Memory Log – Algebraic Process Calculi

SoSe 2023

The following might not be 100% accurate, the process calculus described here is for the most part the "Language of Temporal Ordering Specification"

Defintions

Approximately 10 *minutes are given to read and understand the following definitions.*

L is the set of action labels. Let $a \in L \cup \{i\}$, $g \in L \cup \{i, \delta\}$, $a_i, b_i, g_i \in L (0 \le i < n)$ be the set of actions.

We define the set of process constants as

$$C ::= P$$

Where P is the set of processes defined by

$$\begin{array}{rl} P ::= & \textbf{exit} \\ & \textbf{stop} \\ \text{actions} & a; P \\ \text{enabling} & P >> P \\ \text{disabling} & P[> P \\ \text{hiding} & \text{hide } [a_0, \dots a_n] \text{ in } P \\ \text{renaming} & P[{}^{a_0}/_{b_0} \dots {}^{a_n}/_{b_n}] \\ \text{parallel composition} & P \mid [a_0, \dots a_n] \mid P \\ \text{constants} & C \end{array}$$

The transitions are given by

1. $\textbf{exit} \xrightarrow{\delta} \textbf{stop}$
2. $a; P \xrightarrow{a} P$
3. if $C := P$, $P \xrightarrow{a} P'$, then $C \xrightarrow{a} P'$
4. if $P_1 \xrightarrow{a} P_1'$, $a \neq \delta$ then $P_1 >> P_2 \xrightarrow{a} P_1' >> P_2$
5. if $P_1 \xrightarrow{\delta} P_2$ then $P_1 >> P_2 \xrightarrow{i} P_2$
6. if $P_2 \xrightarrow{a} P_2'$ then $P_1[> P_2 \xrightarrow{a} P_2'$
7. if $P_1 \xrightarrow{a} P_1'$, $a \neq \delta$ then $P_1[> P_2 \xrightarrow{a} P_1'[> P_2$
8. if $P_1 \xrightarrow{\delta} P_1'$ then $P_1[> P_2 \xrightarrow{i} P_2$

9. if $P_2 \overset{a}{\to} P_2'$, $a \neq \delta$ then $P_1[> P_2 \overset{a}{\to} P_1[> P_2'$

10. if $P_2 \overset{\delta}{\to} P_2'$ then $P_1[> P_2 \overset{\delta}{\to} P_2'$

11. if $P_1 \overset{a}{\to} P_1'$, $a \notin \{a_0, \dots a_n\}$ then hide $[a_0, \dots a_n]$ in $P_1 \overset{a}{\to}$ hide $[a_0, \dots a_n]$ in P_1'

12. if $P_1 \overset{a}{\to} P_1'$, $a \in \{a_0, \dots a_n\}$ then hide $[a_0, \dots a_n]$ in $P_1 \overset{i}{\to}$ hide $[a_0, \dots a_n]$ in P_1'

13. (renaming rules, they behave as expected and where not needed in the exam)

14. if $P_1 \overset{a}{\to} P_1'$, $a \notin \{a_0, \dots a_n, \delta\}$ then $P_1 \mid [a_0, \dots a_n] \mid P_2 \overset{a}{\to} P_1' \mid [a_0, \dots a_n] \mid P_2$

15. if $P_1 \overset{a}{\to} P_1'$, $P_2 \overset{a}{\to} P_2'$, $a \in \{a_0, \dots a_n, \delta\}$ then $P_1 \mid [a_0, \dots a_n] \mid P_2 \overset{a}{\to} P_1' \mid [a_0, \dots a_n] \mid P_2'$

1st Prompt

Describe the transitions of the following process

$$(a; \mathbf{exit}) >> P$$

where $P := i; P$.

2nd Prompt

Describe the transitions of the following process

$$(a; \mathbf{exit})[> P$$

keeping the definition of P from the first prompt.

3rd Prompt

Change the calculus in such a way that '*enabling*' a process dose not require performing an '*internal*' (i.e. $\overset{i}{\to}$) transition.

4th Prompt

Let

$$B := a; \mathbf{exit}$$
$$H := \text{hide } [a] \text{ in } B \mid [a] \mid (B \mid [a] \mid B).$$

Describe the transitions.