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Preface

Bruno Buchberger's now well-known article on Gröbner bases in the context of control theory appeared in 1985 in *Multidimensional Systems Theory*. Motivated by this article, many researchers have worked on applications of Gröbner bases and related methods in multidimensional control theory and signal processing. While early work was focused on linear systems theory and partial differential control theory, many interesting new applications have been found more recently in multidimensional signal processing. In particular, Gröbner bases proved to be a powerful tool in designing multidimensional filter banks and wavelets and have also shown potential in solving PDEs.

This volume grew out of the D3 Workshop on *Gröbner Bases in Control Theory and Signal Processing* (May 18–19, 2006) held in Linz, Austria, in the frame of the *Special Semester on Gröbner Bases and Related Methods*. The special semester was organized in the spring and summer of 2006 by the Johann Radon Institute for Computational and Applied Mathematics (RICAM), in close cooperation with the Research Institute for Symbolic Computation (RISC). Directed by Bruno Buchberger (RISC) and Heinz W. Engl (RICAM), it created a unique atmosphere for interdisciplinary cooperation on all aspects of Gröbner bases.

This volume collects survey articles and original research papers by some of the leading researchers in the area and offers a glimpse of the state of the art on the subject. The topics covered include

- Gröbner bases in multidimensional systems,
- the Quillen-Suslin theorem and systems theory,
- statistical signal processing,
- parametric problems in control theory,
- stability of multidimensional input/output systems,
- wavelets and filter design,
- synthesis of multidimensional control systems,
- time-varying linear systems.

For the full workshop program we refer to the RICAM special semester website at:

`http://www.ricam.oeaw.ac.at/specsem/`

It is our pleasure to express our gratitude to all authors for their enthusiasm that undoubtedly will make this volume a valuable contribution to the area. We extend our sincere thanks to Bruno Buchberger, Heinz W. Engl, and the staff at RICAM and RISC for their warm hospitality during the workshop. We cordially thank Robert Plato and Kay Dimler from the publishing house of Walter de Gruyter for their professional help from early brainstorming to the final editing stage.

Seoul and Linz, October 2007
Hyungju Park and Georg Regensburger

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