Preface

Preface to Computer algebra and computer analysis

This special issue on *Computer algebra and computer analysis* was initiated by a session with the same title at the Third International ISAAC Congress, which took place in Berlin, 2001. The guest editors K. Gatermann and W. Koepf organized this session in order to stimulate the interaction between Computer Algebra and Analysis.

In this special issue we have collected articles by participants of the session of the ISAAC Congress'01 and other mathematicians who are interested in the combination/application of computer algebra in analysis. Rather than a proceedings of a session, the issue is meant as a state-of-the-art account of these topics.

This special issue contains eight papers. The article by Gil and Segura *A combined symbolic and numerical algorithm for the computation of zeros of orthogonal polynomials and special functions* gives an algorithm for the computation of zeros of orthogonal polynomials and many other special functions.

The following three papers deal with partial differential equations: in the article *An orderly linear PDE system with analytic initial conditions with a non-analytic solution* Lemaire studies the question when analytic initial data for a system of analytic PDEs lead to analytic solutions. In *The integration of systems of linear PDEs using conservation laws of syzygies* Wolf discusses a new variant of an algorithm to integrate systems of PDEs by differential elimination. Moreover, Walther gives a constructive proof on the existence of stratifications with respect to the Betti numbers of the de Rham cohomology groups for the complement of a given affine variety in $\mathbb{C}^n$ in his article *Cohomology, stratifications and parametric Gröbner bases in characteristic zero*.

The other four papers use computer algebra methods in the study of dynamical systems. In the paper *Applications of SAGBI-bases in dynamics* Gatermann uses SAGBI-bases for the study of centre manifolds and Liapunov–Schmidt reductions of dynamical systems with symmetry. In *The Sibirsky component of the center variety of polynomial differential systems* Jarrah, Laubenbacher and Romanovski give an algorithm to find the Sibirsky component and to compute its dimension. The paper *A matching pursuit technique for computing the simplest normal forms of vector fields* by Yu and Yuan uses computer algebra methods to compute special Birkhoff normal forms of vector fields that would be virtually impossible to investigate by hand. Finally, in the article *Computer analysis of periodic orbits of discontinuous fields* by Jacquemard and Teixeira the authors use Gröbner bases to show that periodic orbits exist for discontinuous vector fields.

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