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Computer Algebra in Scientific Computing

8th International Workshop, CASC 2005
Kalamata, Greece, September 12-16, 2005
Proceedings

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Preface

CASC 2005 continued a tradition — started in 1998 — of international conferences on the latest advances in the application of computer algebra systems (CASs) and methods to the solution of various problems in scientific computing.

The methods of scientific computing play an important role in research and engineering applications in the natural and the engineering sciences. The significance and impact of computer algebra methods and computer algebra systems for scientific computing has increased considerably in recent times. Nowadays, such general-purpose computer algebra systems as Maple, Magma, Mathematica, MuPAD, Singular, CoCoA and others enable their users to solve the following three important tasks within a uniform framework:

- (a) symbolic manipulation;
- (b) numerical computation;
- (c) visualization.

The ongoing development of such systems, including their integration and adaptation to modern software environments, puts them at the forefront in scientific computing and enables the practical solution of many complex applied problems in the domains of natural sciences and engineering.

Greece offers excellent infrastructures for hosting international conferences, and this was a reason for us to choose the city of Kalamata, Greece, as the location for CASC 2005, the eighth conference in the sequence of CASC conferences. The seven earlier CASC conferences, CASC 1998, CASC 1999, CASC 2000, CASC 2001, CASC 2002, CASC 2003, and CASC 2004 were held, respectively, in St. Petersburg, Russia, in Munich, Germany, in Samarkand, Uzbekistan, in Konstanz, Germany, in the Crimea (Ukraine), in Passau (Germany), and in St. Petersburg, Russia, and they proved to be successful.

The Program Committee did a tremendous job reading and evaluating 75 submitted papers, as well as soliciting external reviews, and all of this in a very short period of time. There were about three reviews per submission on average. The result of this job is reflected in this volume, which contains revised versions of the accepted papers. The collection of papers included in the proceedings covers various topics of computer algebra methods, algorithms, and software applied to scientific computing:

1. algebraic methods for nonlinear polynomial equations and inequalities;
2. symbolic-numeric methods for differential and differential-algebraic equations;
3. algorithmic and complexity considerations in computer algebra;
4. algebraic methods in geometric modelling;
5. aspects of computer algebra programming languages;
6. automatic reasoning in algebra and geometry;

7. complexity of algebraic problems;
8. exact and approximate computation;
9. parallel symbolic-numeric computation;
10. Internet accessible symbolic and numeric computation;
11. problem-solving environments;
12. symbolic and numerical computation in systems engineering and modelling;
13. computer algebra in industry;
14. solving problems in the natural sciences;
15. numerical simulation using computer algebra systems; and
16. mathematical communication.

This workshop, like the earlier CASC workshops, was intended to provide a forum for researchers and engineers in the fields of mathematics, computer science, numerical analysis, and industry, to interact and exchange ideas. An important goal of the workshop was to bring together all these specialists for the purpose of fostering progress on current questions and problems in advanced scientific computing.

CASC 2005 featured two satellite workshops

- *Algebraic and Matrix Computation with Applications*, organized by I.Z. Emiris, B. Mourrain, and M.N. Vrahatis
- *Kalamata Combinatorics*, organized by I.S. Kotsireas and C. Koukouvinos

Researchers from France, Germany, Italy, Greece, Spain, Russia, Japan, USA, Canada, Czech Republic, and Egypt participated in CASC 2005.

CASC 2005 wishes to acknowledge generous support from sponsors:

- Hellenic Ministry of Culture, *ΥΠΠΟ*, Athens, Greece
- Maplesoft, Waterloo, Ontario, Canada
- National and Kapodistrian University of Athens, Greece
- University of Patras, Greece
- Wilfrid Laurier University, Waterloo, Ontario, Canada

Our particular thanks are due to the CASC 2005 conference chairs and members of the Local Organizing Committee I.Z. Emiris (Athens), I.S. Kotsireas (Waterloo), and M.N. Vrahatis (Patras), who ably handled local arrangements in Kalamata. We also thank the members of the General Organizing Committee, W. Meixner and A. Schmidt, in particular for their work in preparing the conference proceedings.

Munich, July 2005

V.G. Ganzha
E.W. Mayr
E.V. Vorozhtsov

Organization

CASC 2005 was organized jointly by the Department of Informatics at the Technische Universität München, Germany, and the Computer Algebra Research Group of Wilfried Launer University, Canada.

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