Proposal: Automated Verification for Reachability of LPN and Liveness of Marked Graph

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1 Theory

Reachability can not easily be checked through simple traversals, because a Labeled Petri-Net can have distint markings even a fixed point was reached, *i.e.* a reachable state set may have infinite number of markings . However a necassary condition is found, which means it can also be deployed as a sufficient consition to find all unreachable states. That is: for each marking M of net N, if N has a place invariant i such that

$$i \cdot M \neq i \cdot M_0 \tag{1}$$

Then M is unreachable.

One kind of constrained Petri-Nets is Marked Graph. Its liveness can be verified through following theorem:

Theorem 1 A marked graph N is live iff each cycle of N contains at least one initially marked place.

Furthermore, it is easy to verify safety property and other specifications.

2 Implementation

The input of our liveness checker will be standard LPN format file. Reachability is checked through enumeration. If input file matches Marked Graph definition, liveness will be check based on cycles in net. Potentially other property checking will be included.

References

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