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Preface

Special Issue of Selected Extended Papers of IJCAR 2014

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This special issue of the Journal of Automated Reasoning is dedicated to selected papers presented at the 7th Joint Conference on Automated Reasoning (IJCAR 2014), held between July 19 and July 22, 2014 in Vienna, Austria as part of the Vienna Summer of Logic. IJCAR is the premier international joint conference on all topics in automated reasoning. IJCAR merges every other year three leading events in automated reasoning: CADE (Conference on Automated Deduction), FroCoS (Workshop on Frontiers of Combining Systems), and TABLEAUX (Conference on Analytic Tableaux and Related Methods).

The papers selected for this special issue underwent a two-round reviewing process. In the first round, the papers had been reviewed and accepted by at least three reviewers as part of the IJCAR 2014 reviewing process. We invited authors of top rated papers in the proceedings as evaluated by the reviewers to submit revised and extended versions of their papers to this special issue. In the second round, the submitted extended papers went through the reviewing process of the Journal of Automated Reasoning. Each paper was reviewed by either two or three reviewers, many of whom were different from the reviewers of the paper at IJCAR. The seven selected papers in this special issue cover a wide spectrum of topics in automated reasoning, from system descriptions to purely theoretical contributions, from decidable logics to undecidable higher-order logics and from basic research to application oriented results supported by experiments.

AProVE is a system well-known for automatically proving termination of computer programs. The paper “Analyzing Program Termination and Complexity Automatically with AProVE” presents a detailed account of the system with respect to termination and complexity analysis. The paper “Automatically Proving Termination and Memory Safety for

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Programs with Pointer Arithmetic" presents an approach to add the capability of analyzing pointer arithmetic to the system.

Dealing with uncertainty is an important aspect of logics for knowledge representation. The paper "The Bayesian Ontology Language BEL" introduces a new probabilistic description logic where, in particular, reasoning can be decoupled between the logical and the probabilistic components.

Quantified boolean formulas (QBF) are an extension to propositional logic that constitutes a further challenge to automation and proof documentation. The paper "Solution Validation and Extraction for QBF Preprocessing Techniques" shows how state-of-the-art preprocessing techniques can be documented in a uniform proof system.

The explicit representation of models for some complex logical theory is important for many aspects of automated reasoning, including the reasoning process itself and as an actual result. The paper "Approximations for Model Construction" considers the problem of automatically and efficiently computing models for satisfiable constraints, in the presence of complex background theories such as floating-point arithmetic.

Induction is an important form of reasoning, both for expressive logics and for properties of automated reasoning calculi. The paper "Soundness and Completeness Proofs by Coinductive Methods" investigates the usefulness of codatatypes by employing it to soundness and completeness of proof systems for variations of first-order logic resulting in compact, high-level proofs.

There is a long standing tradition in applying first-order theorem provers to problems in concrete areas of mathematics, including geometry. The paper "Finding Proofs in Tarskian Geometry" follows this tradition in providing proofs by the theorem prover OTTER for about two hundred theorems in Tarskian Geometry including some challenge problems.

We thank the authors for their very valuable contributions, and are especially grateful to the reviewers for their thorough and extensive feedback. We also thank Tobias Nipkow, the Editor-In-Chief of the Journal of Automated Reasoning for his patience, help, and support for this special issue.