



Editorial

Advanced techniques on multirate signal processing for digital information processing

Multirate signal processing has become a key topic enabling efficient techniques for digital information processing in a variety of applications such as digital transceivers for wireless as well as satellite communication systems, digital broadcasting, high performance audio and video, multimedia services, and signal compression. In the wireless communications arena, multirate signal processing techniques provide effective means to implement flexible receiver channelisation filtering and sampling rate conversion for software and cognitive radio digital front-ends. As far as multimedia signal processing is concerned, recent techniques relying on multirate filter banks have resulted in improved subband coding techniques reflected in the JPEG-2000 multimedia standard, as well as on some modern audio compression formats such as MP3, AAC3 and ATRAC3plus, to cite but a few.

This special issue is aimed at highlighting state-of-the-art techniques on the most recent research advances in multirate signal processing. After two rounds of carefully peer-reviews, 5 papers have been selected to be included in this special issue.

The first paper presents a multirate approach for the recovery of wide-band global navigation satellite system signals. Two or more narrow-band front-ends are used in parallel for collecting different portions of the spectrum of a wide-band navigation signal that is then reconstructed from its sub-band components. Moreover, algorithms for phase offset and amplitude imbalance among the recovered narrow-band components have been developed. In the second paper, a novel design of a wide bandwidth polyphase up-sampling filter bank formed by cascading external shaping filters, arbitrary interpolators and two stages of polyphase channelisation is proposed. The channeliser synthesises 160 channels with 6-MHz frequency centres and thus spans a two-sided baseband bandwidth of 960 MHz. The third paper presents a methodology for designing antialiasing filters for autostereoscopic displays. One key observation in the work is that multi-view autostereoscopic displays can be seen as multirate systems because of the construction compromise between the number of different views and spatial resolution adopted for such displays. Images to be visualised on these displays are prone to aliasing errors, thus careful antialiasing design has to be accomplished. In the fourth paper, the authors

proposed an algorithm for pitch estimation including voiced/unvoiced decision in the case of a noisy speech and when two speakers talk simultaneously. The approach is based on spectral multi-scale product analysis of the sound mixture where the speech is processed by finding the spectrum of the product of three successive wavelet transform coefficients. The proposed method is compared with other state-of-the-art algorithms. The last paper of this special issue presents a novel approach for peak-to-average power ratio (PAPR) reduction in multicarrier modulation using genetic algorithms. A comparative study on both OFDM and wavelet packets multicarrier modulation showed that, although the latter outperforms conventional OFDM schemes in terms of PAPR, the use of genetic algorithms applied to partial transmit sequence are more effective in reducing PAPR for OFDM rather than for wavelet multicarrier modulation formats.

We are grateful to the reviewers for their invaluable work and to the authors of the papers collected in this special issue.

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His main areas of research are digital signal processing and wireless communications, especially modulation and coding, including turbo codes and, more recently, network and

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Gordana Jovanovic Dolecek received a BS degree from the Department of Electrical Engineering, University of Sarajevo, an MSc degree from University of Belgrade, and a PhD degree from the Faculty of Electrical Engineering, University of Sarajevo.

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Lim Yong Ching received the A.C.G.I. and B.Sc. degrees in 1977 and the D.I.C. and Ph.D. degrees in 1980, all in electrical engineering, from Imperial College, London, United Kingdom.

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Fa-Long Luo, Ph.D. holds the title of the Chief Scientist at Element CXI, Inc. and Anyka, Inc, San Jose, USA. He has been the Editor-in-Chief of *International Journal of Digital Multimedia Broadcasting* since the year 2007. Fa-Long Luo is now the Chairman of IEEE Industry DSP Standing Committee. He has twenty-seven years of research and industrial experience and has made

extraordinary contributions in related areas with receiving worldwide attention and recognition.

He has also been granted honorable professorship by three top universities and inducted to senior advisory member of Research Institute of Tsinghua University at Shenzhen. Dr. Luo has authored two books published by Cambridge University Press in 1997 and the National Electronics Industry Press in 1993, respectively. He has also authored over 100 technical articles and 18 patents in related areas. As the lead guest editor, he has edited two special issues for Speech Communication and Signal Processing. Fa-Long Luo is the Editor of application handbook *Mobile Multimedia Broadcasting with Multi-Standards* (Springer, 2008). He has also been extensively involved in a number of standardization activities. His other book, *Digital Front-End in Wireless Communications and Broadcasting: Circuits and Signal Processing*, will appear in August, 2011 by Cambridge University Press. Fa-Long Luo served as an Associate Editor of IEEE Signal Processing Magazine and an Area Editor of IEEE Communication Surveys and Tutorials. He was also a Technical Committee Member of IEEE Signal Processing Society.



Prof. Markku Renfors received the Dr. Tech. degree from the Tampere University of Technology (TUT), Tampere, Finland, in 1982. From 1976 to 1988, he held various research and teaching positions at TUT. From 1988 to 1991, he was a Design Manager at the Nokia Research Center and Nokia Consumer Electronics, Tampere,

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Lars Wanhammar was born in Vansbro, Sweden, on August 19, 1944. He received the Tekn. Mag. degree in 1970, the Civ. Ing. degree in 1980, the Tekn. Dr. degree in 1981, and the Docent degree in 1986, all from Linköping University, Linköping, Sweden.

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