Solving parity games

Dependable Systems - Dirk Nowotka

Project Description

Parity games are infinite two player games player on finite graph. They are an important formalism at the intersection of logic, automata and game theory, with applications in verification. Solving parity games – *i.e.,* deciding which player has a winning strategy – is the subject of much research, focused both on understanding their complexity and developing practical solvers. In particular, the existence of a general polynomial time algorithm is a major open problem, while there are many classes of games on which polynomial algorithms exist.

The goal of this project is to implement and evaluate a recently proposed parameterised algorithm for solving parity games. For a fixed parameter k, this algorithm is polynomial and solves parity games for a class of games which depends on k. The theory suggests that a small parameter k could suffice for most games, making this algorithm a good candidate for solving parity games in practice.

The student taking on this project will be testing this hypothesis by comparing their implementation of this algorithm with existing solvers, implemented in either the OCaml tool PGSolver, or the C++ tool Oink.

A large part of this project will consist of getting to grips with some of the theory behind parity game solvers. The ideal student for this project should therefore have a strong interest in theoretical computer science, as well as some programming experience.

This project will involve the student in an ongoing research topic, and has scope to evolve according to the student's interest and findings. Interesting outcomes could form part of an academic publication.

Applicable For

- [x] Bachelorstudents
- [x] Masterstudents

Keywords

Parity Games

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