SC^2 2017

Second International Workshop on Satisfiability Checking and Symbolic Computation

FETOPEN-CSA SC^2 Workshop 2
Bridging Two Communities to Solve Real Problems

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Kaiserslautern, Germany

http://www.sc-square.org/CSA/workshop2.html

Preface

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This volume contains the papers presented at the Second International Workshop on Satisfiability Checking and Symbolic Computation (SC^2 2017). The workshop was held on the 29th July 2017 at the University of Kaiserslautern in Kaiserslautern, Rheinland-Pfalz, Germany.

Symbolic Computation is concerned with the algorithmic determination of exact solutions to complex mathematical problems; more recent developments in the area of Satisfiability Checking are starting to tackle similar problems but with different algorithmic and technological solutions.

The two communities share many central interests, but researchers from these two communities have rarely interacted until recently. Also, the lack of common or compatible tool interfaces is an obstacle to their fruitful combination. Bridges between the communities in the form of common platforms and road-maps are necessary to initiate an exchange, and to support and direct their interaction.

The aim of this workshop, along the SC^2 H2020 FETOPEN Coordination and Support Activity project (712689), was to provide a time to discuss, share knowledge and experience across both communities.

The workshop was open for submission and participation to everyone interested in the topics, whether they were members or associates of the SC^2 H2020 FETOPEN CSA project or not. Papers were solicited on topics that include all aspects involving Satisfiability Checking and Symbolic Computation together. More specifically, some suggested topics were:

- Decision procedures and their embedding into SMT solvers and Computer Algebra Systems
- Satisfiability Checking for Symbolic Computation
- Symbolic Computation for Satisfiability Checking
- Applications relying on Symbolic Computation and Satisfiability Checking
- Combination of Symbolic Computation and Satisfiability Checking tools

This is the second SC^2 workshop: the first took place in September 2016 in Timisoara, Romania[3] with proceedings available as Volume 1804 of CEUR-WS[4].

[3] http://www.sc-square.org/CSA/workshop1.html
[4] http://ceur-ws.org/Vol-1804/

Proceedings Papers

The workshop solicited submissions to the proceedings as either full papers or extended abstracts. In either case each of these submissions received at least three reviews from the program committee members. We accepted 3 full papers and 4 extended abstracts into these CEUR-WS proceedings.

Full Papers:

- Jan Horacek and Martin Kreuzer - *On Conversions from CNF to ANF.*
- Tarik Viehmann, Gereon Kremer and Erika Ábrahám - *Comparing Different Projection Operators in the Cylindrical Algebraic Decomposition for SMT Solving*
- Martin Brain, James H. Davenport and Alberto Griggio - *Benchmarking Solvers, SAT-style*

Extended Abstracts:

- Rui-Juan Jing and Marc Moreno Maza - *Computing the Integer Points of a Polyhedron*
- Erika Ábrahám, Jasper Nalbach and Gereon Kremer - *Embedding the Virtual Substitution Method in the Model Constructing Satisfiability Calculus Framework*
- John Abbott and Anna Maria Bigatti - *New in CoCoA-5.2.0 and CoCoALib-0.99550 for SC-Square*
- Stephen Forrest - *Integration of SMT-LIB support into Maple*

Presentations without Publication

In addition, the workshop solicited presentations without publication on topics of work that had been published elsewhere but would be of interest to the SC^2 community. These contributions were assessed for relevance by the program committee with 5 such presentation taking place at the workshops.

Presentations without Publication:

- Maximilian Jaroschek, Andreas Humenberger and Laura Kovács - *Polynomial Invariant Generation for Multi-Path Loops*
- Daniela Ritirc, Armin Biere and Manuel Kauers - *Complexity of circuit ideal membership testing*
- Pascal Fontaine, Mizuhito Ogawa, Thomas Sturm and Xuan Tung Vu - *Subtropical Satisfiability*
- Martin Bromberger and Christoph Weidenbach - *Computing a Complete Basis for Equalities Implied by a System of LRA Constraints*
- Curtis Bright, Ilias Kotsireas and Vijay Ganesh - *A SAT+CAS Method for Enumerating Williamson Matrices of Even Order*
- Deepak Kapur - *Nonlinear Polynomials, Interpolants and Invariant Generation for System Analysis*

The last of these was a survey of work and the chairs agreed to include a non-reviewed survey paper into the proceedings as a useful reference for participants.

Invited Speaker

The workshop had an invited talk, by Jeremy Avigad (Carnegie Mellon University) on *The Lean Theorem Prover*.

Abstract: Lean is a new interactive theorem prover that is based on dependent type theory. The system is designed to combine interactive theorem proving, computation, and automation within the same logical framework. Dependent type theory provides an expressive language for reasoning about concrete and abstract mathematical structures, and the fact that it has a computational interpretation means that Lean can be used as a programming language as well. With a suitable interface to the system internals, it can also be used as a metaprogramming language, that is, a language with which one can extend the functionality of the system itself. I will survey all these aspects of the system in this talk, and consider ways that Lean can be used as a platform to unify symbolic combination, automated reasoning, and verified proof. In particular, I will describe a Lean-Mathematica connection developed by Robert Y. Lewis, which takes advantage of Lean's metaprogramming capabilities.

Program Committee

Co-Chairs:

- Matthew England (Coventry University, U.K.)
- Vijay Ganesh (University of Waterloo, Canada)

Program Committee

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- Wolfgang Windsteiger (Johannes Kepler Universität, Linz, Austria)

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