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Martin Wirsing (Eds.)

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Theoretical Aspects of Computing – ICTAC 2005

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Theoretical Aspects of Computing – ICTAC 2005

Second International Colloquium
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Proceedings

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Preface

This volume contains the proceedings of ICTAC 2005, the second ICTAC, *International Colloquium on Theoretical Aspects of Computing*. ICTAC 2005 took place in Hanoi, Vietnam, October 17–21, 2005.

ICTAC was founded by the International Institute for Software Technology of the United Nations University (UNU-IIST) to serve as a forum for practitioners, lecturers and researchers from academia, industry and government who are interested in theoretical aspects of computing and rigorous approaches to software engineering. The colloquium is aimed particularly, but not exclusively, at participants from developing countries. We believe that this will help developing countries to strengthen their research, teaching and development in computer science and engineering, improve the links between developing countries and developed countries, and establish collaboration in research and education. By providing a venue for the discussion of common problems and their solutions, and for the exchange of experiences and ideas, this colloquium supports research and development in computer science and software technology. ICTAC is attracting more and more attention from more and more countries.

Topics covered by ICTAC include:

- automata theory and formal languages,
- principles and semantics of programming languages,
- logic and its applications,
- software architectures and their description languages,
- software specification, refinement and verification,
- model checking and theorem proving,
- formal techniques in software testing,
- models of object and component systems,
- coordination and feature interaction,
- integration of formal and engineering methods,
- service-oriented and document-driven development,
- models of concurrency, security and mobility,
- theory of parallel, distributed and Internet-based (grid) computing,
- real-time and embedded systems,
- type and category theory in computer science.

Research papers in these topics are always considered by ICTAC.

ICTAC 2005 received 122 paper submissions from 29 countries, and accepted 35 papers. We would like to thank the authors of all submitted papers.

Selecting papers for a program from the large number of submissions in a fair and competent manner is a hard job. Luckily, ICTAC 2005 had an excellent Program Committee with highly qualified members from diverse backgrounds to carry out the job. Each submission was reviewed carefully by at least three referees working in relevant fields. Borderline papers were further discussed during an intensive on-line meeting of the Program Committee. We believe that

the program resulting from this excellent job of the Program Committee was scientifically very strong. In addition to the contributed papers, the proceedings also include contributions from invited speakers: Reiko Heckel, Zhiming Liu, José Meseguer, Rocco De Nicola, and Do Long Van.

Five tutorials were selected as affiliated events of ICTAC 2005. The abstracts of the tutorials are also included in the proceedings. We express our thanks to all of the people who submitted tutorial proposals.

Special thanks are due to the Program Committee members and all the referees, whose names are listed on the following pages, for their assistance in reviewing and selecting papers. The help from the Advisory Committee, especially Zhiming Liu, was invaluable. We express our appreciation to the Organizing Committee, especially Ho Si Dam, Le Hai Khoi, Le Quoc Hung and Bui The Duy, and the Publicity Chair, Bernhard Aichernig, for their efforts in making ICTAC 2005 such a successful and enjoyable event. We would particularly like to thank Kitty Iok Sam Chan of UNU-IIST for her hard work in maintaining the conference administration system. We would also like to express our thanks to all UNU-IIST staff for their active support of ICTAC 2005. Last but not least we are grateful to Springer for its helpful collaboration and quick publication.

October 2005

Dang Van Hung and Martin Wirsing

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Table of Contents

Invited Speakers

A Rewriting Logic Sampler <i>José Meseguer</i>	1
Codes and Length-Increasing Transitive Binary Relations <i>Do Long Van, Kieu Van Hung, Phan Trung Huy</i>	29
Languages and Process Calculi for Network Aware Programming – Short Summary <i>Rocco De Nicola</i>	49
Stochastic Analysis of Graph Transformation Systems: A Case Study in P2P Networks <i>Reiko Heckel</i>	53
Component-Based Software Engineering <i>He Jifeng, Xiaoshan Li, Zhiming Liu</i>	70

Formal Languages

Outfix-Free Regular Languages and Prime Outfix-Free Decomposition <i>Yo-Sub Han, Derick Wood</i>	96
Solving First Order Formulae of Pseudo-Regular Theory <i>Sébastien Limet, Pierre Pillot</i>	110
Splicing Array Grammar Systems <i>K.G. Subramanian, A. Roslin Sagaya Mary, K.S. Dersanambika</i>	125

Computer Science Logics

Compositionality of Fixpoint Logic with Chop <i>Naijun Zhan, Jinzhao Wu</i>	136
An SLD-Resolution Calculus for Basic Serial Multimodal Logics <i>Linh Anh Nguyen</i>	151

Upside-Down Transformation in SOL/Connection Tableaux and Its Application	
<i>Koji Iwanuma, Katsumi Inoue, Hidetomo Nabeshima</i>	166

Program Construction

On the Stability Semantics of Combinational Programs	
<i>Tran Van Dung</i>	180
Generating C Code from LOGS Specifications	
<i>Jianguo Zhou, Yifeng Chen</i>	195
Formalizing the Debugging Process in Haskell	
<i>Alberto de la Encina, Luis Llana, Fernando Rubio</i>	211
Finding Resource Bounds in the Presence of Explicit Deallocation	
<i>Hoang Truong, Marc Bezem</i>	227

Real-Time Systems

The Timer Cascade: Functional Modelling and Real Time Calculi	
<i>Raymond Boute, Andreas Schäfer</i>	242
A Robust Interpretation of Duration Calculus	
<i>Martin Fränzle, Michael R. Hansen</i>	257
Symbolic Model Checking of Finite Precision Timed Automata	
<i>Rongjie Yan, Guangyuan Li, Zhisong Tang</i>	272

Concurrency and Refinement

Covarieties of Coalgebras: Comonads and Coequations	
<i>Ranald Clouston, Robert Goldblatt</i>	288
Linking Theories of Concurrency	
<i>He Jifeng, C.A.R. Hoare</i>	303
On Cool Congruence Formats for Weak Bisimulations	
<i>Robert Jan van Glabbeek</i>	318
Externalized and Internalized Notions of Behavioral Refinement	
<i>Michel Bidoit, Rolf Hennicker</i>	334

Software Security

Information Flow Is Linear Refinement of Constancy <i>Fausto Spoto</i>	351
On Typing Information Flow <i>G�rard Boudol</i>	366
Representation and Reasoning on RBAC: A Description Logic Approach <i>Chen Zhao, Nuermaimaiti Heilili, Shengping Liu, Zuoquan Lin</i>	381
Revisiting Failure Detection and Consensus in Omission Failure Environments <i>Carole Delporte-Gallet, Hugues Fauconnier, Felix C. Freiling</i>	394

Quantitative Logics

Congruences and Bisimulations for Continuous-Time Stochastic Logic <i>Ernst-Erich Doberkat</i>	409
A Logic for Quantum Circuits and Protocols <i>Manas Patra</i>	424
Quantitative Temporal Logic Mechanized in HOL <i>Orieta Celiku</i>	439
Weak Stochastic Bisimulation for Non-Markovian Processes <i>Natalia L�pez, Manuel N��ez</i>	454

Object-Orientation and Component Systems

On Refinement of Software Architectures <i>Sun Meng, Lu�s S. Barbosa, Zhang Naixiao</i>	469
POST: A Case Study for an Incremental Development in �COS <i>Quan Long, Zongyan Qiu, Zhiming Liu, Lingshuang Shao, He Jifeng</i>	485
Implementing Application-Specific Object-Oriented Theories in HOL <i>Kenro Yatake, Toshiaki Aoki, Takuya Katayama</i>	501
Constructing Open Systems via Consistent Components <i>Nguyen Truong Thang, Takuya Katayama</i>	517

Model-Checking and Algorithms

A Sub-quadratic Algorithm for Conjunctive and Disjunctive Boolean Equation Systems
Jan Friso Groote, Misa Keinänen 532

Using Fairness Constraints in Process-Algebraic Verification
Antti Puhakka 546

Maximum Marking Problems with Accumulative Weight Functions
Isao Sasano, Mizuhito Ogawa, Zhenjiang Hu 562

Applied Logics and Computing Theory

Toward an Abstract Computer Virology
G. Bonfante, M. Kaczmarek, J.-Y. Marion 579

On Superposition-Based Satisfiability Procedures and Their Combination
Hélène Kirchner, Silvio Ranise, Christophe Ringeissen, Duc Khanh Tran..... 594

Tutorials at ICTAC 2005

A Summary of the Tutorials at ICTAC 2005
Dang Van Hung 609

Author Index 613

A Rewriting Logic Sampler

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Abstract. Rewriting logic is a simple computational logic very well suited as a *semantic framework* within which many different models of computation, systems and languages can be naturally modeled. It is also a flexible *logical framework* in which many different logical formalisms can be both represented and executed. As the title suggests, this paper does not try to give a comprehensive overview of rewriting logic. Instead, after introducing the basic concepts, it focuses on some recent research directions emphasizing: (i) extensions of the logic to model real-time systems and probabilistic systems; and (ii) some exciting application areas such as: semantics of programming languages, security, and bioinformatics.

1 Introduction

Rewriting logic is now a teenager; a *quinceañera*, as they call adolescent women reaching 15 in Spain and Latin America. There are hundreds of papers; five rewriting logic workshops have already taken place and a sixth will meet in Vienna next March; and a host of tools and applications have been developed. Taking pictures of this “young person” as it grows up is a quite interesting intellectual exercise, one that can help other people become familiar with this field and its possibilities. I, with the help of others, have done my share of picture taking in earlier stages [69,70,72,67]. In particular, the “roadmap” [67] that Narciso Matí-Oliet and I wrote, gives a brief but comprehensive overview and cites 328 papers in the area as of 2002. This paper takes a different tack. I will *not* try to give you an overview. I will give you a *sampler*, some rewriting logic *tapas* if you will, to tease your curiosity so that hopefully you may find some things that you like and excite your interest.

I should of course say something about my choice of topics for the sampler; and about some important developments that I do not cover. At the theoretical level, one of the interesting questions to ask about a formalism is: how *general, flexible and extensible* is it? For example, how does it compare in generality to other formalisms? how can it deal with new application areas? how well can it be extended in new directions? can it represent its own metalevel? I address some of these questions by my choice of topics, but I consciously omit others. The most glaring omission is the theoretical extension from ordinary rewrite theories to *generalized rewrite theories* [10], that substantially extend the logic’s expressive power. For the sake of a simpler exposition, this whole development