

Master's Internship Proposal

Where

Laboratoire Spécification et Vérification
École Normale Supérieure de Cachan
61, avenue du Président Wilson
94235 Cachan CEDEX
France
<http://www.lsv.ens-cachan.fr>

Title: Accelerated Paths in Petri Nets

Keywords: Petri nets, acceleration, logics.

Description

Although the exact complexity of accessibility in Petri nets is still unsettled, covering and boundedness were proven EXPSPACE-complete by [CLM76, Rac78]. Rackoff's technique was later generalized by [Yen92] to a logical language on paths in Petri nets, with the same EXPSPACE bound.

However, it turns out that Yen's algorithm only works for a fragment of the original logic, called *increasing path formulae* [AH09]. Although many properties can still be expressed in this fragment, the properties that rely on *accelerations* (i.e. introduction of ω values in a Karp and Miller covering tree construction) do not fit in this restricted fragment. In particular, the complexity of the regularity problem—whether the set of traces of a Petri net is a regular language [VVN81]—is currently in balance. Another instance is that of T -boundedness—whether the set of traces is a bounded language [CFS09].

The aim of this internship is to initiate research on path logics for Petri nets that allow to express accelerations but remain verifiable in exponential space. A first step is to examine how to adapt Rackoff's algorithm to check T -boundedness and regularity in exponential space. A second step is to generalize these insights and propose a sensible language for accelerated paths in Petri nets.

Contact

	Sylvain Schmitz	Alain Finkel
<i>Phone:</i>	+33 (0)1 47 40 75 42	+33 (0)1 47 40 75 69
<i>Email:</i>	schmitz@lsv.ens-cachan.fr	finkel@lsv.ens-cachan.fr

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