Research Highlight: Deciding Parity Games in Quasipolynomial Time

Work of
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Parity games are infinite duration games played on finite directed graphs. Each node of the graph carries a value and the player move alternately along the edges of the graph. The two players each have a parity and the parity of the largest value occurring infinitely often on a node of the play determines the winner. An open question of this game is the computational complexity to determine the winner of a parity game. Since 2008, the best known complexity bound was by an algorithm of Jurdzinski, Paterson and Zwick which took approximately $n^{O(\sqrt{n})}$ time to determine the winner of a parity game on a finite directed graph with n nodes; the main contribution of Calude, Jain, Khoussainov, Li and Stephan was to bring down this complexity to slightly less than $O\left(n^{\log(n)}\right)$, that is, to provide a quasipolynomial time algorithm for the problem. Furthermore, they showed that the problem is fixed parameter tracktable for the main parameter of the number of values used in the game.

Their joint work also investigated the applications of these results to the complexity of solving Muller games. The work received a Best Paper Award at the Forty Ninth Symposium on the Theory of Computing which is one of the premier conferences in theoretical computer science.

Reference:

See Session 3 of the Conference Programme of STOC 2017 at
http://acm-stoc.org/stoc2017/toc.html
http://www.comp.nus.edu.sg/news/2112-2017stocbp/