T-79.179 **Spring 2005**
Parallel and Distributed Digital Systems
Exercise 2
7-13.2.2005

The exercise numbering is identical to the book [Fok00].

3.1.1 Let the communication of two atomic actions from $\{a, b\}$ always result to c. Find the process graph that belongs to the process term

$$((ab)a) \parallel b.$$

Give the derivations of the transitions in this process graph from the transition rules of BPA with the merge operator.

3.4.2 Derive the process graphs of the following process terms:

- $\partial_{\{a\}}(ac)$;
- $\partial_{\{a\}}((a + b)c)$;
- $\partial_{\{c\}}((a + b)c)$;
- $\partial_{\{a,b\}}((ab) \parallel (ba))$ with $\gamma(a, b) = c$.

3.4.4 Prove from the transition rules that the process term in Example 3.4.1 displays the desired behaviour of the channel; that is, it executes either $comm(0)$ or $comm(1)$, after which it terminates successfully.

3.4.5 Let $\gamma(a, c) = \delta$ and $\gamma(b, c) = a$. Say for each of the following process terms whether it contains a deadlock:

- $\partial_{\{b\}}(ab + c)$;
- $\partial_{\{b\}}(a(b + c))$;
- $\partial_{\{b,c\}}(a(b + c))$;
- $\partial_{\{b\}}((ab) \parallel c)$;
- $\partial_{\{b,c\}}((ab) \parallel c)$.

B.5.1 Let a and b be constants. Say for each of the following pairs of TSSs T_0 and T_1 over signatures $\{a\}$ and $\{a, b\}$, respectively, whether $T_0 \oplus T_1$ is a conservative extension of T_0. In cases where the extension is not conservative, give a transition of a that holds with respect to $T_0 \oplus T_1$ but not with respect to T_0.

- $\emptyset$ and $\frac{}{aP}$
- $\frac{}{xP}$ and $\frac{}{bQ}$
- $\frac{xQ}{aP}$ and $\frac{}{bQ}$
- $\frac{xQ}{xP}$ and $\frac{}{bQ}$
- $\frac{}{x \xrightarrow{c} y}$ and $\emptyset$
- $\emptyset$ and $\frac{}{bQ}$ $\frac{xQ}{xP}$