Foreword

Special Issue: Games in Verification

This special issue of *Journal of Computer and System Sciences* is devoted to game theoretic methods in automated verification and model checking. The idea for a special issue was proposed in the context of the EU Research and Training Network "Games and Automata for Synthesis and Validation (GAMES)", and a call for submissions to this special issue was internationally distributed in this research community.

The breadth of topics in this special issue reflects the ubiquitousness of game theoretic topics in verification. The first paper is an in-depth survey about two-player games on graphs with ω-regular objectives, a class of games with applications in the verification and synthesis of reactive systems. The next two papers are concerned with model checking algorithms for the μ-calculus. The second paper extends the game-based framework of μ-calculus model checking to the multi-valued setting, where formulas are interpreted over Kripke structures defined over a lattice. The authors define a new game for the multi-valued model checking problem of the full μ-calculus, and demonstrate a direct model checking algorithm for the alternation-free fragment. The third paper then describes a solution method for parity games, and thus, μ-calculus model checking, by reduction to Boolean satisfiability. The fourth paper considers applications of game theory to program debugging. The authors present a method to automatically locate and correct faults in a finite state system that is specified by a temporal logic formula. They formulate the correction problem as a game for which they introduce two practical solution heuristics. Finally, the fifth paper is concerned with the computational complexity of model checking first order logic and (monadic) second order logic over hierarchical structures. The complexity results demonstrate a tight correspondence between the bounded quantifier-alternation fragments of first order/monadic second order and the polynomial/exponential time hierarchy which is due to the common game theoretic foundation of these concepts.

Although the current volume is a special issue, all papers went through the standard refereeing procedures of this journal. We would like to thank the referees for their help in making the publication of this special issue possible, and the authors for their patience in the long history of this special issue.

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