technische universität dortmund

fakultät für informatik

computer science 12

jan.kleinsorge [☺] tu-dortmund.de
michael.engel [☺] tu-dortmund.de

Exercises to
Introduction to Embedded Systems
Summer term 2010

Assignment 3

(10 Points)

Deadline is Tuesday, May 25, 2010, 12:00

3.1 Kahn-Process Networks (5 Points)

Remember the Fibonacci numbers: $F(n) = \begin{cases} 0 & \text{if } n = 0 \\ 1 & \text{if } n = 1 \\ F(n-2) + F(n-1) & \text{if } n > 1 \end{cases}$

Tasks:

- Create the following simple processes:
  - **Process Init1(input A, output B):** At the start, it sends just once the integer value “1” on its output channel. Afterwards, it executes in an infinite loop: Read one value from the input channel and put it on the output channel.
  - **Process Init0(input A, output B):** At the start, it sends just once the integer value “0” on its output channel. Afterwards, it has the same behavior like process init1.
  - **2 x Process Dup(input A, output B, C):** It executes in an infinite loop: Read one value from the input channel and put the value on both output channels.
  - **Process Add(input A, B, output C):** It executes in an infinite loop: Read one value from each input channel. Add the two values. Put the result on its output channel.
  - **Process Sink(input A):** In an infinite loop, this process reads one value from the input channel per cycle.
- Develop a process network which produces the sequence of the Fibonacci numbers. Use the processes created in the previous task.
- Start the visualization and check if your process network is correct.

Note: Download the software *LeviKPN* from `http://ls12-www.cs.tu-dortmund.de/en/teaching/courses/ss10/ies/labs` in order to specify and simulate your Kahn process network.

3.2 Fundamentals of Petri-Nets (5 Points)

Draw the following Condition/Event-System: $N = (C, E, F)$, given

- *Conditions:* $C = \{c_1, c_2, c_3, c_4\}$,
- *Events:* $E = \{e_1, e_2, e_3\}$,
- *Relations:*
  $F = \{(c_1, e_1), (c_1, e_2), (e_1, c_2), (e_1, c_3), (e_2, c_2), (e_2, c_3), (e_2, c_4), (c_2, e_3), (c_3, e_3), (c_4, e_3), (e_3, c_1), (e_3, c_4)\}$.

Specifiy the precondition of e_3 as well as the postcondition of e_1. Is N *simple* or/and *pure*? Given it is not, which edge(s) need(s) to be removed in order to turn N into a pure net. Substantiate or proof your answers **concisely**.

Hint: Download *jPNS* from the labs website and construct some example-nets to get a better feeling for their semantics.

General notes:

Dates and additional information can be found at `http://ls12-www.cs.tu-dortmund.de/en/teaching/courses/ss10/ies/`. The assignments will be published **Tuesdays** on a weekly basis and have to be solved until the next **Monday**. Drop your sheets into the mailbox in OH16 right across the secretariat (E22) or send an e-email to your tutor. In the latter case, the submissions must be of either **PDF** or **PS** format. To pass the labs a minimum of 60% of the total points must be achieved.