Lecture Notes in Computer Science 7261

Kerstin Eder João Lourenço
Onn Shehory (Eds.)

Hardware and Software: Verification and Testing

7th International
Haifa Verification Conference, HVC 2011
Haifa, Israel, December 6-8, 2011
Revised Selected Papers

Springer

Volume Editors

Kerstin Eder
University of Bristol, Department of Computer Science
Merchant Venturers Building 3.25, Woodland Road, Bristol BS8 1UB, UK
E-mail: kerstin.eder@bristol.ac.uk

João Lourenço
NOVA University of Lisbon, Department of Computer Science and Engineering
FCT-UNL, Quinta da Tore, 2829-516 Caparica, Portugal
E-mail: joao.lourenco@fct.unl.pt

Onn Shehory
IBM Research Labs at Haifa
Haifa University Campus, Mount Carmel, Haifa 31905, Israel
E-mail: onn@il.ibm.com

ISSN 0302-9743 e-ISSN 1611-3349
ISBN 978-3-642-34187-8 e-ISBN 978-3-642-34188-5
DOI 10.1007/978-3-642-34188-5
Springer Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012950042

CR Subject Classification (1998): D.2.4-5, D.3.1, F.3.1-2, D.2.11, I.2.2-3

LNCS Sublibrary: SL 2 – Programming and Software Engineering

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

This volume contains the papers presented at the Haifa Verification Conference 2011, the 7th in the series of annual conferences dedicated to advancing the state of the art and state of the practice in verification and testing of hardware and software. HVC provides a forum for researchers and practitioners from both academia and industry to share their work, exchange ideas, and discuss challenges and future directions of testing and verification for hardware, software, and hybrid systems.

Academic research in system verification and testing is roughly divided into two major paradigms: formal verification and dynamic verification (testing). Within each paradigm, algorithms, techniques and even terminology may differ considerably between hardware-related solutions and software-related solutions. However, the common underlying goal of verification, across paradigms and system types, is to gain confidence in a system meeting its functional as well as its non-functional requirements. HVC is the only conference that brings together researchers and practitioners from all verification and testing sub-fields, thereby encouraging the migration of methods and ideas among domains. One key asset of HVC is the strong participation from industry. HVC provides a platform for the academic and industrial research communities to mix and mingle, thereby creating new opportunities for collaborative research. We are particularly proud to say that the papers selected for presentation at HVC 2011 covered a wide range of sub-fields related to testing and verification applicable to software, hardware, and hybrid systems, thus stimulating discussion within the wider verification community.

From a total of 43 submissions, the Program Committee selected 15 regular papers for full presentation, three tools papers for short presentation, and four posters for the student poster session on day one of the conference. HVC 2011 was organized in five technical sessions devoted to topics including synthesis, formal verification, software quality, testing, and coverage. The best paper selection jury considered both the quality of the technical paper as well as the presentation at the conference. The best paper prize was awarded to Marijn Heule, Oliver Kullmann, Siert Wieringa, and Armin Biere for their paper entitled “Cube and Conquer: Guiding CDCL SAT Solvers by Lookaheads.”

Granted since 2007, the HVC award recognizes the most promising academic and industrial contribution to the fields of testing and software and hardware verification from the last five years. The HVC 2011 award went to Daniel Kroening from Oxford for his contribution of CBMC, a bounded model checker for C programs. CBMC is the first and most influential industrial-strength verification engine for a non-academic programming language, and hence a major milestone in automated verification. To date, CBMC is the only verification engine that supports the full functionality of C, including precise modeling of floating-point operations and bit-precise arithmetic. CBMC promotes the industrial adoption of formal software verification more than any other tool in existence and is therefore a significant contribution to the verification community.

The conference was hosted by IBM at the IBM Research Labs in Haifa. We would like to thank all who made HVC 2011 run smoothly and gratefully acknowledge the invaluable support by many on the IBM administrative team, without which this event could not meet its goals and match the high standards established over the years. We would like to thank the Program Committee, the HVC Award Committee, the Best Paper Prize Jury, the authors of all submissions to HVC 2011 and, of course, the presenters of the papers and posters accepted. All these contributed toward making HVC 2011 another success in the HVC conference series. We would also like to thank the tutorial presenters Avner Engel, Ofer Strichman, and Rachel Tzoref-Brill for an informative first day prior to the main conference. Special thanks are due to our invited speakers who enriched the program with insightful and inspiring presentations: Kathryn Kranen, Jasper Design Automation, Ben Liblit, University of Wisconsin-Madison, Klaus-Dieter Schubert, IBM Deutschland Research and Development GmbH, and Armin Biere, Johannes Kepler University, Linz.

Finally, we would like to thank our sponsors, IBM, Cadence, Mentor Graphics, and Jasper Design Automation, for their generous support in preparation and throughout the event.

July 2012

Kerstin Eder
João Lourenço
Onn Shehory

Organization

General Chair

Onn Shehory	IBM Haifa Labs, Israel

Program Chairs

Kerstin Eder	University of Bristol, UK	(Verification Track)
João Lourenço	New University of Lisbon, Portugal	(Software Testing Track)

Tutorials Chair

Oz Hershkovitz	IBM Haifa Labs, Israel

Local Organization

Yair Harry	IBM Haifa Labs, Israel	(Webmaster)
Shirley Namer	IBM Haifa Labs, Israel	(Local Logistics)
Onn Shehory	IBM Haifa Labs, Israel	(Coordinator)

Program Committee

Sharon Barner	IBM Haifa Labs, Israel
Geoff Barrett	Broadcom, UK
Armin Biere	Institute for Formal Models and Verification, Austria
Eyal Bin	IBM Haifa Labs, Israel
Roderick Bloem	Graz University of Technology, Austria
Michael Browne	IBM, USA
Michael Butler	University of Southampton, UK
Radu Calinescu	University of Aston, UK
Hana Chockler	IBM Haifa Labs, Israel
Kerstin Eder	University of Bristol, UK
Eitan Farchi	IBM Haifa Labs, Israel
Harry Foster	Mentor Graphics, USA
Franco Fummi	University of Verona, Italy
Ian G. Harris	University of California Irvine, USA
Ziyad Hanna	Jasper DA, USA
Klaus Havelund	JPL, USA
Alan Hu	University of British Columbia, USA
Mika Katara	Tampere University of Technology, Finland
Zurab Khasidashvili	Intel, Israel

Tsvi Kuflik	University of Haifa, Israel
Mark Last	Ben Gurion University, Israel
João Lourenço	New University of Lisbon, Portugal
Tom Melham	Oxford University, UK
Amir Nahir	IBM Haifa Labs, Israel
Mauro Pezze	University of Lugano, Switzerland, and University of Milano Bicocca, Italy
Orna Raz	IBM Haifa Labs, Israel
Michael S. Hsiao	VirginiaTech, USA
Wolfram Schulte	Microsoft Research,USA
Onn Shehory	IBM Haifa Labs, Israel
Armando Tacchella	University of Genova, Italy
Helen Treharne	University of Surrey, UK
Shmuel Ur	Innovations Ltd., Israel
Helmut Veith	Vienna University of Technology, Austria
Heike Wehrheim	Paderborn University, Germany

HVC Award Committee

Shmuel Ur	Innovations Ltd., Israel (Chair)
Ian G. Harris	University of California Irvine, USA
Klaus Havelund	JPL, USA
Mika Katara	Tampere University of Technology, Finland
Ofer Strichman	Technion, Israel

Additional Referees

Sam Bayless
Christian Bird
John Colley
Chris Derobertis
Ricardo Dias
Andrew Edmunds
Cindy Eisner
Ranan Fraer
Jim Grundy
Georg Hofferek
Andreas Holzer
Alexander Ivrii
Kenneth Johnson
Antti Jääskeläinen
Robert Koenighofer
Dmitry Korchemny
Anatoly Koyfman
Yael Meller
Madanlal Musuvathi
Ziv Nevo
Avigail Orni
Andrey Rybalchenko
Alexander Schremmer
Carl Seger
Martina Seidl
Dominik Steenken
Dorian Thomas
Rachel Tzoref-Brill
Heikki Virtanen
Matti Vuori
Sven Walther
Nick Wiggins
Chao Yan

Table of Contents

Invited Talks

Synthesis

Formal Verification

Software Quality

Testing and Coverage

Experience and Tools

Posters – Student Event