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Advanced Information Systems
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6. Exercise Sheet: Petri-Nets

Submission: 28.07.2011
Discussion: 28.07.2011

Submission Guidlines: We will discuss the solutions to the exercise sheet on 28.07.2011. If you want to have comments on your solutions you can submit them after the lesson.

Exercise 1 (Firing of Petri-nets)
Prove or falsify:

Let $N = (P, T, F, V, m_0)$ be an eS-Net and m, m' be markings of N and $w \in L_N(m_0)$.

$$m[\,w{>}m' \iff m' = m + \Delta w.$$

Exercise 2 (Petri-net modelling)
Use a eS-Net to model the following handshaking protocol:

Processes P_1 und P_2 interchange messages. P_1 is the sender, P_2 the receiver. After having sent a message, the sender waits for *ACK* sent by the receiver as acknowledgement. Having received the *ACK*, the sender may send a next message.
The receiver waits for messages. If a message arrives, the message is acknowledged by sending *ACK* to the sender. Once the message is processed, the receiver waits for another message.

Exercise 3 (Petri-net modelling)
Use a eS-Net to model the following Reader-Writer synchronization protocol:

There are 4 processes which have access to a resource p^*. A process may either update or only read the resource. At any point of time at most one process is allowed to update the resource, however at most 4 processes are allowed to read the content of the resource concurrently.

Exercise 4 (Petri-net modelling)
Use a eS-Net to model the following Reader-Writer synchronization protocol:

There are 8 processes which have access to a resource p^*. A process may either update or only read the resource. At any point of time at most one process is allowed to update the resource, however at most 4 processes are allowed to read the content of the resource concurrently.
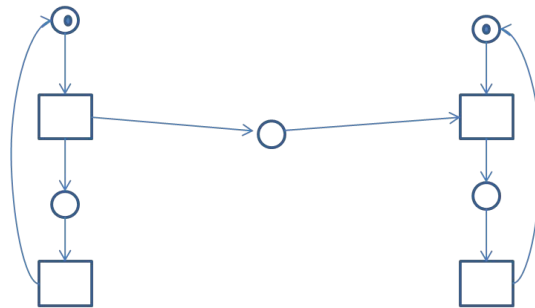
Exercise 5 (Petri-net properties)
Let the following eS-Net be given.
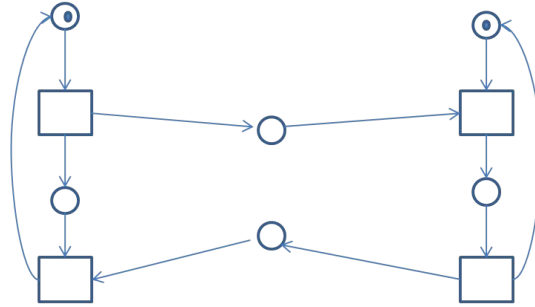
(a) Give the reachability and the coverability graph.

(b) Determine the T- and P-invariants.

(c) Interpret the invariants.

(d) Assume that in the initial marking of the eS-Net the left upper place is marked with 2 tokens, the right upper with 1 and all other plces do not have tokens. Give the reachability and the coverability graph. Comment on the feasability of these graphs for analysis in comparison to an invariant-based analysis.

Exercise 6 (Petri-net properties)
Let the following eS-Net be given.

(a) Give the reachability and the coverability graph.

(b) Determine the T- and P-invariants.

(c) Interpret the invariants.

Exercise 7 (Petri-net boundedness)
Prove or falsify the boundedness of the following eS-Net: