

Tutorial 6

1. Structural unboundedness for general Petri nets belongs to NP.
2. How to reduce coverability to reachability in general Petri nets?
3. Show reductions between the following problems:
 - (a) *reachability problem*: $M \in \mathbb{N}^r$, is M reachable? (RP)
 - (b) *submarking reachability problem*: \tilde{P} — subset of places, $M_{\tilde{P}}$ — configuration over \tilde{P} , does there exist a reachable configuration M such that over the places of \tilde{P} it agrees with $M_{\tilde{P}}$? (SRP)
 - (c) *zero reachability problem*: is $\mathbf{0}$ reachable? (ZRP)
 - (d) *single-place zero reachability problem*: given a place p , does there exist a reachable configuration M such that $M(p) = 0$? (SPZRP)
4. A set $S \subseteq \mathbb{N}^r$ is RP-solvable iff the problem of deciding whether, for a given net N with initial configuration M_0 , there exists a reachable configuration in S is reducible to RP. Prove that every Reachable Set (a set of all configurations reachable in some net (N, M_0)) is RP-solvable.
5. Show that reachability and coverability are equally hard problems for elementary Petri nets.

Homework (not mandatory)

1. Prove that liveness and reachability are interreducible in general Petri nets.