

Two-Player Zero Sum Games played on Graphs: ω -Regular and Quantitative Objectives

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The class of two-player zero sum games played on graphs is a canonical model to formalize and reason about the non-terminating interaction between a system and its environment. In this series of lectures, I will expose fundamental results for game graphs both for omega-regular objectives and for quantitative objectives. Those results will cover algorithms and complexity analysis of the central problems in the area.

More precisely, I consider algorithms and complexity results for the following games:

- reachability and safety games
- Büchi, co-Büchi and parity games
- energy and mean-payoff games in one and in multiple dimensions

Participants that would like to read related materials before the lectures are referred to the following papers: [4, 5, 3, 1, 2].

References

- [1] L. Brim, J. Chaloupka, L. Doyen, R. Gentilini, J. Raskin. *Faster Algorithms for Mean-payoff Games*. Formal Methods in System Design, 38(2); pp. 97–118; 2011.
- [2] K. Chatterjee, L. Doyen, M. Randour, J. Raskin. *Looking at Mean-payoff and Total-payoff through Windows*. CoRR; abs/1302.4248, 2013.
- [3] K. Chatterjee, M. Randour, J. Raskin. *Strategy Synthesis for Multi-dimensional Quantitative Objectives*. Acta Inf., 51(3-4); pp. 129–163; 2014.
- [4] M. Jurdzinski. *Algorithms for Solving Parity Games*. 2011.
- [5] Y. Velner, K. Chatterjee, L. Doyen, T. A. Henzinger, A. Rabinovich, J. Raskin. *The Complexity of Multi-mean-payoff and Multi-energy Games*. CoRR; abs/1209.3234; 2012.