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## Editorial

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**Biographical notes:** Petra Perner is the Director of the Institute of Computer Vision and Applied Computer Sciences IBAI. She received her Diploma Degree in Electrical Engineering and her PhD Degree in Computer Science. She has been the principal investigator of various national and international research projects. She received several research and business awards for her work. Her research interest is image analysis and interpretation, machine learning, data and image mining, machine learning, and case-based reasoning. Recently, she is working on various medical, chemical and biomedical applications, information management applications, and e-commerce applications. She has published numerous scientific publications and patents. Her vision is to build intelligent flexible and robust data-interpreting systems that are inspired by the human case-based reasoning process.

G.C. Giakos is a Faculty of the Electrical and Computer Engineering, and Biomedical Engineering Departments, at the University of Akron. In addition, he is the Director of Imaging Technologies, Molecular Nanophotonics, and Applied Nanosciences Laboratories. He has fostered several breakthrough inventions which have been rewarded with 18 US and international Patent Awards and applications, and more than 150 peer-review papers. He is the recipient of the Distinguished Faculty Fellow Award, from the Office of Naval Research/Naval Research Laboratory. He is the Chief Scientist and serves as Chairman of the Board of Directors of Akron Scientific, a spin-off of the University of Akron.

Dimitrios A. Karras received his Diploma and MSc Degree in Electrical and Electronic Engineering from the National Technical University of Athens, Greece in 1985, and the PhD Degree in Electrical Engineering, from the National Technical University of Athens, Greece in 1995, with honours. Since 2004, he has been with the Chalkis Institute of Technology, Automation Department, Greece as Full Professor in Digital Systems. He has published more than 30 journal and 70 conference papers. His research interests span the fields of pattern recognition and neural networks, signal and image processing and analysis, communications and security, as well as parallel algorithms.

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The inaugural issue of the *International Journal of Signal and Imaging Systems Engineering* (IJSISE) is now reality and in your hands, dear knowledgeable reader, engineer, practitioner, academic or researcher in the field of signal/image processing.

IJSISE will publish, after peer review, high quality papers proposing discussions on the theoretical, experimental and applied signal and image processing/communication techniques and systems, with emphasis on

systems engineering of state-of-the-art signal and imaging systems. Although the majority of journals in this engineering field deal mainly with signal or image processing algorithms, IJSISE acknowledges the importance and the complexity of systems engineering of working signal and imaging systems and provides the interface between basic research/algorithms/techniques and integral systems. State-of-the-art systems analysis, design, integration, evaluation, benchmarking and standardisation

along with the development of new algorithms evaluated towards building such systems constitute the primary focus of IJSISE and deserve a publication area within it. With these thoughts in our minds we are presenting you the inaugural issue of IJSISE comprised of extended peer reviewed versions of the best papers presented at the conference MDA 2006 forming a special issue on *Mass-Data Analysis of Images and Signals in Medicine, Biotechnology and Chemistry* as well as of five regular papers.

The motivation for editing a special issue on *Mass-Data Analysis of Images and Signals in Medicine, Biotechnology and Chemistry* is that the automatic analysis of images and signals in medicine, biotechnology, and chemistry is a challenging and demanding field. Signal-producing procedures by microscopes, spectrometers and other sensors have found their way into wide fields of medicine, biotechnology, economy and environmental analysis. With this arises the problem of the automatic mass analysis of signal information. Signal-interpreting systems which generate automatically the desired target statements from the signals are therefore of compelling necessity. The continuation of mass analyses on the basis of the classical procedures leads to investments of proportions that are not feasible. New procedures and system architectures are therefore required. The scope of the *International Workshop on Mass Data Analysis of Images and Signals in Medicine, Biotechnology and Chemistry MDA'2006* ([www.mda-signals.de](http://www.mda-signals.de)), as well as its successors, has been to bring together researchers, practitioners and industry people who are dealing with mass analysis of images and signals to present and discuss recent research in these fields.

The goals of this workshop have been to:

- provide a forum for identifying important contributions and opportunities for research on mass data analysis on microscopic images
- promote the systematic study of how to apply automatic image analysis and interpretation procedures to that field
- show case applications of mass data analysis in biology, medicine, and chemistry.

In this special issue appear selected papers from the first workshop. The first and necessary step for automating image analysis is an accurate segmentation of the objects themselves, which is, then, followed by the extraction of significant morphological parameters. Unfortunately, object segmentation in biological problems is usually an ill-posed problem: due to poor dye quality, object boundary could be not well distinguishable and parts of the same tissue could be not equally stained; two or more objects could be very close to each other or even overlapping and so on.

Consequently, three out of the six papers deal with image segmentation for biological objects such as cells or tissues. Frucci and Sanniti di Baja use watershed segmentation and propose a method to reduce the over segmentation by functional and heuristic rules.

Wählby et al. discuss the problem of image segmentation of fluorescence microscopic cell images. They propose a way for image segmentation based on the distance transformation of the thresholded image and apply later on watershed segmentation to these images. It allows them to detect nuclei and cytoplasm for their kind of images.

Colantonio et al. use a Fuzzy-C means clustering and a neural net to classify the pre-segmented areas into cells and cytoplasm. They apply this method to blood cells and can show good segmentation results as well as good computational time performance.

The main problem with applications from medicine, biotechnology, and chemistry is that it covers a wide problem area. Therefore, a lot of different image-based applications exist that are not solved yet, not only for the automatic analysis – which sometimes is the hardest point – but also for the problem of good image acquisition. Evangelisti et al. present in their paper a real-time system for the observation of swimming microorganism. They present the image acquisition unit as well as their analysis procedures for the determination of the translational and rotational speed of the microorganism.

Shape characterisation of time-varying objects is a main problem in many medical applications not only for real-time image-interpretation problems such as in heart ventricle analysis but, also, for problems where subsequently images are taken after a larger time interval and the deformation of the object shape has to be studied since it gives a good understanding of progress of the disease such as in the study of degenerative brain diseases in MR or CT image of the brain. Moroni et al. show their methodology on how to segment, construct, and represent the object under study under time-varying conditions.

Another important task is the statistical analysis of electrophoresis time series for DNA sequencing by Tonazzini and Bedini. This work shows that there is a reach amount of methods available from image analysis, pattern recognition and statistics. However, the application of these methods to the different existing problems needs to have enthusiastic researchers that are not afraid of looking at the border of the discipline they studied, and rather than this, they are eager to bring these techniques into real life. As we know this is not always a challenging problem since, besides research, a lot of other problems have to be solved. At first there must be the will to work in an interdisciplinary way and accept that there are bounds between the disciplines that can only be weakened by being open-minded and through the ability to work across-disciplines. Second, there is a lot of side work to do that makes such a project running – collecting data, cleaning data and understanding the problem task.

The *International Workshop on Mass Data Analysis of Images and Signals in Medicine, Biotechnology and Chemistry MDA'2006* has set up a sign and encouraged more people to go into real-world applications. During 2008 this event will run as the *Intern. Conference on Mass Data Analysis of Images and Signals in Medicine, Biotechnology and Chemistry MDA'2008*. We hope to welcome some of

the readers of this journal to this conference too, as well as its successors, presenting their work.

In addition to the special issue papers this inaugural issue contains five regular papers.

The first one by G.C. Giakos presents a theoretical formalism accompanied with experimental evidence which demonstrates that aqueous insulin macromolecules, and complex metaphase macromolecules exhibit enhanced photophysical and metamaterial-like characteristics leading to an overall enhancement of the interacting optical fields.

The second one by Assimakis et al. presents an implementation of the time invariant Kalman Filter using the General Chandrasekhar Algorithm and compares it to the classical one.

Next, G. Papakostas et al. present a comparative study of two possible combinations of the Backpropagation (BP) algorithm and a Genetic Algorithm (GA), for Neural Networks training in Machine Vision Applications.

The fourth regular issue paper by R.P. Patankar et al. develops a signal processing method that can detect and map patterns to an anomaly measure for failure precursor detection in electronic circuits, based on symbolic dynamics.

Finally, A. Vadivel et al. propose a new histogram generation method from the HSV colour space and show how it can be effectively used for temporal video segmentation, a method showing high recall and precision of shot boundary detection in content-based video retrieval applications.

We hope that this inaugural issue will be interesting and satisfying your needs, dear readers. There is no need to say that all your comments will be indispensable for improving the quality of this journal and therefore, they are more than welcome! Of course your high quality research reports are welcome too, for consideration for publication after a reasonably short peer review process!