

# Preface

This textbook regroups selected papers of the Workshop on Computer Algebra and Polynomials, which was held in Linz at the Johann Radon Institute for Computational and Applied Mathematics (RICAM) during November 25–29, 2013, on the occasion of the Special Semester on Applications of Algebra and Number Theory. The workshop included invited talks and contributed talks. Authors of selected contributed talks were invited to submit a paper to these proceedings.

This workshop focuses on the theory and algorithms for polynomials over various coefficient domains that may be (but is not restricted to) a commutative algebra, such as a finite field or ring. The operations on polynomials in the focus are factorization, composition and decomposition, basis computation for modules, etc. Algorithms for such operations on polynomials have always been of central interest in computer algebra, as it combines formal (the variables) and algebraic or numeric (the coefficients) aspects.

The plan was to bring together a mix of experts for the various coefficient domains in order to explore similarities as well as differences. Also experts for applications of manipulation of polynomials were invited, such as polynomial system solving or the analysis of algebraic varieties.

The workshop contributions were selected through a rigorous reviewing process based on anonymous reviews made by various expert reviewers. There were usually two reviewers for one submission. The process was simple blind as authors did not know the names of the reviewers evaluating their papers. We have chosen 12 articles from the many excellent submissions we received. We hope that the reader will find an interesting perspective of this rich and active area. Let us mention here a few words about each of the selected papers.

The expository paper by Felix Breuer gives an introduction to Ehrhart theory and takes a tour through its applications in enumerative combinatorics. The paper by Carlos D’Andrea presents several methods and open questions for dealing in a more efficient way with the implicitization of rational parameterization. The survey paper by Joachim von zur Gathen and Konstantin Ziegler presents several counting results for indecomposable/decomposable polynomials over finite fields. Willem A. de Graaf describes methods for dealing with the problem of deciding whether a given element of the vector space lies in the closure of the orbit of another given element. The paper by Georg Grasegger and Franz Winkler presents a new and rather general method for solving algebraic ordinary differential equations. The paper by Manuel Kauers, Maximilian Jaroschek, and Fredrik Johansson shows a Sage implementation of Ore algebras. The paper by Zoltán Kovács and Bernard Parisse presents several changes for solving equation system of the GeoGebra software. Ragni Piene’s paper studies several concepts of the classical polar varieties. The paper by Cristian-Silviu Radu solves an open problem about modular polynomials of levels 3 and 5. The survey paper by Carsten Schneider presents algorithms and their efficiency for some parameterized

telescoping problems. The paper by J. Rafael Sendra, David Sevilla, and Carlos Villarino provides sufficient conditions for a parameterization to be surjective and computing a set of the points not covered by the parameterization. Finally, the paper by Maria-Laura Torrente presents an overview of the problem of the representation of rational surface as set theoretic complete intersection and also an original proof that the rational normal quartic is set-theoretically complete intersection of quadrics.

All accepted papers, except one, were presented at the workshop during talks of 25 or 45 min. There were also some talks with no contribution to the proceedings, see the website <http://www.ricam.oeaw.ac.at/specsem/specsem2013/workshop3/> of the workshop for the list of all speakers and abstracts.

We would like to thank all the speakers for their contributions to the program, and all the authors who have submitted their precious manuscripts to this book. We would also like to ask for their understanding for our possible mistakes. The workshop and this volume would not have been possible without the contributions of numerous individuals and organizations, and we sincerely thank them for their support.

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