

Internship proposal

Distributed model-checking for time and prioritised Petri nets

Supervisors: Étienne André, Laure Petrucci

Location: LIPN, CNRS UMR 7030

Université Paris 13

99 avenue Jean-Baptiste Clément

93430 VILLETANEUSE

Contacts : {Etienne.Andre,Laure.Petrucci}@lipn.univ-paris13.fr

Model-checking aims at verifying that a software or hardware system meets its specification. Petri nets allow for compact modelling of systems.

One of the main issues verification faces is the so-called “state space explosion problem”. Several techniques allow to counter this problem: states representation, transition sequences abstraction, distributed verification, etc.

Among these techniques, modular verification [CP00, LP04, LM04] takes into account the modular structure of the model during the state space construction, for systems composed of synchronised semi-autonomous subsystems. This approach has been extended to time Petri nets [LP07] and Petri nets with dynamic priorities [LP11].

Objectives of the internship: Modular state spaces for these Petri nets extensions may contain spurious states since the synchronisation constraints in the modular case does not solely depend on the local module configuration. Priorities from other modules may preempt a synchronisation. This makes properties verification more complex than in the case of place/transition nets.

The internship will lead to new algorithms for properties verification using modular state spaces for time or prioritised Petri nets, without unfolding. These algorithms will be inherently distributed, which is consistent with the modular verification setting. The algorithms will be proven correct and implemented within the high-level Petri nets analysis tool HELENA (<http://www.lipn.fr/~evangelista/helena/>).

References

- [CP00] S. Christensen and L. Petrucci. Modular analysis of Petri nets. *The computer journal*, 43(3):224–242, 2000.
- [LM04] Timo Latvala and Marko Mäkelä. Ltl model checking for modular petri nets. In *ICATPN*, pages 298–311, 2004.
- [LP04] C. Lakos and L. Petrucci. Modular analysis of systems composed of semiautonomous subsystems. In *Proc. 4th Int. Conf. on Application of Concurrency to System Design (ACSD'04), Hamilton, Canada, June 2004*, pages 185–194. IEEE Computer Society Press, June 2004.
- [LP07] C. Lakos and L. Petrucci. Modular state space exploration for timed Petri nets. *Jour. Software Tools for Technology Transfer (STTT)*, 9(3–4):393–411, June 2007.
- [LP11] C. Lakos and L. Petrucci. Modular state spaces for prioritised Petri nets. *LNCS*, 6662:136–156, April 2011.