PREFACE

For the last three decades, Digital Signal Processing (DSP) has been transferred from university labs to many activity areas of the contemporary society. Implementations of DSP algorithms can be widely recognized in a variety of applications associated with modern digital electronics and telecommunications. Undoubtedly, we can claim that applications of DSP methods resulted in solving many crucial technical problems and, consequently, allowed generating completely new possibilities of human activities and improved the standard of life. Signals appearing in humans' environment are, obviously, its natural elements. Nevertheless, those formed by a human being are usually mathematically processed in many ways in order to extract information contained in them and prepare their transmission. Systems are also obviously employed in DSP, so that these two notions are strictly connected.

The set of DSP algorithms is huge. In a majority of cases, these are algorithms dedicated, or matched, to specific applications. Nevertheless, this area is concentrated around the "information character" of signals and usually employs advanced mathematical tools. Obviously, the associated elements of this research are simulations and real life experiments. A huge variety of DSP algorithms and their applications results in the necessity of exchanging ideas in these areas. Such a possibility is offered by the cyclic International Conference on *Signals and Electronics Systems (ICSES)*, organized every two years in Poland, and obeying a whole "spectrum" of theoretical and practical aspects of DSP methods and electronic systems to perform them. This conference is a successor of the National Conference on *Circuit Theory and Electronic Systems*, having more than a 40 years' tradition, held every year in Poland since the 1970s and being a forum for presentation of research results as well as exchange of ideas.

The latest *ICSES* was held in Wrocław in September 2012. This special section on *Signals and Systems* contains six papers devoted to many aspects of digital signal and systems processing presented at the conference, which are extended and enhanced versions of the conference talks.

The subsequent papers are devoted to

- a non-negative matrix factorization algorithm with application to blind sources separation: geometric analysis and numerical examples of the RASLS NMF algorithm prove its usefulness in spectral signals separation (Zdunek);

- the use of Tikhonov regularization and constrained quadratic programming with applications to electronic programming: this approach allows effective solution of huge size problems (Garda and Galias);

- an automatic speech signal segmentation method with the use of innovation filtering: the proposed criteria show their high efficiency (Makowski and Hossa);

- applications of artificial intelligence methods in detection of faults in electronic systems: efficiency of diagnostics relies on adjustment of algorithms, based on optimization (Bilski and Wojciechowski);

- applications of Boolean satisfactory checking in the area of contemporary design of electronic systems (Pułka);

- problems of image processing in computer tomography (Fabijańska *et al.*).

It is our hope that the presented papers will be of interest for the readers of the *International Journal of Applied Mathematics and Computer Science*. The editors of this special section would like to express their gratitude to the reviewers of the published papers. We feel honored to thank especially Prof. Józef Korbicz, the Editor-in-Chief of *AMCS*, for his help, assistance and support in preparation of this special section.

Ryszard Makowski
Jan Zarzycki
Signal Processing Systems Chair
Wrocław University of Technology, Poland

June 2014

Ryszard Makowski obtained his Ph.D. in acoustics from the Faculty of Electronics at the Wrocław University of Technology in 1982. Since 1996 he has been an associate professor at the same faculty. He is the author of about 70 scientific papers primarily in the field of digital signal processing in areas such as acoustics, mechanics, mining seismology and telecommunications. Currently his main scientific interests focus on automatic speech recognition, speech enhancement and machinery condition monitoring.

Jan Zarzycki is a full professor at the Faculty of Electronics, Wrocław University of Technology, and the head of the Chair of Signal Processing Systems. His main scientific activities are associated with the area of stochastic signal processing. These include the theory and algorithms of nonlinear optimum (least-squares) filtering of higher-order (and non-Gaussian) stationary and non-stationary stochastic sequences and time series, nonlinear Schur parametrization and innovations filtering of higher-order stochastic signals, as well as efficient realizations of orthogonal nonlinear digital filters of the Volterra–Wiener class.