

*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*

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

*University of Dortmund, Germany*

Madhu Sudan

*Massachusetts Institute of Technology, MA, USA*

Demetri Terzopoulos

*New York University, NY, USA*

Doug Tygar

*University of California, Berkeley, CA, USA*

Moshe Y. Vardi

*Rice University, Houston, TX, USA*

Gerhard Weikum

*Max-Planck Institute of Computer Science, Saarbruecken, Germany*

Peter Vojtáš  
Mária Bieliková  
Bernadette Charron-Bost  
Ondrej Sýkora (Eds.)

# SOFSEM 2005: Theory and Practice of Computer Science

31st Conference on Current Trends  
in Theory and Practice of Computer Science  
Liptovský Ján, Slovakia, January 22-28, 2005, Proceedings



Springer

## Volume Editors

Peter Vojtáš

P.J. Šafárik University, Department of Computer Science, Faculty of Science

Jesenná 5, 04154 Košice, Slovak Republic

E-mail: vojtas@upjs.sk

Mária Bieliková

Slovak University of Technology

Faculty of Informatics and Information Technologies

Ilkovičova 3, 812 19 Bratislava, Slovak Republic

E-mail: bielik@fiit.stuba.sk

Bernadette Charron-Bost

LIX, École Polytechnique

91128 Palaiseau Cedex, France

E-mail: charron@lix.polytechnique.fr

Ondrej Sýkora

Loughborough University, Department of Computer Science

Loughborough, Leicestershire LE11 3TU, UK

E-mail: o.sykora@lboro.ac.uk

Library of Congress Control Number: 2004117173

CR Subject Classification (1998): F.2, F.1, D.2, G.2, H.3, H.2.8, H.4, F.3

ISSN 0302-9743

ISBN 3-540-24302-X 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 is a part of Springer Science+Business Media

springeronline.com

© Springer-Verlag Berlin Heidelberg 2005

Printed in Germany

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

Printed on acid-free paper SPIN: 11375982 06/3142 5 4 3 2 1 0

# Preface

This volume contains papers selected for presentation at the 31st Annual Conference on Current Trends in Theory and Practice of Informatics – SOFSEM 2005, held on January 22–28, 2005 in Liptovský Ján, Slovakia.

The series of SOFSEM conferences, organized alternately in the Czech Republic and Slovakia since 1974, has a well-established tradition. The SOFSEM conferences were originally intended to break the Iron Curtain in scientific exchange. After the velvet revolution SOFSEM changed to a regular broad-scope international conference. Nowadays, SOFSEM is focused each year on selected aspects of informatics. This year the conference was organized into four tracks, each of them complemented by two invited talks:

- *Foundations of Computer Science* (Track Chair: Bernadette Charron-Bost)
- *Modeling and Searching Data in the Web-Era* (Track Chair: Peter Vojtáš)
- *Software Engineering* (Track Chair: Mária Bielíková)
- *Graph Drawing* (Track Chair: Ondrej Sýkora)

The aim of SOFSEM 2005 was, as always, to promote cooperation among professionals from academia and industry working in various areas of informatics. Each track was complemented by two invited talks.

The SOFSEM 2005 Program Committee members coming from 13 countries evaluated 144 submissions (128 contributed papers and 16 student research forum papers). After a careful review process (counting at least 3 reviews per paper), followed by detailed discussions in the PC, and a co-chairs meeting held on October 8, 2005 in Bratislava, Slovakia, 44 papers (overall acceptance rate 34.38%) were selected for presentation at SOFSEM 2005: 28 full contributed papers (acceptance rate 21.88%) and 16 short contributed papers selected by the SOFSEM 2005 PC for publication in the Springer LNCS proceedings volume.

An integral part of SOFSEM is the Student Research Forum. The forum offers the opportunity to publish, present and discuss student projects, to receive feedback on both the original results of scientific work as well as on work in progress. The Program Committee selected 7 papers for publication (from 16 submitted) for presentation at the Student Research Forum session. The best student paper by Martin Senft was selected and included in these proceedings.

We would like to thank all Program Committee members for their meritorious work in evaluating the submitted papers, as well as numerous additional referees who assisted the Program Committee members.

As editors of these proceedings, we are much indebted to all the contributors to the scientific program of the symposium, especially to the authors of the papers. Special thanks go to those authors who prepared the manuscripts according to the instructions and made life easier for us. We would also like to thank those who responded promptly to our requests for minor modifications

and corrections in their manuscripts. The database and electronic support system for the Program Committee was designed by Rastislav Královič. Our special thanks go to Richard Královič for most of the hard technical work in preparing this volume. We are also thankful to the members of the Organizing Committee led by Dana Pardubská who made sure that the conference ran smoothly in a pleasant environment. Last, but not least, we want to thank Springer for excellent cooperation in the publication of this volume.

January, 2005

Mária Bielíková  
Bernadette Charron-Bost  
Ondrej Sýkora  
Peter Vojtáš

# Organization

## Steering Committee

Branislav Rován, <i>Chair</i>	Comenius University, Bratislava, Slovakia
Miroslav Bartošek, <i>Secretary</i>	Masaryk University, Brno, Czech Republic
Mária Bielíková	Slovak University of Technology in Bratislava, Slovakia
Peter van Emde Boas	University of Amsterdam, The Netherlands
Keith G. Jefferey	CLRC RAL, Chilton, Didcot, Oxon, UK
Antonín Kučera	Masaryk University, Brno, Czech Republic
Július Štuller	Institute of Computer Science, Prague, Czech Republic
Gerard Tel	Utrecht University, The Netherlands
Petr Tůma	Charles University in Prague, Czech Republic

## Program Committee

Mária Bielíková, <i>Co-chair</i>	Bratislava
Bernadette Charron-Bost, <i>Co-chair</i>	Palaiseau
Ondrej Sýkora, <i>Co-chair</i>	Loughborough
Peter Vojtáš, <i>Chair</i>	Košice
Claude Crepeau (Montréal)	Catuscia Palamidessi (Palaiseau)
Ulrich Eisenecker (Zweibrücken)	Dana Pardubská (Bratislava)
Ghica van Emde Boas (Heemstede)	Dimitris Plexousakis (Heraklion)
Viliam Geffert (Košice)	Jaroslav Pokorný (Prague)
Sergio Greco (Cosenza)	Karel Richta (Prague)
Patrick Healy (Limerick)	Mark Roantree (Dublin)
Juraj Hromkovič (Zürich)	Klaus-Dieter Schewe (Palmerston North)
Michael Kaufmann (Tübingen)	Václav Snášel (Ostrava)
Rastislav Kráľovič (Bratislava)	Gerard Tel (Utrecht)
Jan Kratochvíl (Prague)	Ioannis Tollis (Dallas)
Giuseppe Liotta (Perugia)	Petr Tůma (Prague)
Frederic Magniez (Orsay)	Imrich Vrto (Bratislava)
Peter Mellor (London)	Krzysztof Wecel (Poznań)
Pavol Návrát (Bratislava)	Pavel Zezula (Brno)
Jerzy Nawrocki (Poznań)	
Patrice Ossona de Mendez (Paris)	

## Additional Referees

G. Andrejková	D. Hirschkoﬀ	R. Ostertág
S. Barton	P. Hliněný	Ch. Papamantou
M. Batko	T. Horváth	M. Patrignani
T. Biedl	L. Ištoňová	J.-F. Perrot
H.-J. Boeckenhauer	J. Ivančo	I. Phillips
D. Bongartz	M. Jiřina Jr.	T. Pitner
S. Brlek	C. Johnen	M. Pizzonia
L. Bulej	G. Juhás	A. Pugliese
N. Busi	T. Kalibera	M. de Rougemont
T. Chothia	B. Katreniak	M. Santha
I. Černá	J. Kempe	S. Seibert
E. Danna	M. Klazar	L. Sidirourgos
E. Di Giacomo	S. Kobourov	T. Skopal
W. Didimo	I. Koffina	A. Slobodová
S. Dobrev	G. Kokkinidis	J. Sochor
V. Dohnal	J.-C. Konig	L. Stacho
V. Dujmovic	V. Koutný	J. Stern
C. Durr	S. Krajči	L. Sanselme
P. Eades	K. Kritikos	D. Swierstra
P. van Emde Boas	Ri. Kráľovič	A. Szabari
C. Endler	J. Kupke	A. Tagarelli
H. Fernau	S. Laplante	G. Tel
S. Flesca	A. Laurent	W. Unger
M. Forišek	F. Le Fessant	F.D. Valencia
F. Furfaro	P. Lennartz	W.F. de la Vega
J.M. Gabbay	K. Lynch	P. Veltri
J. Gajdošíková	E. Masciari	P. Verbaan
M. Galbavý	V. Mencl	Y. Verhoeven
D. Galmiche	D. Miller	F. Vernadat
A. Garg	P. Mlynarčík	M.G. Vigliotti
L. Giordano	I. Mlynková	J. Vinař
D. Gottesman	F. Morain	M. Vomlelová
D. Gross	F. Mráz	V. Vranić
D. Gruska	P. Nadeau	G. Woeginger
P. Gurský	F.Z. Nardelli	R. de Wolf
P. Hájek	L. Nebeský	I. Žežula
P. Harrenstein	R. Neruda	

## Organized by

Slovak Society for Computer Science

Faculty of Mathematics, Physics and Informatics,  
Comenius University, Bratislava

*in cooperation with*

Czech Society for Computer Science

Faculty of Informatics and Information Technologies,  
Slovak University of Technology, Bratislava

Faculty of Science, Institute of Informatics, P.J. Šafárik University, Košice

## Supported by

European Association for Theoretical Computer Science

Slovak Research Consortium for Informatics and Mathematics

## Organizing Committee

Vanda Hambáľková  
Vladimír Koutný  
Rastislav Kráľovič  
Richard Kráľovič  
Zuzana Kubincová

Edita Máčajová  
Marek Nagy  
Dana Pardubská (chair)  
Viliam Solčány



# Table of Contents

## Invited Talks

Discovering Treewidth <i>Hans L. Bodlaender</i> .....	1
From Research Prototypes to Industrial Strength Open Source Products – The ObjectWeb Experience <i>Emmanuel Cecchet</i> .....	17
How Hard Is It to Take a Snapshot? <i>Faith Ellen Fich</i> .....	28
Logical Foundations for Data Integration <i>Maurizio Lenzerini</i> .....	38
Recent Advances in Graph Drawing <i>Petra Mutzel</i> .....	41
The Hyperdatabase Network – New Middleware for Searching and Maintaining the Information Space <i>Hans-Jörg Schek</i> .....	42
Architecture of a Business Framework for the .NET Platform and Open Source Environments <i>Thomas Seidmann</i> .....	47
Progress on Crossing Number Problems <i>László A. Székely</i> .....	53

## Full Contributed Papers

Greedy Differential Approximations for Min Set Cover <i>C. Bazgan, J. Monnot, V. Th. Paschos, F. Serrière</i> .....	62
A Methodology of Visual Modeling Language Evaluation <i>Anna Bobkowska</i> .....	72
Local Computations on Closed Unlabelled Edges: The Election Problem and the Naming Problem <i>Jérémie Chalopin</i> .....	82

A Hierarchical Markovian Mining Approach for Favorite Navigation Patterns	
<i>Jiu Jun Chen, Ji Gao, Jun Hu, Bei Shui Liao</i> . . . . .	92
Non-planar Orthogonal Drawings with Fixed Topology	
<i>Markus Chimani, Gunnar W. Klau, René Weiskircher</i> . . . . .	96
A Topology-Driven Approach to the Design of Web Meta-search Clustering Engines	
<i>Emilio Di Giacomo, Walter Didimo, Luca Grilli, Giuseppe Liotta</i> . . .	106
Computing Upward Planar Drawings Using Switch-Regularity Heuristics	
<i>Walter Didimo</i> . . . . .	117
Serial and Parallel Multilevel Graph Partitioning Using Fixed Centers	
<i>Kayhan Erciyeş, Ali Alp, Geoffery Marshall</i> . . . . .	127
Two-Layer Planarization: Improving on Parameterized Algorithmics	
<i>Henning Fernau</i> . . . . .	137
On the Stability of Approximation for Hamiltonian Path Problems	
<i>Luca Forlizzi, Juraj Hromkovič, Guido Proietti, Sebastian Seibert</i> . . . .	147
Robustness of Composed Timed Systems	
<i>Hacène Fouchal, Antione Rollet, Abbas Tarhini</i> . . . . .	157
Topology Generation for Web Communities Modeling	
<i>György Frivolt, Mária Bielíková</i> . . . . .	167
Recursion Versus Replication in Simple Cryptographic Protocols	
<i>Hans Hüttel, Jiří Srba</i> . . . . .	178
Modeling Data Integration with Updateable Object Views	
<i>Piotr Habela, Krzysztof Kaczmarek, Hanna Kozankiewicz, Kazimierz Subieta</i> . . . . .	188
Fixed-Parameter Tractable Algorithms for Testing Upward Planarity	
<i>Patrick Healy, Karol Lynch</i> . . . . .	199
Read/Write Based Fast-Path Transformation for FCFS Mutual Exclusion	
<i>Prasad Jayanti, Srdjan Petrovic, Neha Narula</i> . . . . .	209
Adjustment of Indirect Association Rules for the Web	
<i>Przemysław Kazienko, Mariusz Matrejek</i> . . . . .	219

Anonymous Communication with On-line and Off-line Onion Encoding <i>Marek Klonowski, Mirosław Kutylowski, Filip Zagórski</i> .....	229
Characteristic Patterns for LTL <i>Antonín Kučera, Jan Strejček</i> .....	239
Planar Straight-Line Drawing in an $\mathcal{O}(n) \times \mathcal{O}(n)$ Grid with Angular Resolution $\Omega(1/n)$ <i>Maciej Kurowski</i> .....	250
Modeling Nested Relationships in XML Documents Using Relational Databases <i>Olli Luoma</i> .....	259
RAQ: A Range-Queriable Distributed Data Structure <i>Hamid Nazerzadeh, Mohammad Ghodsi</i> .....	269
On Some Weighted Satisfiability and Graph Problems <i>Stefan Porschen</i> .....	278
On the Security and Composability of the One Time Pad <i>Dominik Raub, Rainer Steinwandt, Jörn Müller-Quade</i> .....	288
Lower Bounds on the OBDD Size of Graphs of Some Popular Functions <i>Daniel Sawitzki</i> .....	298
XML-Based Declarative Access Control <i>Robert Steele, William Gardner, Tharam S. Dillon, Abdelkarim Erradi</i> .....	310
VCD: A Visual Formalism for Specification of Heterogeneous Software Architectures <i>David Šafránek, Jiří Šimša</i> .....	320
Cost-Constrained Minimum-Delay Multicasting <i>Satoshi Tayu, Turki Ghazi Al-Mutairi, Shuichi Ueno</i> .....	330
Ontology-Based Inconsistency Management of Software Requirements Specifications <i>Xuefeng Zhu, Zhi Jin</i> .....	340
<b>The Best Student Paper</b>	
Suffix Tree Based Data Compression <i>Martin Senft</i> .....	350

## Short Contributed Papers

Tier Aspect Model Based on Updatable Views <i>Radosław Adamus, Kazimierz Subieta</i> .....	360
Well-Founded Metamodeling for Model-Driven Architecture <i>Liliana Favre</i> .....	364
Stepwise Optimization Method for $k$ -CNN Search for Location-Based Service <i>Jun Feng, Naoto Mukai, Toyohide Watanabe</i> .....	368
An Approach for Integrating Analysis Patterns and Feature Diagrams into Model Driven Architecture <i>Roman Filkorn, Pavol Návrát</i> .....	372
Outerplanar Crossing Numbers of 3-Row Meshes, Halin Graphs and Complete $p$ -Partite Graphs <i>Radoslav Fulek, Hongmei He, Ondrej Sýkora, Imrich Vrto</i> .....	376
Fast Bit-Vector Algorithms for Approximate String Matching Under Indel Distance <i>Heikki Hyyrö, Yoan Pinzon, Ayumi Shinohara</i> .....	380
Feature Selection by Reordering <i>Marcel Jirina, Marcel Jirina Jr.</i> .....	385
A Management Scheme for the Basic Types in High Level Languages <i>Fritz Mayer-Lindenberg</i> .....	390
Bayesian Networks in Software Maintenance Management <i>Ana C.V. de Melo, Adilson de J. Sanchez</i> .....	394
A Multiagent System Aiding Information Retrieval in Internet Using Consensus Methods <i>Ngoc Thanh Nguyen, Adam Blazowski, Michal Malowiecki</i> .....	399
Interval-Valued Data Structures and Their Application to e-Learning <i>Adam Niewiadomski</i> .....	403
Boolean Functions with a Low Polynomial Degree and Quantum Query Algorithms <i>Raitis Ozols, Rūsiņš Freivalds, Jevgeņijs Ivanovs, Elīna Kalniņa, Lelde Lāce, Masahiro Miyakawa, Hisayuki Tatsumi, Daina Taimiņa</i> .....	408

Representation of Extended RBAC Model Using UML Language <i>Aneta Poniszewska-Maranda, Gilles Goncalves, Fred Hemery</i> .....	413
A Methodology for Writing Class Contracts <i>Nele Smeets, Eric Steegmans</i> .....	418
Volumes of 3D Drawings of Homogenous Product Graphs <i>Lubomir Torok</i> .....	423
<b>Author Index</b> .....	427