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Formal Techniques for Distributed Objects, Components, and Systems

37th IFIP WG 6.1 International Conference, FORTE 2017
Held as Part of the 12th International Federated Conference on Distributed Computing Techniques, DisCoTec 2017
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Foreword

The 12th International Federated Conference on Distributed Computing Techniques (DisCoTec) took place in Neuchâtel, Switzerland, during June 19–22, 2017. It was organized by the Institute of Computer Science of the University of Neuchâtel.

The DisCoTec series is one of the major events sponsored by the International Federation for Information Processing (IFIP). It comprises three conferences:

- COORDINATION, the IFIP WG6.1 International Conference on Coordination Models and Languages
- DAIS, the IFIP WG6.1 International Conference on Distributed Applications and Interoperable Systems
- FORTE, the IFIP WG6.1 International Conference on Formal Techniques for Distributed Objects, Components and Systems

Together, these conferences cover a broad spectrum of distributed computing subjects, ranging from theoretical foundations and formal description techniques to systems research issues.

Each day of the federated event began with a plenary speaker nominated by one of the conferences. The three invited speakers were Prof. Giovanna Di Marzo Serugendo (UniGE, Switzerland), Dr. Marko Vukolić (IBM Research, Switzerland), and Dr. Rupak Majumdar (MPI, Germany).

Associated with the federated event were also three satellite events that took place during June 21–22, 2017:

- The 10th Workshop on Interaction and Concurrency Experience (ICE)
- The 4th Workshop on Security in Highly Connected IT Systems (SHCIS)
- The EBSIS-sponsored session on Dependability and Interoperability with Event-Based Systems (DIEBS)

Sincere thanks go to the chairs and members of the Program and Steering Committees of the aforementioned conferences and workshops for their highly appreciated efforts. The organization of DisCoTec 2017 was only possible thanks to the dedicated work of the Organizing Committee, including Ivan Lanese (publicity chair), Romain Rouvoy (workshop chair), Peter Kropf (finance chair), and Aurélien Havet (webmaster), as well as all the students and colleagues who volunteered their time to help. Finally, many thanks go to IFIP WG6.1 for sponsoring this event, Springer's *Lecture Notes in Computer Science* for their support and sponsorship, and EasyChair for providing the reviewing infrastructure.

April 2017

Pascal Felber
Valerio Schiavoni

Preface

This volume contains the papers presented at FORTE 2017, the 37th IFIP International Conference on Formal Techniques for Distributed Objects, Components and Systems. This conference was organized as part of the 12th International Federated Conference on Distributed Computing Techniques (DisCoTec) and was held during June 19–22, 2017, in Neuchâtel (Switzerland).

The FORTE conference series represents a forum for fundamental research on theory, models, tools, and applications for distributed systems. The conference encourages contributions that combine theory and practice, and that exploit formal methods and theoretical foundations to present novel solutions to problems arising from the development of distributed systems. FORTE covers distributed computing models and formal specification, testing, and verification methods. The application domains include all kinds of application-level distributed systems, telecommunication services, Internet, embedded, and real-time systems, as well as networking and communication security and reliability.

After careful deliberations, the Program Committee selected 17 papers for presentation, of which three are short papers and one is a tool paper. In addition to these papers, this volume contains an abstract of the invited talk by an outstanding researcher, Rupak Majumdar (Max Planck Institute for Software Systems, Kaiserslautern, Germany), on "Systematic Testing for Asynchronous Programs." We warmly thank him for his participation. We also thank all the authors for their submissions, their willingness to continue improving their papers, and their presentations!

Conferences like FORTE rely on the willingness of experts to serve in the Program Committee; their professionalism and their helpfulness were exemplary. We thank the members of the Program Committee and all the external reviewers for their excellent work. We would like also to thank the general chair, Pascal Felber (University of Neuchâtel, Switzerland), and the support of the Organizing Committee chaired by Valerio Schiavoni (University of Neuchâtel, Switzerland), and the publicity chair, Ivan Lanese (University of Bologna, Italy). We also thank the members of the Steering Committee for their helpful advice. For the work of the Program Committee and the compilation of the proceedings, the EasyChair system was employed; it freed us from many technical matters and allowed us to focus on the program, for which we are grateful.

April 2017

Ahmed Bouajjani
Alexandra Silva

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Systematic Testing for Asynchronous Programs (Invited Talk)

Rupak Majumdar

MPI-SWS, Kaiserslautern, Germany

Asynchronous programming is a generic term for concurrent programming with cooperative task management and shows up in many different applications. For example, many programming models for the web, smartphone and cloud-backed applications, server applications, and embedded systems implement programming in this style. In all these scenarios, while programs can be very efficient, the manual management of resources and asynchronous procedures can make programming quite difficult. The natural control flow of a task is obscured and the programmer must ensure correct behavior for all possible orderings of external events. Specifically, the global state of the program can change between the time an asynchronous procedure is posted and the time the scheduler picks and runs it.

In this talk, I will describe algorithmic analysis techniques for systematic testing of asynchronous programs. I will talk about formal models for asynchronous programs and verification and systematic testing techniques for these models. The results will use connections between asynchronous programs and classical concurrency models such as Petri nets, partial order reductions for asynchronous programs, as well as combinatorial constructions of small test suites with formal guarantees of coverage.

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