ETH
Eidgenössische Technische Hochschule Zürich
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Distributed Computing

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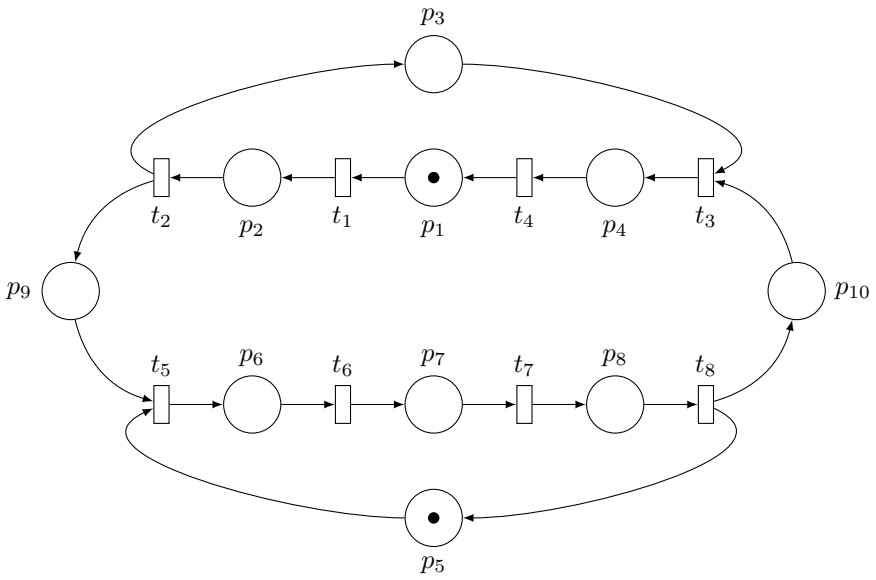
Discrete Event Systems

Exercise Sheet 15

1 Structural Properties of Petri Nets and Token Game

Given is the following petri net N_1:



a) What are the pre and post sets of transitions t_5 and t_8 and of place p_3?

b) Which transitions are enabled after t_1 and t_2 fired?

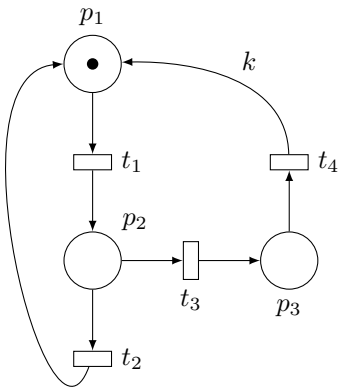
c) Determine the number of tokens in N_1 before and after t_2 fired.

d) Play the token game for N_1 and construct the reachability graph.

Hint: You may denote the states in such a way that the index indicates the places that hold a token in this state, for example $\vec{s}_0 = (1, 0, 0, 0, 1, 0, 0, 0, 0, 0) =: s_{1,5}$.

2 Basic Properties of Petri Nets

Given is the following petri net N_2:



Explain the terms *boundedness* and *deadlock-freeness* using this example, i.e. for which values of $k \in \mathbb{N}$ is the petri net N_2 bounded/unbounded and not deadlock-free?

3 Mutual Exclusion

Your task is to model a system as a petri net in which two processes want to access a common exclusive resource. This means that the two processes have to exclude each other mutually from the concurrent access to the resource (e.g. a critical program section). More concrete, this means:

1. A process executes its program.
2. In order to enter the critical section, a given mutex variable must be 0.
3. If this is the case, the process sets the mutex to 1 and executes its critical section.
4. When done, it resets the mutex to 0 and enters an uncritical section.
5. Then the procedure starts all over again.