Distributed synthesis in continuous time - DTU Orbit (09/11/2017)

Distributed synthesis in continuous time

We introduce a formalism modelling communication of distributed agents strictly in continuous-time. Within this framework, we study the problem of synthesising local strategies for individual agents such that a specified set of goal states is reached, or reached with at least a given probability. The flow of time is modelled explicitly based on continuous-time randomness, with two natural implications: First, the non-determinism stemming from interleaving disappears. Second, when we restrict to a subclass of non-urgent models, the quantitative value problem for two players can be solved in EXPTIME. Indeed, the explicit continuous time enables players to communicate their states by delaying synchronisation (which is unrestricted for non-urgent models). In general, the problems are undecidable already for two players in the quantitative case and three players in the qualitative case. The qualitative undecidability is shown by a reduction to decentralized POMDPs for which we provide the strongest (and rather surprising) undecidability result so far.

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