

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Alfred Kobsa

University of California, Irvine, CA, USA

Friedemann Mattern

ETH Zurich, Switzerland

John C. Mitchell

Stanford University, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

Oscar Nierstrasz

University of Bern, Switzerland

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Germany

Madhu Sudan

Microsoft Research, Cambridge, MA, USA

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max-Planck Institute of Computer Science, Saarbruecken, Germany

Zohar Manna Doron A. Peled (Eds.)

Time for Verification

Essays in Memory of Amir Pnueli

Volume Editors

Zohar Manna
Stanford University, Computer Science Department
Stanford, CA 94305, USA
E-mail: zm@cs.stanford.edu

Doron A. Peled
Bar Ilan University, Department of Computer Science
Ramat Gan, 52900, Israel
E-mail: doron.peled@gmail.com

Library of Congress Control Number: 2010929623

CR Subject Classification (1998): F.2, F.4

LNCS Sublibrary: SL 1 – Theoretical Computer Science and General Issues

ISSN	0302-9743
ISBN-10	3-642-13753-9 Springer Berlin Heidelberg New York
ISBN-13	978-3-642-13753-2 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

springer.com

© Springer-Verlag Berlin Heidelberg 2010
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper 06/3180



Amir Pnueli (1941-2009)

Preface

This volume is dedicated to the memory of Amir Pnueli: a great scientist, a colleague and a friend. Amir touched our lives in several ways. As a scientist, Amir had the exceptionally deep insight that can open a new research area with a cleverly crafted paper. Having published over 250 papers, and won the Turing Award, the highest awarded recognition in computer science, Amir is no doubt one of the most brilliant and visionary computer scientists of all times. As a colleague and research collaborator, Amir steered the entire field of research in unforeseen, original, directions. As a mentor, Amir was admired by the students that were lucky to be supervised by him. Amir will always be remembered as a colleague and a friend, who, with his kind manners and great vision has influenced and will continue to influence present and future generations of computer scientists.

April 2010

Zohar Manna
Doron Peled

Table of Contents

Modal and Temporal Argumentation Networks	1
<i>Howard Barringer and Dov M. Gabbay</i>	
Knowledge Based Scheduling of Distributed Systems	26
<i>Saddek Bensalem, Doron Peled, and Joseph Sifakis</i>	
Quantitative Simulation Games	42
<i>Pavol Černý, Thomas A. Henzinger, and Arjun Radhakrishna</i>	
The Localization Reduction and Counterexample-Guided Abstraction Refinement	61
<i>Edmund M. Clarke, Robert P. Kurshan, and Helmut Veith</i>	
A Scalable Segmented Decision Tree Abstract Domain	72
<i>Patrick Cousot, Radhia Cousot, and Laurent Mauborgne</i>	
Towards Component Based Design of Hybrid Systems: Safety and Stability	96
<i>Werner Damm, Henning Dierks, Jens Oehlerking, and Amir Pnueli</i>	
Mildly Context-Sensitive Languages via Buffer Augmented Pregroup Grammars	144
<i>Daniel Genkin, Nissim Francez, and Michael Kaminski</i>	
Inference Rules for Proving the Equivalence of Recursive Procedures ...	167
<i>Benny Godlin and Ofer Strichman</i>	
Some Thoughts on the Semantics of Biocharts	185
<i>David Harel and Hillel Kugler</i>	
Unraveling a Card Trick	195
<i>Tony Hoare and Natarajan Shankar</i>	
An Automata-Theoretic Approach to Infinite-State Systems	202
<i>Orna Kupferman, Nir Piterman, and Moshe Y. Vardi</i>	
On the Krohn-Rhodes Cascaded Decomposition Theorem	260
<i>Oded Maler</i>	
Temporal Verification of Reactive Systems: Response	279
<i>Zohar Manna and Amir Pnueli</i>	

The Arrow of Time through the Lens of Computing	362
<i>Krishna V. Palem</i>	
What Is in a Step: New Perspectives on a Classical Question	370
<i>Willem-Paul de Roever, Gerald Lüttgen, and Michael Mendler</i>	
Author Index	401