Editorial

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Biographical notes: Dimitrios A. Karras received his Diploma and MSc in Electrical Engineering from the National Technical University of Athens (NTUA), Greece, in 1985 and a PhD in Electrical and Computer Engineering with honours from the NTUA in 1995. Since 2004, he has been with the Chalkis Institute of Technology, Automation Department, Greece, as a Professor in Digital Systems and Signal Processing as well as with the Hellenic Open University as a Visiting Professor in Communication Systems. He has published more than 50 journal papers in pattern recognition, image/signal processing, neural networks and bioinformatics and more than 140 research papers in international conferences. His research interests span pattern recognition and neural networks, image and signal processing and systems, biomedical systems, communications, networking and security. He has served as a programme committee member, programme and general chair in many international workshops and conferences in signal, image and automation systems. He is the Editor-in-Chief of *International Journal of SISE*.

George C. Giakos is a Professor in the Department of Electrical and Computer Engineering, and Biomedical Engineering at the University of Akron, OH, USA. In addition, he is the Director of Imaging Technologies and Surveillance Technologies, Molecular Nanophotonics and Applied Nanosciences Laboratories. His research is articulated in the design of imaging systems, ladars and surveillance sensor platforms for the Department of Defense and Homeland Security, multispectral polarimetry, exploration of molecular pathways and signatures for early detection of disease. His research group was the first in the USA to pioneer the characterisation of the detection and imaging characteristics of Cadmium Zinc Telluride for flat-panel radiography applications. His research has been rewarded with 15 US patents and more than 150 peer-review articles. He is the recipient of a Distinguished Faculty Fellow Award from the Office of Naval Research. He received numerous prestigious research awards from AFRL, NRL and NASA. He is an IEEE Fellow.

The third issue for 2012 of the *International Journal of Signal and Imaging Systems Engineering (IJSISE)* includes nine exciting regular papers, linking with crucial algorithmic, hardware and system integration areas in signal and imaging systems in front of, also, vital applications. More specifically, the research reports demonstrated in this issue feature tempting hardware implementations of Discrete Wavelet Transform (DWT) for motion estimation and image compression, interesting algorithms for image and signal compression as well as for content based image retrieval, multimedia coding, image enhancement and fault diagnosis. Obviously, this issue covers a lot of contemporary areas under discussion in signal and image processing.

The first research report by Ganapathi Hegde and Pukhraj Vaya, from India, examines the Full Search Block Matching Algorithm (FSBMA) performed on 3-D images in the DWT transform domain, employing the 3-D Discrete Wavelet Transform (3-D DWT). FSBMA performed on LLL sub band component achieves good Peak Signal to Noise Ratio (PSNR), Compression Ratio (CR) and reduces computation complexity by 75% when compared with the

original image. Modified lifting scheme based DWT and Systolic Array Architecture (SAA) based FSBMA are implemented on Field Programmable Gate Array (FPGA) achieving favourable operational characteristics.

In the sequel, the paper by Nagabushanam, M., Cyril Prasanna Raj, P. and Ramachandran, S. from India, realising that there is a growing need to embed DWT into a real system, investigates a Field Programmable Gate Array (FPGA) implementation of DWT resulting in higher processing speed and lower costs when compared to other implementation methods. More specifically, in this report, a modified DA-DWT, which performs low-pass and high-pass filtering, is shown to improve the computational speed of DWT. Moreover, a 9/7 filter is designed using modified Distributed Arithmetic (DA) architecture to perform low-pass and high-pass filtering. By using optimized DA architecture the Look-Up-Table (LUT) size is substantially reduced. The design is verified in a Verilog Hardware Description Language (HDL) simulator and implemented on XILINX Virtex5.

The third paper by Chandan Singh D. Rawat and Sukadev Meher, from India, studies a new approach in hybrid image compression embedding Human Visual System (HVS) into Partitioning in Hierarchical Trees (SPIHT) algorithm to offer different perceptual weights to different image blocks. Extensive HVS research has shown that there are three perceptually significant activity blocks in an image: smooth, edge and texture blocks. Of the different HVC's set up in the literature for distinguishing the regions of interest in the images, the authors employ two of the most pronounced HVC's, 'Entropy and Variance'. The distinct combinations of the Human Visual Characteristics (HVC) values define the blocks as: Edges, smoothed regions and texture regions. Subsequently, each of these blocks are encoded using Set SPIHT at particular compression rates based on their significance. The SPIHT coder results with a bit stream, which is then, fed to the Self Organizing Feature Maps (SOFM) based Vector Quantization (VQ) coding for further compression. The reconstruction of the original image involves the linear combination of its corresponding processes as in image encoding. The experimental results exhibit the improvement in the compression rate and subjective visual quality of the reconstructed images.

Then, the research report by Kumar, A. and Ranjeet, K. from India, investigates a novel optimised wavelet filter bank based methodology for compression of electrocardiogram (ECG) signals. The methodology employs new wavelet filter bank whose coefficients are derived with different window techniques such as Kaiser and Blackman windows using simple linear optimisation. A comparative study of performance of different existing wavelet filters and the proposed wavelet filter is made in terms of CR Percent Root mean square Difference (PRD), Mean Square Error (MSE) and Signal-to-Noise Ratio (SNR). The new developed wavelet filter gives better compression ratio and good fidelity parameters as compared to other wavelet filters, implemented in the field of biomedical signal processing.

The next paper by PL.Chithra and P.Thangavel, from India, proposes a new efficient embedded wavelet image compression based on Multi-Directional Traversal Algorithm (MDTA). MDTA keeps track of significant pixels of the LL sub band of wavelet coefficients in multiple directions. MDTA combines multidirectional approach for LL band of wavelet coefficients and quad tree partitioning to locate scattered significant clusters in other sub bands. The suggested algorithm consists mainly of simple comparisons and does not require any complex computations. Experimental results yield good image quality at high compression ratio with relatively low complexity. It is demonstrated that MDTA performs very well with all other codecs such as SPIHT, EBCOT and PCAS and morpho codecs like MRWD, ECZQR and EWCBL.

In the sequel, the paper by Tamilarasi, M. and Palanisamy, V. from India, presents a wavelet based contourlet image compression algorithm. The authors, based on recent reports on natural image compression showing superior performance of contourlet transform, a new extension to the wavelet transform in two dimensions using Laplacian Pyramid (LP) and directional filter banks, develop their compression algorithm suitable for medical imaging. Within the diagnosis of medical images, the significant part Region of Interest (ROI) is separated out from the rest of the image using fuzzy C means algorithm and then, optimised contourlet transform is applied to enhance the visual quality of the resulting images. The regions of less significance are compressed using DWT and finally, modified embedded zerotree wavelet algorithm is applied, using different predefined symbols instead of the ones used in Shapiro's Embedded Zero tree Wavelet algorithm (EZW), demonstrating better PSNR and high compression ratios. Finally, Huffman coding is applied to the resulting image to get the improved compressed image.

The seventh paper by Falie, D. from Romania, presents a novel methodology to address the issue that Range images of the Time-of-Flight camera (TOF) are affected by errors due to the scattered light inside the camera body (flare light) and by the indirect (diffuse) light. The 3D images are distorted because the errors of the range image depend on the surfaces' reflectivity. The presented algorithm, based on a modified TOF camera, computes a correction vector that corresponds to the average effect of the diffuse and flare light. The enhanced range image is obtained by subtracting this vector from the recorded vector image. In this manner, the author effectively demonstrates that the range image distortions in the dark regions are reduced.

The next paper by Om Prakash, Vrijendra Singh and Prem Kumar Kalra, from India, explores a novel approach for signature extraction from acoustic signals based on Short Time Fourier Transform (STFT) and its use for Artificial Neural Network (ANN) based fault diagnosis of internal combustion engine. STFT can provide a time-frequency resolution data for signal signature extraction. The authors claim that it is suitable for extracting mechanical fault information form acoustic signals and present a novel

protocol of time dependent frequency information for the development of appropriate signature and its application in engine fault diagnosis. The results of the protocol application show that the extracted signatures of seven classes of acoustic signals as engine fault information are effective for the development of efficient classification models.

Finally, the paper by Reddy, P. V. N. and Satya Prasad, K. from India, explores a new algorithm known as Line Edge Binary Pattern (LEBP) proposed for content based image retrieval. The suggested method represents the local region of an image based on the distribution of line edges in contrast to Local Binary Patterns (LBP). LBP extracts the information based on distribution of point edges, which are evaluated by taking into consideration local difference between the center pixel and its neighbors in an image. The retrieval results of the proposed method are tested on Corel 1000 and Corel 2450 image databases demonstrating a significant improvement in terms of precision and recall as compared to LBP and other existing spatial and transform domain methods.

We expect that the existing issue, demonstrating stimulating new contributions and key algorithms and implementations for signal and imaging systems, jointly in algorithmic and hardware level of integration will be attractive for practitioners, engineers and researchers. We would like to express our great appreciation to all authors, reviewers and especially to our journal manager as well as to our publisher for their concrete, huge and constant support.