

Guest Editorial: Special Issue on Signal Processing

Dear Readers,

It affords us great pleasure to introduce you to a collection of the best 10 invited papers focusing on different areas of signal processing that were originally mainly submitted by young scientists and Ph.D. students and, on a limited scale, presented at the 2011 34th International Conference on Telecommunications and Signal Processing (TSP) held on 18-20 August, 2011, in Budapest, Hungary. Here you can find their extended versions, in which the authors present their research results in more depth and detail.

Let us briefly introduce the TSP conference. The beginning of the TSP dates back to 1977, when a small group of enthusiasts from the Department of Telecommunications of Brno University of Technology, Czech Republic, organized the first meeting under this title. Because of the success of the first event it was also repeated in 1978 and this annual repetition of the conference has continued till now. Naturally, during such a long time there appeared several important milestones in the life of TSP, from which the year 2008 can be mentioned as the most significant, when the TSP was held for the first time outside the borders of the Czech Republic and the Proceedings volume was for the first time indexed by the Conference Proceedings Citation Index, a Web of Science[®] database of Thomson Reuters. In addition, after the Czechoslovakia Section of IEEE became a technical co-sponsor in 2011, the Proceedings of the TSP also started to be indexed and fully abstracted by the IEEE Xplore[®] database. We hope that this tradition will continue and also that several more milestones can gradually be appended to this summary in future. The aim of this annual conference is to bring together both novice and experienced scientists and developers from different branches of telecommunication technology and signal processing, establish new contacts, find new colleagues and collect new ideas from the fields of their interest. The growing number of submitted papers and attendance assures us that in spite of the huge number of conferences in this area such a support for young academics, researchers and developers is still required and provides significant competitive advantages. The wide-ranging topics of the TSP 2011 covered information society, information systems, network services, network technologies, telecommunication systems, analog signal processing, audio, speech and language processing, biomedical signal processing, digital signal processing, and image and video signal processing. From the 127 papers accepted for presentation at the conference and published in the Proceedings, the best 17 papers focusing on different aspects of signal processing were selected for this Special Issue, and the corresponding authors were invited to submit an extended version of their article. After a careful assessment by international reviewers, 10 extended papers have been accepted for publishing in this Special Issue.

The first paper in this Special Issue, written by *M. A. Ibrahim et al.* presents new topologies for realizing one lossless grounded inductor and two floating, one lossless and one lossy, inductors employing a single differential difference current conveyor (DDCC) and a minimum number of passive components, two resistors, and one grounded capacitor. The floating inductors are based on ordinary dual-output DDCC while the grounded lossless inductor is based on a modified dual-output DDCC. The proposed lossless floating inductor is obtained from the lossy one by employing a negative impedance converter.

In the second paper, *U. E. Ayten et al.* proposed a novel electronically tunable floating frequency dependent negative resistor (FDNR), floating inductor, floating capacitor, and floating resistor simulator circuit employing two current backward transconductance amplifier (CBTAs) and three passive components. The proposed circuit is free from component matching and all the passive elements are grounded. These features make the proposed circuit suitable for fully integrated circuit design. In addition, the high-order frequency dependent element simulator circuit is also presented by the authors.

In the next paper, *J. Petrzela* discusses the influence of piecewise-linear approximation on the global dynamics associated with autonomous third-order dynamical systems with the quadratic vector fields. The novel method for optimal nonlinear function approximation preserving the system behavior is proposed and experimentally verified. This approach is based on the calculation of the state attractor metric dimension inside a stochastic optimization routine. The approximated systems are compared to the original by means of the numerical integration.

The paper by *K. M. Snopek* investigates two various representations of a *Dimensional by n* (n-D) real signal. The first one is the n-D complex analytic signal with a single-orthant spectrum defined by Hahn in 1992 as the extension of the 1-D Gabor's analytic signal. It is compared with two hypercomplex approaches: the known n-D Clifford analytic signal and the Cayley-Dickson analytic signal defined by the author in 2009. The signal-domain and frequency-domain definitions of these signals are presented and compared in 2-D and 3-D. In the paper, the example of a 2-D separable Cauchy pulse is also illustrated.

The fifth paper by *M. A. Demir and A. Ozen* proposes a novel enhanced variable step size constant modulus algorithm (VSS-CMA) based on autocorrelation of error signal to improve the weakness of CMA for application to blind equalization. The new algorithm resolves the conflict between the convergence rate and precise of the fixed step-size conventional CMA algorithm. The obtained computer simulation results using single carrier IEEE 802.16-2004 pro-

toloc have demonstrated that the proposed VSS-CMA algorithm has considerably better performance than conventional CMA, normalized CMA, and the other VSS-CMA algorithms.

The paper by *H. Su et al.* presents two high-efficient parallel realizations of the context-based adaptive variable length coding (CAVLC) based on heterogeneous multi-core processors. By optimizing the architecture of the CAVLC encoder, three kinds of dependences are eliminated or weaken, including the context-based data dependence, the memory accessing dependence and the control dependence. In the paper experiments results are given that are compared with the CPU version. The throughput of the presented CAVLC encoders is more than 10 times higher than that of published software encoders on DSP and multicore platforms.

The next paper by *J. Schimmel* discusses aliasing distortion in digital audio signal synthesis of classic periodic waveforms with infinite Fourier series for electronic musical instruments. It proposes new measure for objective assessment of the audible aliasing distortion based on signal to aliasing maskers ratio. The method uses two psychoacoustic models of simultaneous masking based on the MPEG Psychoacoustic model and other models used in audio and speech processing. The paper compares the computing demands of trivial generation of classic periodic waveforms using oversampling with those of other methods.

The paper by *M. Slanina et al.* deals with the temporal properties of a scoring session when assessing the subjective quality of full HD video sequences using the continuous video quality tests. The performed experiment uses a modification of the standard test methodology described in ITU-R Rec. BT.500. In order to compare the subjective scores with objective quality measures, authors provide an analysis of PSNR and VQM for the considered sequences to find that correlation of the objective metric results with user scores, recored during playback and after playback, differs significantly.

In the ninth paper by *P. Kamencay et al.*, a stereo matching algorithm based on image segments is presented. Authors propose the hybrid segmentation algorithm that is based on a combination of the Belief Propagation and Mean Shift algorithms with aim to refine the disparity and depth map by using a stereo pair of images. The introduced algorithm utilizes image filtering and modified Sum of Absolute

Differences stereo matching method. The obtained experimental results demonstrate that the final depth map can be obtained by application of segment disparities to the original images.

In the last paper, written by *D. Mitrea et al.*, a computerized noninvasive technique for the automatic diagnosis of hepatocellular carcinoma (HCC) based on information obtained from ultrasound images is developed. In this work, authors analyze the role that the superior order Grey Level Cooccurrence Matrices (GLCM) and the associated parameters have in the improvement of HCC characterization and automatic diagnosis. The best spatial relations between the pixels that lead to the highest performances, for the third, fifth and seventh order GLCM are also determined.

We hope that you - readers - will find the above mentioned papers interesting, inspiring, and motivating for further research. Please enjoy the time spent during the reading and we hope to see you at future TSP conferences. Finally, we would like to thank all the anonymous reviewers who spent much of their precious time reviewing the papers. Their timely reviews and comments greatly helped us in selecting the best papers for this Special Issue. We also thank all the authors who have submitted their papers for this issue. Special thanks go to the Editor-In-Chief, Assoc. Prof. Tomas Kratochvil, for his valuable support and for his assistance in the preparation of this volume. Thanks.



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