



## Editorial

### Special Issue on Applications of Gröbner Bases to Multidimensional Systems and Signal Processing

The work on Gröbner bases, named by Bruno Buchberger after his teacher at the University of Innsbruck, can be broadly classified into investigations on its existence, development of algorithms for its construction, and the apparently ever-expanding number of applications. The existence phase is linked to the contributions of Gordan (1900), Riquier (1910), Macaulay (1927), Gröbner (1932, 1939) and Hironaka (1964), among others. Riquier, in particular, even considered algorithmic aspects not only for polynomials but for differential operators with coefficients in the differential field of rational functions. Heisuke Hironaka introduced the term standard bases in his work done for power series in several variables. The core of the algorithm development phase followed the pioneering dissertation of Buchberger in 1965 and continues to expand to this day in various forms at several institutes and universities worldwide. The development of software which have a Gröbner basis package include COCOA (University of Genoa, Italy), SINGULAR (University of Kaiserslautern, Germany) MACAULAY 2 (Cornell University and University of Illinois, U.S.A.). Computer Algebra Systems like MATHEMATICA and MAPLE, popular for many years to implement numerical as well as symbolic manipulations, now also contain Gröbner basis programs. The development of these software packages, stimulated by developments in algorithmic algebra, accelerated the resurgence of previously identified applications as well as many new applications.

This Special Issue is concerned with Applications of Gröbner bases in multidimensional systems and signal processing. The importance of Gröbner bases in the area of focus of this journal was realized as early as 1985 and I wish to thank Professor Buchberger for accepting my invitation to contribute a chapter in my book that year. I remember distinctly his visit to the University of Pittsburgh in the early eighties, when my Ph.D. student John Guiver and I were struggling with the computation-intensive task of calculating by hand the Gröbner basis of a specified multivariate polynomial in our studies on stabilizing two-dimensional feedback systems. Naturally, the advent of the computer algebra packages, referred to in the previous paragraph, accelerated tremendously the scopes for applications that included the construction of nontrivial examples spanning diverse problems in robust minimax controller design, multidimensional feedback systems and the design of multidimensional filter banks. I wish to thank the guest editors for their hard work in organizing this timely issue. They spared no efforts in getting comments from the reviewers, contributing to the reviewing efforts themselves, when necessary, and meeting several deadlines for publication of this valuable issue without unnecessary delay. I also

want to extend my thanks to J. P. Guiver and C. Charoenlarnopparut for many enlightening discussions on the subject over the years and to B. Buchberger for his contributions which influenced considerably our own research in multidimensional systems and signal processing.

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