Concurrency Theory (SS 2015) Out: Wed, June 3 Due: Tue, June 9

Exercise Sheet 7

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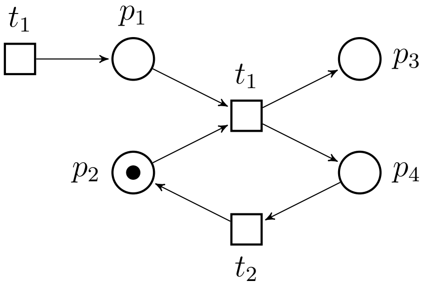
Problem 1: Tree Decomposition

- Describe, as precise as you can, the graphs that correspond to computations (i.e. single runs) of a pushdown system.
- Formulate the strategy presented in the lecture to compute a tree decomposition of such graphs.

Problem 2: Backwards search for Petri nets

a) Write the definition of $minpre(M)$ for Petri nets. Is it computable?

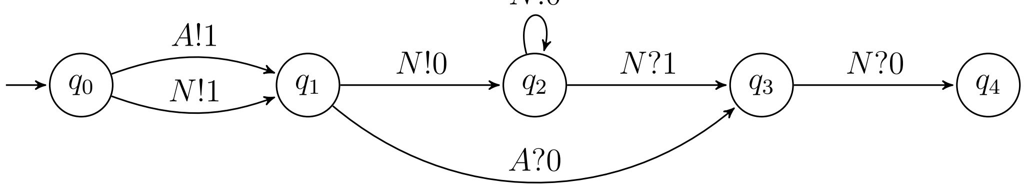
b) Consider the following Petri net:



Run the backwards search to prove that the marking $M = (0\ 0\ 2\ 0)^T$ is coverable.

Problem 3: Coverability for Lossy Channel Systems

Consider the LCS depicted in the figure below.



Determine if configurations $(q_4, \underset{\substack{\uparrow \\ A \text{ entry}}}{\overset{\substack{N \text{ entry} \\ \downarrow}}{\begin{bmatrix} 0 \\ \varepsilon \end{bmatrix}}})$ and $(q_4, \begin{bmatrix} \varepsilon \\ 1 \end{bmatrix})$ are coverable using the known procedure.

Problem 4: Extension of Lossy Channel Systems

Let $L = (Q, q_0, \rightarrow, C, M)$ be an LCS that can arbitrarily spawn new processes. The transition relation is now $\rightarrow \subseteq Q \times OP \times Q \times Q^*$. The transition $(q, op, q', q_1, ..., q_k) \in \rightarrow$ yields a change in the control state from q to q' in some process in the configuration, it performs an operation op and spawns k new processes in control states $q_1, ..., q_k$. A configuration now contains a sequence of control states instead of one.

a) Formally define the configurations of L and the transition relation.

b) Define a decidable wqo on the configurations.

c) Prove that it is a wsts and show that $minpre$ is computable.