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 from the NTUA in 1995, with honours. 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 programme committee member, programme and general chair in many international workshops and conferences in signal, image and automation systems. He is 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.

Uwe Hampel is Head of the Division of Experimental Thermal Fluid Dynamics at the Institute of Safety Research in the Forschungszentrum Dresden-Rossendorf. He is also a Lecturer in the Faculty of Electronics and Information Technology at Dresden University. His research interests are in imaging methods and sensors for industrial multiphase flow applications, in particular optical imaging, wire-mesh sensors, and computed tomography methods. His group is recognised for the development of novel fast tomographic imaging modalities, such as ultrafast electron beam tomography for flow imaging. He is author and co-author of more than 220 peer-reviewed journal and proceeding papers, holder of 13 patents, reviewer for various grant agencies, and founding member of the International Society for Industrial Process Tomography (ISIPT) as well as of member of several technical and scientific committees.

The third issue of 2010 of the *International Journal of Signal and Imaging Systems Engineering* (IJSISE) is now ready containing two special issue papers and five regular papers. The special issue papers have been selected under a rigorous peer review procedure from extended version papers presented at IST 2009, IEEE International Workshop on Imaging Systems and Techniques, by Dr. Uwe Hampel. At this point the Editors-in-Chief of IJSISE would like to thank Dr. Uwe Hampel for his outstanding contribution and to emphasise the fact that IJSISE always welcomes proposals for special issues covering in depth specific subjects of signal and imaging systems but also, welcomes proposals from conference organisers to publish a small number of best papers presented at their conference, after, however, a special review procedure keeping the high standards of this journal. We are happy to remark that the contents of the current issue present research in both hardware and software design of signal and imaging systems and we would like to express our interest in receiving more research reports on the hardware design so as to come to the point to present balanced journal issues in terms of hardware and software design and engineering of signal and imaging systems.

Regarding the special issue papers on Imaging Systems and Techniques we herein welcome, we could point out that Imaging systems and techniques have found widespread application in medical and biological imaging, security and surveillance systems, remote sensing, biometrics, non-destructive testing, computer sciences, materials research, and most recently also in various types of customer products. Imaging systems may be based on different physical measuring principles, such as optical, infrared, acoustic, microwave, terahertz, electrical, X-ray and gamma ray sensing techniques, for example. But behind the imaging sensor there is strong common ground in electronics concepts and circuits for signal conversion, processing, acquisition, and storage as well as algorithms for image enhancement, image reconstruction and image analysis. Imaging systems are increasingly complex and therefore challenge electronic engineers and computer scientists. Concurrently to an ongoing trend of increasing the spatial and temporal resolution of such systems, there is a growing demand for hardware-supported image processing, multi-modality imaging, data reduction as well as improved sensitivity, specificity and robustness.

The IEEE International Workshop on Imaging Systems and Techniques (IST) is a platform for scientists and engineers to exchange and discuss the progress in the development of traditional and novel digital imaging technologies for the 21st century. The 2009 workshop hosted in Shenzhen, China, from 11th to 12th May 2009 was the sixth in a series of annual meetings following the successful events held previously in Stresa, Italy, Niagara Falls, Canada, Minori, Italy, Krakow, Poland, and Chania, Greece. It has seen 92 presentations from 224 international authors, dealing with the design, development, evaluation and applications of imaging systems, instrumentation, measuring techniques, and image processing algorithms. In the progression of this event the *International Journal of Signal and Imaging Systems Engineering* has decided to contribute with the following set of papers to the publication of the most recent scientific and engineering progress in imaging systems technology.

In the first special issue paper by Yuanyuan Shang, Yong Guan, Xumin Liu and Weigong Zhang the design of a high-speed 2K × 2K Complementary Metal-Oxide-Semiconductor (CMOS) camera is introduced, which is part of the Wide Field Monitor System proposed in China recently. It consists of an analogue and a digital embedded system. Research on characteristic measurement for CMOS imagers, including readout noise, linearity, quantum efficiency, photo response non-uniformity, dark current, full-well capacity and gain, is also carried out. The evaluation results indicate that this high-speed CMOS camera can meet the requirements of the Wide Field Monitor System.

Next, in the second special issue paper by Dejey and R.S. Rajesh, two combined transforms are explored for colour image watermarking namely

- Discrete Wavelet Transform – Fan Beam Transform (DWT-FBT)

- Spatio-Chromatic Discrete Fourier Transform – Fan Beam Transform (SCDFT-FBT).

Both the combined domains utilise the luminance and chrominance or the chrominance content alone for watermarking. The combined transforms herein discussed excel in terms of perceived quality, capacity and robustness to attacks. The DWT-FBT domain shows superior performance than SCDFT-FBT domain in its resistance to compression, cropping, colour conversion and rotation. Results of the proposed combined transforms are compared with two existing DWT-DCT domain watermarking schemes and show their effectiveness.

The first regular paper by Chang-Jun Lin, Hiroaki Ozaki, Hua Qiu and Yong Yue, presents a sensing device for gasoline engine speed used in a miniature Portable Unmanned Helicopter (PUH). The sensing device has several favourable features appropriate for PUH control, i.e., small, light, accurate and easy to handle in the control operation, especially, easy and low-cost for manufacturing. Moreover, it is also applicable to general gasoline engines. Experimental results with a miniature PUH have demonstrated the effectiveness and practicability of the sensing device for the application in PUH control.

In the sequel, Sanjay Singh, Kirat Pal and M.J. Nigam study edge detection techniques in earthquake engineering as an important task for recognition of seismic faults which are not detectable by other techniques. More precisely, they investigate a novel fuzzy edge detection technique of seismic images based on the maximum entropy principle. After introducing the concept of fuzzy probability, conditional probability and fuzzy partitioning a 2-level optimal thresholding is sought adaptively through the maximum entropy principle applied on the seismic gradient images in order for the Seismic edge images to be obtained.

In the third regular paper by Theologos Athanaselis, Stelios Bakamidis, Ioannis Dologlou and Stavroula-Evita

Fotinea two well-known speech enhancement techniques are compared in a Magnetic Resonance Imaging (MRI) scanner noise reduction scheme prior to speech recognition stage. This interesting study deals with the comparison between the Non Linear Spectral Subtraction (NSS) with iterative overestimation and the Singular Value Decomposition (SVD)-based noise reduction techniques in enhancing medical content speech contaminated by MRI scanner noise. It is proven experimentally that both techniques can improve the recognition performance of voice commands in order to voice control an MRI scanner. Making one step ahead, the paper further investigates the performance of both signal enhancement techniques in the recognition of speech utterances with medical information.

Next, Temberveni Venu Gopal, B. Ramesh Naik and V. Kamakshi Prasad study a novel method of representing a shape in imaging systems. It is based on an adaptation of Fourier theory known descriptors. To obtain a good boundary description, the authors choose to define it in an 8-connectivity means. Fourier Descriptors have a disadvantage of giving equal weights to all its 8-neighbours. So, the Fourier coefficient formula must be completely recomputed so that horizontal and vertical neighbours are given more weight when compared to the diagonal neighbours. Under Java retrieval framework, the authors compare their results with the existing Fourier descriptors and favourably validate the proposed method.

Finally, Girdharilal H. Agrawal and Nitin K. Choudhari offer us an extensive experimental account on Non Destructive Testing (NDT) of wood properties. NDT for wood is used to measure natural and environmentally induced irregularities to determine its mechanical properties. The authors discuss the basic operation, design and experimental technique for Contact type Ultrasonic NDT method to discover wood properties. Their experimentation is based on analysing the signal acquired using two piezoelectric ultrasonic transducers involving Fast Fourier Transform (FFT) and Power Spectral Density (PSD) methodology.

We believe that this issue, presenting a variety of design approaches in both hardware and software engineering of signal and imaging systems, will be of value for all practitioners and researchers. We would like to thank especially our guest editor, Dr. Uwe Hampel, all authors as well as all reviewers and our publisher for their support.

Our efforts are endlessly focused on improving quality and principally indexing of this journal. Your recommendations are important towards this goal, jointly with your high quality original research reports and your advertisement within your institutions.