Proposition de stage de Master

Lieu

LSV, CNRS + ENS de Cachan
61 ave du Président Wilson
94235 Cachan cedex

Titre : Petri net unfolding methods for verifying weak properties

Déscription du stage:

Petri nets and their partial order unfoldings have been increasingly used in the field of control for discrete event systems, in particular for fault diagnosis. This task (in its event-based form) can be resumed as follows: given a system that is only partially observable - i.e. only some of its transitions carry an observable label -, deduce from the *observable* behaviour whether or not a certain unobservable transition f - the *fault* - has occurred. The associated question of *diagnosability* asks if the system satisfies the following : after the occurrence of f, only a bounded number of additional events is possible before the observation allows to unambiguously deduce the occurrence of f.

In recent work [**?**, **?**], it was shown that the concurrent behaviour of concurrent systems - modeled by Petri nets - can exhibit a weaker form of diagnosability. There, a system is called *weakly diagnosable* if the fault is discovered on all *progressive* behaviours, i. e. under the additional condition that all the different local subprocesses of the distributed system under study progress in an equitable manner, and no enabled transition remains enabled indefinitely without firing. The traditional *strong* diagnosability property cited above implies weak diagnosability, and both are equivalent in the case of *sequential* systems.

Weak diagnosability constitutes a genuinely *concurrency-based* problem for Petri net analysis. The purpose of the internship is to develop

- adequate finite complete prefixes [**?**] of Petri net unfoldings that suffice for checking weak diagnosability, and
- efficient algorithms for the construction of these prefixes and the fast verification of weak diagnosability.

Depending on the candidat's interest and background, it is possible yet not mandatory to study extensions to further properties and/or more general model classes.

Personne encadrant le stage:

Stefan Haar
Tel.: +33 (0)1 47 40 75 67 stefan.haar@inria.fr, haar@lsv.ens-cachan.fr

References

[1] S. Haar. Types of Asynchronous Diagnosability and the *Reveals*-Relation in occurrence nets. *IEEE Transactions on Automatic Control* **55**(10), pages 2310–2320, 2010. Preprint at
`http://www.lsv.ens-cachan.fr/Publis/PAPERS/PDF/haar-tac10.pdf`

[2] S. Haar. What Topology Tells us about Diagnosability in Partial Order Semantics. Proceedings *WODES*'10, pages 221–226. 2010. Preprint at: `http://www.lsv.ens-cachan.fr/Publis/PAPERS/PDF/SH-wodes10.pdf`

[3] V. Khomenko, M. Koutny and W. Vogler: Canonical Prefixes of Petri Net Unfoldings. *Acta Informatica* **40**(2) 95–118, Springer-Verlag 2003.