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Testing Software and Systems

27th IFIP WG 6.1 International Conference, ICTSS 2015
Sharjah and Dubai, United Arab Emirates, November 23–25, 2015
Proceedings

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Preface

This volume contains the proceedings of the 27th International Conference on Testing Software and Systems, ICTSS 2015. The conference was held in Sharjah and Dubai, United Arab Emirates, during November 23–25, 2015.

The conference has a long history. In the past five years, ICTSS was held in Madrid (Spain), Istanbul (Turkey), Aalborg (Denmark), Paris (France), and Natal (Brazil). During the 2007–2009 period, the event was held as a joint conference of the International Conference on Testing of Communicating Systems (TESTCOM) and FATES, in Tallinn (Estonia), Tokyo (Japan), and Eindhoven (The Netherlands). Before that, between 2000 and 2006, TESTCOM was held in Ottawa (Canada), Berlin (Germany), Sophia Antipolis (France), Oxford (UK), Montreal (Canada), and New York City (USA). During the 1997–1999 period, the conference was called the International Workshop on Testing of Communicating Systems (IWTCS) and was held in Cheju Island (Korea), Tomsk (Russia), and Budapest (Hungary). Between 1988 and 1996 the conference was known as the International Workshop for Protocol Test Systems (IWPTS). Nine workshops took place in Vancouver (Canada), Berlin (Germany), McLean (USA), Leidschendam (The Netherlands), Montréal (Canada), Pau (France), Tokyo (Japan), Evry (France), and Darmstadt (Germany).

We received 42 submissions, and after a careful reviewing process by the Program Committee only 14 full and four short papers were selected for presentation at the conference. The accepted papers together with the abstracts of the two invited presentations by Gregor von Bochmann from the University of Ottawa (Canada) and Teruo Higashino from Osaka University (Japan) comprise the contents of the proceedings.

We are grateful to the authors of submitted papers, the invited speakers, the additional reviewers, and the Steering and Program Committee members for their valuable contributions and particularly to Rob Hierons, Steering Committee Chair, for his help and guidance. We acknowledge the use of EasyChair for the conference management. We also thank the IFIP and Springer, the American University of Sharjah, and Tomsk State University for their support.

November 2015

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**Invited Talks
(Abstracts)**

Testing Software Systems – A Perspective

Gregor V. Bochmann

School of Electrical Engineering and Computer Science,
University of Ottawa, Canada

Abstract. The talk will begin with a review of general testing concepts, such as white-box and black-box testing, different realizations of oracles (including a formal behavior specification), fault models and fault coverage issues, and testing architectures. This will set the framework for the following discussion which has two parts: (a) a discussion of the history of the ICTSS conference and the issues discussed during the early times since around 1985, and (b) an overview of two ongoing research projects: (1) on testing implementations against partial-order specifications, and (2) on reverse engineering of Rich Internet Applications for vulnerability testing.

The first ICTSS conference was held in Vancouver (Canada) in 1988 and was called International Workshop on Protocol Test Systems. The main question discussed at that time was how to test a protocol implementation to ensure that it satisfies all requirements of a given protocol specification (a form of black-box testing). The main issues were the modeling language used for the specification, fault models, and algorithms for obtaining test suites with given fault coverage. At the same time, standardization committees of ISO and ITU developed guidelines for architectures for protocol testing and a language (TTCN) for specifying test cases. Later, the scope of ICTSS was broadened to cover the testing of many other kinds of software systems.

In the second part of the talk, we will first discuss issues that arise in testing systems against a behavior specification that defines a partial order for the interactions of the implementation. Different partial-order specification languages will be considered. Then another ongoing research project on crawling Rich Internet Applications (RIAs) is discussed. Through the testing of a given implementation, a model of the RIA is developed (this is a kind of black-box testing, but without a reference specification). The purpose here is to obtain a “complete” model of the application such that each state (i.e. each page at the user interface) of the application can be subsequently checked for security vulnerabilities or accessibility requirements. Since the state space of these applications is usually huge, we propose (a) different algorithms for obtaining the most important information relatively fast, (b) concurrent exploration by multiple crawlers, and (c) some methods for avoiding the exploration of “equivalent” and “redundant” states.

Formal Modeling and Testing for Designing Future IoT Based Systems

Teruo Higashino

Graduate School of Information Science and Technology,
Osaka University, Japan

Abstract. Recently, sensing technology and IoT (Internet of Things) have much attention for designing and developing affluent and smart social systems. In this talk, we focus on the design and development of future IoT based systems such as ITS (Self-driving vehicles and collision avoidance), smart grid (power control), crowd sensing systems from human beings with mobile devices, and so on. We discuss about considerations for developing resilient IoT based systems such as (i) mobility influence, (ii) real-time data processing, (iii) treatment of a huge amount of geospatial data, and so on, and provide frameworks for their formal modeling and testing.

The reliability and performance of most ITS and crowd sensing systems are strongly affected from vehicular and human mobility. In the first part of this talk, we summarize recent Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) wireless communication mechanisms and crowd sensing systems, and discuss about their mobility influence. Then, we introduce frameworks for their formal modeling and testing in order to improve their reliability.

In urban areas, since multiple wireless communication devices often coexist, they interfere each other. In such cases, geospatial monitoring and passive testing are useful in order to observe that a set of desirable properties called “invariants” holds. In the second part of this talk, we summarize recent research about geospatial monitoring and passive testing, and show how their formal modeling and testing frameworks can be used.

In the third part of this talk, we focus on real-time data processing and treatment of geospatial data. In smart grid systems, real-time feedbacks are essential for stable power supply. In crowd sensing systems, a huge amount of geospatial sensing data need to be treated. General cloud servers might not be able to be used for storing such a huge amount of data and providing real-time feedbacks. We introduce recent research about edge computing (fog computing), and provide frameworks for their formal modeling and testing.

Contents

Model Based Testing

Checking Experiments for Finite State Machines with Symbolic Inputs	3
<i>Alexandre Petrenko and Adenilso Simao</i>	
Using Multiple Adaptive Distinguishing Sequences for Checking Sequence Generation	19
<i>Canan Güniçen, Guy-Vincent Jourdan, and Hüsnü Yenigün</i>	
Model-Based Testing from Input Output Symbolic Transition Systems Enriched by Program Calls and Contracts	35
<i>Imen Boudhiba, Christophe Gaston, Pascale Le Gall, and Virgile Prevosto</i>	

Test Derivation Methods

Graph Methods for Generating Test Cases with Universal and Existential Constraints	55
<i>Sylvain Hallé, Edmond La Chance, and Sébastien Gaboury</i>	
Reducing the Cost of Grammar-Based Testing Using Pattern Coverage	71
<i>Cleverton Hentz, Jurgen J. Vinju, and Anamaria M. Moreira</i>	
Automated Test Design for Boundaries of Product Line Variants	86
<i>Stephan Weißleder, Florian Wartenberg, and Hartmut Lackner</i>	

Monitoring and Fault Localization

Guiding Testers' Hands in Monitoring Tools: Application of Testing Approaches on SIP	105
<i>Xiaoping Che, Stephane Maag, Huu Nghia Nguyen, and Fatiha Zaïdi</i>	
Testing for Distinguishing Repair Candidates in Spreadsheets – the Mussco Approach	124
<i>Rui Abreu, Simon Außerlechner, Birgit Hofer, and Franz Wotawa</i>	
Novel Insights on Cross Project Fault Prediction Applied to Automotive Software	141
<i>Harald Altinger, Steffen Herbold, Jens Grabowski, and Franz Wotawa</i>	

Model and System Testing

Inferring Finite State Machines Without Reset Using State Identification Sequences 161
Roland Groz, Adenilso Simao, Alexandre Petrenko, and Catherine Oriat

mu2: A Refactoring-Based Mutation Testing Framework for Erlang 178
Ramsay Taylor and John Derrick

A Survey on Testing for Cyber Physical System 194
Sara Abbaspour Asadollah, Rafia Inam, and Hans Hansson

Real-Time Systems

Test-Data Generation for Testing Parallel Real-Time Systems 211
Muhammad Waqar Aziz and Syed Abdul Baqi Shah

Selective Test Generation Approach for Testing Dynamic Behavioral Adaptations 224
Mariam Lahami, Moez Krichen, Hajer Barhoumi, and Mohamed Jmaiel

Short Papers

Heuristics for Deriving Adaptive Homing and Distinguishing Sequences for Nondeterministic Finite State Machines. 243
Natalia Kushik and Hüsniü Yenigün

Genetic Algorithm Application for Enhancing State-Sensitivity Partitioning. 249
Ammar Mohammed Sultan, Salmi Baharom, Abdul Azim Abd Ghani, Jamilah Din, and Hazura Zulzalil

A Negative Input Space Complexity Metric as Selection Criterion for Fuzz Testing 257
Martin A. Schneider, Marc-Florian Wendland, and Andreas Hoffmann

A Practical Evaluation Method of Network Traffic Load for Capacity Planning 263
Takeshi Kitahara, Shuichi Nawata, Masaki Suzuki, Norihiro Fukumoto, and Shigehiro Ano

Author Index 269