Informatics and Mathematical Modelling
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02152 CONCURRENT SYSTEMS FALL 2008

CP Exercise Class 1

Monday September 8

Petri Nets

1. Solve Petri.2 (in the Auxiliary Exercises [Aux], page 1).

2. Is it possible to construct a Petri Net which allows the same sequences of actions, but without any concurrency?

3. Discuss some advantages/disadvantages of using a formal model like Petri Nets to describe activities compared to using natural language.

4. In a directed graph, a *fork* is a node with one incoming and two (or more) outgoing arrows.

Draw the two kinds of forks that may occur in a Petri Net.

What do these two kinds of forks model?

5. Do Petri.4 (you may consult [Basic 1] to recall the mathematical representation of Petri Nets).

Processes

Four operations (= actions) are to be synchronized in the following way:

> A, B og C are executed concurrently. When both A and B are done, D is executed. When both D and C are done, the execution starts all over again.

6. Draw a Petri Net where the operations are synchronized as described above.

7. Assume that a progamming langauge has a statement construct:

$$\textbf{co}\ S_1 \parallel S_2 \parallel \ldots \parallel S_n\ \textbf{co}$$

which executes the statements $S_1, S_2, \ldots, S_n$ concurrently and terminates when they are all terminated. (Such **co** ... **oc** statements may be nested.)

Write a program which synchronizes the operations as in the Petri Net.

8. Assume that the operations are given as Java statements. Sketch a Java program in which the operations are synchronized as above.

Interleavings

9. Do Exercise Trans.1 (on page 2 of the Auxiliary Exercises [Aux]).

10. [Optional, skip if you have forgotten basic combinatorics] Do Exercise Trans.2.

11. Do Andrews Ex. 2.11 (in the textbook).

12. [Optional] Do Andrews Ex. 2.14. You should draw *transition diagrams* for the processes, making their atomic actions explicit.