SOFSEM'97: Theory and Practice of Informatics

24th Seminar on Current Trends in Theory and Practice of Informatics
Milovy, Czech Republic, November 22-29, 1997 Proceedings

Springer
Foreword

The SOFSEM (SOFTware SEMinar) is now being held for the 24th time. Having been transformed during the years from a local event to a fully international conference, the current SOFSEM is special in being a mix of a winter school, a conference, and an advanced workshop, each striving for multidisciplinarity in computer science. This aim is reflected in the technical program consisting of a relatively large number of invited talks, refereed papers (known as contributed papers), and refereed poster contributions. In addition, time and space for flash communications, industrial presentations, and exhibitions are provided. The program of SOFSEM usually starts with an opening talk delivered by a distinguished member of the computer science community; this year we are honored that Jan van Leeuwen has agreed to present his keynote address *Challenges in Large-Scale Distributed Systems*.

This volume constitutes the proceedings of SOFSEM'97 held in Milovy, Czech Republic, November 22–29, 1997. This year, 63 papers were submitted from 11 European countries. The selection of the 24 best papers was carried out during a one-day Program Committee (PC) meeting held in Brno. The referees had previously judged all papers according to their contribution to the state of the art, technical soundness, clarity of presentation, and adequacies of the length and bibliography. The Endowment Board (EB) supported by the Advisory Board recommended 22 invited talks focused on the following key topic areas: *Distributed and Parallel Systems, Software Engineering and Methodology, Databases and Information Systems, and Fundamentals*.

SOFSEM is the result of considerable effort by a number of people. It is my pleasure to record my thanks to the Advisory Board for their support, to the Endowment Board for their general guidance and enormous effort in finding excellent speakers for the invited talks, and to the Organizing Committee (OC) for making SOFSEM'97 happen. It has been an honor for me to work with the members of the Program Committee and other referees who devoted a lot of effort to reviewing the submitted papers.

My special thanks go to Keith Jeffery, the PC vice-chair, for his extremely cooperative and generous overall support and for sharing with me all his experience from serving as the PC Chair in 1996. Also, I would like to record a special credit to Mirek Bartošek for technical preparation of the proceedings. On a personal note, I am particularly grateful to Jiří Sochor, the PC secretary, who has done a tremendous job in keeping track of all the hundreds PC agenda related issues, among which, his perfect preparation of the PC meeting deserves to be especially recognized. Also, I would like to acknowledge the excellent cooperation I received from Jiří Wiedermann as EB Chair, and Jan Staudek as OC Chair.

I am very grateful to the editors of the LNCS series for their continuing trust in SOFSEM and to Springer-Verlag for publishing the proceedings. In addition, I appreciate highly the financial support of our sponsors which assisted with the invited speakers and advanced students.
Ultimately, the success of SOFSEM will be determined not only by the speakers and the committee members as the core of conference, but generally by all the attendees, who will contribute to the spirit of the conference. So I am very grateful to all of my professional colleagues who have done, and will do, their best to make SOFSEM a high-quality event. Finally, I would like to express my appreciation for having the opportunity to serve as the Program Committee Chair of SOFSEM'97 and welcome you to this event.

September 1997
František Plášil
SOFSEM'97 Program Committee Chair
Advisory Board

Dines Bjørner
Peter van Emde Boas
Manfred Broy
Michal Chytil
Georg Gottlob
Keith G. Jeffery
Maria Zemánková

Technical University of Denmark, Lyngby, Denmark
University of Amsterdam, The Netherlands
Technical University Munich, Germany
Anima Praha, s.r.o., Prague, Czech Republic
Vienna University of Technology, Austria
CLRC Rutherford Appleton Laboratory, Oxon, UK
NSF, Washington DC, US

Endowment Board

Jiří Wiedermann, chair
Bronislav Rovan, vice-chair
Keith G. Jeffery
Jan Pavelka
František Plášil
Igor Prívara
Jan Staudek

Academy of Sciences of the Czech Republic, Prague, CZ
Comenius University, Bratislava, SK
CLRC Rutherford Appleton Laboratory, Oxon, UK
DCIT Prague, CZ
Charles University, Prague, CZ
Institute of Informatics and Statistics, Bratislava, SK
Masaryk University, Brno, CZ

Program Committee

František Plášil, chair
Keith G. Jeffery, vice-chair
Jiří Sochor, secretary
Patrizia Asirelli
Robert G. Babb II
Michel Banatre
Guy Bernard
Viliam Geffert
Jane Grimson
Eduard Gröller
Petr Jančar
Martin Kersten
Petr Kroha
Antonín Kučera
Bořivoj Meličar
Hanspeter Mössenböck
Lenka Motyčková
Mogen Nielsen
Václav Rajlich

Charles University, Prague, CZ
CLRC RAL, Oxon, UK
Masaryk University, Brno, CZ
I.E.I.–E.N.R., Pisa, IT
University of Denver, US
IRISA/INRIA, Rennes, FR
INT, Evry, FR
UPJŠ Košice, SK
Trinity College, Dublin, IR
Vienna University of Technology, Vienna, AT
Ostrava University, CZ
CWI, Amsterdam, NL
TU Chemnitz, DE
Charles University, Prague, CZ
Czech Technical University, Prague, CZ
University of Linz, AT
Masaryk University, Brno, CZ
Aarhus University, DK
Wayne State University, Detroit, US
List of Referees

Patrizia Asirelli  Jaroslav Nešetřil
Robert G. Babb II Mogen Nielsen
Guy Bernard Lukáš Petrík
Václav Dvořák František Plášil
Viliam Geffert Václav Rajlich
Jane Grimson Karel Richta
Eduard Gröller Peter Ružička
Václav Hlaváč Anton Scheber
Jan Hlavička Santosh Shrivastava
Petr Jančar Hava Siegelmann
Keith G. Jeffery Jiří Šíma
Martin Kersten Jiří Sochor
Petr Kroha Arne Sølvberg
Antonín Kučera Gerard Tel
Bořivoj Melichar Volker Tschammer
Francois Meunier Jiří Wiedermann
Hanspeter Mössenböck Krzysztof Zielinski
Lenka Motyčková
SOFSEM '97

Organized by
Czech Society for Computer Science
Slovak Society for Computer Science
Czech ACM Chapter
Czech Research Consortium for Informatics and Mathematics

In cooperation with
Faculty of Informatics, Masaryk University, Brno
Institute of Computer Science, Masaryk University, Brno
Institute of Computer Science, Academy of Sciences of the Czech Republic, Prague
Department of Software Engineering, Charles University, Prague
Department of Computer Science, Comenius University, Bratislava
CLRC Rutherford Appleton Laboratory, Oxon, UK

Sponsored by
ApS Brno s.r.o.
Digital Equipment s.r.o.
European Research Consortium for Informatics and Mathematics
Help Service s.r.o.
Hewlett Packard s.r.o.
IBM Czech Republic s.r.o.
Oracle Czech s.r.o.

Organizing Committee
Jan Staudek, chair
Miroslav Bartošek, vice-chair
Zdena Walletzká, secretary

Petr Hanáček
Zdeněk Malčík
Tomáš Pitner

Petr Přikryl
Petr Sojka
Tomáš Staudek
Contents

Invited Papers

FUNDAMENTALS

Computer Chess: Algorithms and Heuristics for a Deep Look into the Future  
*R. Feldmann*  
1

Algorithms for Triangulated Terrains  
*M. van Kreveld*  
19

On the Distributed Realization of Parallel Algorithms  
*K.-J. Lange*  
37

The Fundamental Problem of Database Design  
*J.A. Makowsky, E.V.Ravve*  
53

Solving and Approximating Combinatorial Optimization Problems  
(Towards MAX CUT and TSP)  
*J. Nešetřil, D. Turzík*  
70

The Computational Power of Continuous Time Neural Networks  
*P. Orponen*  
86

A Foundation for Computable Analysis  
*K. Weihrauch*  
104

Towards Machines That Can Think  
*J. Wiedermann*  
122

Computational Complexity of Continuous Problems  
*H. Woźniakowski*  
142

Path Layout in ATM Networks  
*S. Zaks*  
144

DISTRIBUTED AND PARALLEL COMPUTING

The Mobile Agent Technology  
*S. Covaci, T. Magedanz*  
161

Theory and Practice in Interactionally Rich Distributed Systems  
*D.A. Duce*  
163

Configuration-Based Programming Systems  
*V. Issarny*  
183
Automatic Generation of Parallelizing Compilers for Object-Oriented Programming Languages from Denotational Semantics Specifications .... 201
P.K. Muthukrishnan, B.R. Bryant

SOFTWARE ENGINEERING AND METHODOLOGY

A Formal Software Engineering Paradigm: From Domains via Requirements to Software – Formal Specification & Design Calculi ... 219
D. Bjorner

The Whole Picture to Software Process Improvement ..................... 249
A. Kuntzmann-Combelles

Object-Oriented Design Patterns .............................................. 266
W. Pree

DATABASES AND INFORMATION SYSTEMS

Object-Oriented DBMS and Beyond ........................................... 275
K.R. Dittrich, A. Geppert

On Integration of Relational and Object-Oriented Database Systems .... 295
M.E. Orlowska, H. Li, C. Liu

From OO Through Deduction to Active Databases – ROCK, ROLL & RAP .......................................................... 313
M.H. Williams, N.W. Paton

An Introduction to Virtual Reality Modeling Language ................... 331
J. Žára

Stepping Stones to an Information Society ................................. 349
J. Zlatuška
XIII

Contributed Papers

Lower Bounds for the Virtual Path Layout Problem in ATM Networks . . 375
L. Becchetti, C. Gaibisso

Query Processing in Temporal Evidential Databases ................. 383
B. Dai, D.A. Bell, J.G. Hughes

A First Approach to Temporal Predicate Locking
for Concurrency Detection in Temporal Relational Databases
Supporting Schema Versioning ........................................ 391
C. De Castro

Efficient Insertion of Approximately Sorted Sequences of Items
into a Dictionary .......................................................... 399
C. Gaibisso, G. Proietti

High Availability Support in CORBA Environments ..................... 407
P. Galdámez, F.D. Muñoz-Escot, J.M. Bernabéu-Aubán

On f-Sparse Sets in NP – P ............................................. 415
V. Glasnáč

Zero-Overhead Exception Handling Using Metaprogramming .......... 423
M. Hof, H. Mőssenböck, P. Pirkelbauer

The Output-Store Formal Translator Directed by LR Parsing ............ 432
J. Janoušek, B. Melichar

Parallel Processing on Alphas Under MATLAB 5 ....................... 440
J. Kadlec

PRAM Lower Bound for Element Distinctness Revisited .............. 448
P. Kolman

Optimal Trees for Searching in Codebook ................................ 456
I. Kopeček

Time Optimal Self-Stabilizing Algorithms ................................ 464
R. Královič

Requirements Specification Iteratively Combined with Reverse
Engineering ................................................................. 473
P. Kroha, M. Strauß

On Finite Representations of Infinite-State Behaviours .............. 481
A. Kučera