS semantics for CCS to derive the labelled transitions system for the process UNI defined above. The proofs can be ommitted and a drawing of the LTS is enough.

2. Consider the CCS processes P_0 and Q_0 defined by the following equations:

$$\begin{aligned} \mathrm{P}_0 &\stackrel{\mathsf{def}}{=} a.\mathrm{P}_1 + a.\mathrm{P}_2 \\ \mathrm{P}_1 &\stackrel{\mathsf{def}}{=} b.\mathrm{P}_0 + a.\mathrm{P}_2 \\ \mathrm{P}_2 &\stackrel{\mathsf{def}}{=} a.\mathrm{P}_2 + b.\mathrm{P}_0 \end{aligned} \tag{1}$$

$$\begin{aligned} \mathrm{Q}_0 &\stackrel{\mathsf{def}}{=} a.\mathrm{Q}_1 \\ \mathrm{Q}_1 &\stackrel{\mathsf{def}}{=} a.\mathrm{Q}_1 + b.a.\mathrm{Q}_1 \end{aligned} \tag{2}$$

   For each of the processes P_0 and Q_0, draw a labeled transition system that describes its behavior.

2 Derivations

By using SOS rules for CCS prove the existence of the following transitions where you assume that $\mathrm{A} \stackrel{\mathsf{def}}{=} b.a.\mathrm{B}$:

1. $(\mathrm{A} \,|\, \overline{b}.0) \setminus \{b\} \xrightarrow{\tau} (a.\mathrm{B} \,|\, 0) \setminus \{b\}$

2. $(\mathrm{A} \,|\, \overline{b}.a.\mathrm{B}) + (\overline{b}.\mathrm{A}) \xrightarrow{\overline{b}} (\mathrm{A} \,|\, a.\mathrm{B})$