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Tools and Algorithms for the Construction and Analysis of Systems

22nd International Conference, TACAS 2016
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Proceedings

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ETAPS Foreword

Welcome to the proceedings of ETAPS 2016, which was held in Eindhoven, located in “the world’s smartest region,” also known as the Dutch Silicon Valley. Since ETAPS’ second edition held in Amsterdam (1999), ETAPS returned to The Netherlands this year.

ETAPS 2016 was the 19th instance of the European Joint Conferences on Theory and Practice of Software. ETAPS is an annual federated conference established in 1998, consisting of five constituting conferences (ESOP, FASE, FoSSaCS, TACAS, and POST) this year. Each conference has its own Programme Committee and its own Steering Committee. The conferences cover various aspects of software systems, ranging from theoretical computer science to foundations to programming language developments, analysis tools, formal approaches to software engineering, and security. Organizing these conferences in a coherent, highly synchronized conference program, enables attendees to participate in an exciting event, having the possibility to meet many researchers working in different directions in the field, and to easily attend the talks of various conferences. Before and after the main conference, numerous satellite workshops took place and attracted many researchers from all over the globe.

The ETAPS conferences received 474 submissions in total, 143 of which were accepted, yielding an overall acceptance rate of 30.2 %. I thank all authors for their interest in ETAPS, all reviewers for their peer-reviewing efforts, the Program Committee members for their contributions, and in particular the program co-chairs for their hard work in running this intensive process. Last but not least, my congratulations to all the authors of the accepted papers!

ETAPS 2016 was greatly enriched by the unifying invited speakers Andrew Gordon (MSR Cambridge and University of Edinburgh, UK), and Rupak Majumdar (MPI Kaiserslautern, Germany), as well as the conference-specific invited speakers (ESOP) Cristina Lopes (University of California at Irvine, USA), (FASE) Oscar Nierstrasz (University of Bern, Switzerland), and (POST) Vitaly Shmatikov (University of Texas at Austin, USA). Invited tutorials were organized by Lenore Zuck (Chicago) and were provided by Grigore Rosu (University of Illinois at Urbana-Champaign, USA) on software verification and Peter Ryan (University of Luxembourg, Luxembourg) on security. My sincere thanks to all these speakers for their inspiring and interesting talks!

ETAPS 2016 took place in Eindhoven, The Netherlands. It was organized by the Department of Computer Science of the Eindhoven University of Technology. It was further supported by the following associations and societies: ETAPS e.V., EATCS (European Association for Theoretical Computer Science), EAPLS (European Association for Programming Languages and Systems), and EASST (European Association of Software Science and Technology). The local organization team consisted of Mark van den Brand, Jan Friso Groote (general chair), Margje Mommers, Erik Scheffers, Julien Schmalz, Erik de Vink, Anton Wijs, Tim Willems, and Hans Zantema.

The overall planning for ETAPS is the main responsibility of the Steering Committee, and in particular of its Executive Board. The ETAPS Steering Committee consists of an Executive Board and representatives of the individual ETAPS conferences, as well as representatives of EATCS, EAPLS, and EASST. The Executive Board consists of Gilles Barthe (Madrid), Holger Hermanns (Saarbrücken), Joost-Pieter Katoen (chair, Aachen and Twente), Gerald Lüttgen (Bamberg), Vladimiro Sassone (Southampton), and Tarmo Uustalu (Tallinn). Other members of the Steering Committee are: Parosh Abdulla (Uppsala), David Basin (Zurich), Giuseppe Castagna (Paris), Marsha Chechik (Toronto), Javier Esparza (Munich), Jan Friso Groote (Eindhoven), Reiko Heckel (Leicester), Marieke Huisman (Twente), Bart Jacobs (Nijmegen), Paul Klint (Amsterdam), Jens Knoop (Vienna), Kim G. Larsen (Aalborg), Axel Legay (Rennes), Christof Löding (Aachen), Matteo Maffei (Saarbrücken), Pasquale Malacaria (London), Tiziana Margaria (Limerick), Andrzej Murawski (Warwick), Catuscia Palamidessi (Palaiseau), Frank Piessens (Leuven), Jean-Francois Raskin (Brussels), Mark Ryan (Birmingham), Julia Rubin (Massachusetts), Don Sannella (Edinburgh), Perdita Stevens (Edinburgh), Gabriele Taentzer (Marburg), Peter Thiemann (Freiburg), Luca Vigano (London), Igor Walukiewicz (Bordeaux), Andrzej Wasowski (Copenhagen), and Hongseok Yang (Oxford).

I sincerely thank all ETAPS Steering Committee members for all their work in making the 19th edition of ETAPS a success. Moreover, thanks to all speakers, attendees, organizers of the satellite workshops, and Springer for their support. Finally, a big thanks to Jan Friso and his local organization team for all their enormous efforts enabling ETAPS to take place in Eindhoven!

January 2016

Joost-Pieter Katoen
ETAPS SC Chair
ETAPS e.V. President

Preface

TACAS 2016 was the 22nd edition of the International Conference on Tools and Algorithms for the Construction and Analysis of Systems conference series. The conference took place during April, 2016, on the campus of the Eindhoven University of Technology as part of the 19th European Joint Conferences on Theory and Practice of Software (ETAPS 2016).

TACAS is a forum for researchers, developers, and users interested in rigorously based tools and algorithms for the construction and analysis of systems. The conference aims to bridge the gaps between different communities with this common interest and to support them in their quest to improve the utility, reliability, flexibility, and efficiency of tools and algorithms for building systems.

The research areas covered by TACAS 2016 include specification and verification techniques; software and hardware verification; analytical techniques for real-time, hybrid, or stochastic systems; analytical techniques for safety, security, or dependability; model-checking; theorem-proving; SAT and SMT solving; static and dynamic program analysis; testing; abstraction techniques for modeling and verification; compositional and refinement-based methodologies; system construction and transformation techniques; tool environments and architectures; tool demonstrations, as well as applications and case studies.

As in former years, TACAS 2016 solicited four types of submissions:

- Research papers, identifying and justifying a principled advance to the theoretical foundations for the construction and analysis of systems, where applicable supported by experimental validation
- Case study papers, reporting on case studies and providing information about the system being studied, the goals of the study, the challenges the system poses to automated analysis, research methodologies and approaches used, the degree to which goals were attained, and how the results can be generalized to other problems and domains
- Regular tool papers, presenting a new tool, a new tool component, or novel extensions to an existing tool, with an emphasis on design and implementation concerns, including software architecture and core data structures, practical applicability, and experimental evaluations
- Short tool demonstration papers, focusing on the usage aspects of tools

This year, 175 papers were submitted to TACAS, among which 157 were research, case study, or tool papers, and 18 were tool demonstration papers. After a rigorous review process followed by an online discussion, the Program Committee accepted 44 full papers and nine tool demonstration papers.

This volume also includes an invited paper by the ETAPS unifying speaker Rupak Majumdar titled “Robots at the Edge of the Cloud.”

TACAS 2016 also hosted the 5th International Competition on Software Verification (SV-COMP), chaired and organized by Dirk Beyer. The competition had a record number of participants: 35 verification tools from 16 countries were submitted for the systematic comparative evaluation. This volume includes an overview of the competition results, and short papers describing 14 of the participating tools. These papers were reviewed by a separate Program Committee (PC); each of the papers was assessed by four reviewers. Two sessions in the TACAS program were reserved for the presentation of the results: the summary by the SV-COMP chair and the participating tools by the developer teams.

Many people worked hard and offered their valuable time generously to make TACAS 2016 successful. First of all, the PC chairs would like to thank the 493 researchers from 30 countries who worked hard to complete and submit papers to the conference. In all, 525 reviews (three for each submission) were written by PC members and their 227 external reviewers in order to select the papers to be presented at the conference. Steering Committee members also deserve a special recognition. Without them, a competitive and peer-reviewed international symposium like TACAS simply could not take place. Also, we would like to express a special thanks to Joost-Pieter Katoen, who answered many of our questions during the preparation of TACAS 2016.

Finally, we thank EasyChair for providing us with the infrastructure to manage the submissions, the reviewing process, the PC discussion, and the preparation of the proceedings.

January 2016

Marsha Chechik (TACAS PC Co-chair)
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