Research internship (Master M2)

Title   Synthesis of Distributed Systems with Parameterized Network Topology

Description

We consider distributed programs that can be run on an arbitrary network topology from a class of topologies (e.g., on all pipeline, all grid, or all ring topologies). Typically, such a program is given by a single sequential process, and a copy of that process can be run on any node in the given network topology. During its execution, each process may receive signals from an (uncontrollable) environment.

In *parameterized synthesis*, a specification φ is given (e.g., a temporal-logic formula) describing the desired system behavior. The goal is then to synthesize a program that implements φ. Thus, the program acts as a collection of local controllers that enforce the system to satisfy φ, independently of the network topology and independently of the behavior of the environment. There have been, so far, only a few approaches to parameterized synthesis [1, 2]. Existing works consider specifications that are interpreted over sequentialized executions of a system. The aim of the internship is to develop a framework for parameterized synthesis in a setting with *real concurrency*, where the specification is interpreted over partially ordered behaviors reflecting the parallelism. This will combine [1, 2], [3], and [4], where parameterized synthesis, partial-order specifications, and parameterized distributed systems have been considered, respectively.

References

[1] S. Jacobs and R. Bloem. Parameterized Synthesis. In *Proceedings of TACAS 2012*, LNCS, vol. 7214. Springer, 2004, pp. 362–376.

[2] A. Khalimov, S. Jacobs, and R. Bloem. Towards Efficient Parameterized Synthesis. In *Proceedings of VMCAI 2013*, LNCS, vol. 7737. Springer, 2004, pp. 108–127.

[3] P. Gastin and N. Sznajder. Fair Synthesis for Asynchronous Distributed Systems, *ACM Transactions on Computational Logic* 14(2:9), 2013.
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