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Editorial

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Recent progress and prospects in multimedia, human-computer interaction, visual communications, semantic web, and cognitive vision call for and can benefit from applications of advanced image and video analysis technologies. Adaptive robust systems are required for analysis, indexing, and summarization of large amounts of audio-visual data. Advanced image analysis technologies are needed for next-generation description and browsing services characterized by structured, object-and content-based representations. Automatic extraction of semantic information from still or moving images and the analysis of their content are necessary for automatic annotation, indexing, and categorization.

The aim of this special issue is to bring together contributions from the latest developments in the field of object-oriented and semantic image and video analysis applications. Ten papers have been selected following the reviewing process and appear in this issue, which are briefly described below.

In the first paper, Cavallaro and Ebrahimi tackle semantic video object extraction by interacting between color change detection and region-based processing, achieving high spatial accuracy and temporal coherence. In the second paper, H.-Y. Wang and Ma propose a video object segmentation approach, involving image segmentation and motion estimation; the approach is based on spatial-constrained motion mask generation and motion-constrained spatial region merging.

Video object segmentation is also the topic of the third paper by Porikli and Y. Wang. The authors perform a spatio-temporal decomposition of the data, defining simple homogeneous, in terms of low-level visual descriptors, components; the latter, called volumes, are then expanded and grouped into objects, using hierarchical clustering. In the next paper, Li et al. use a Markov random field model to obtain object-based semantic image segmentation, focusing on remote sensing applications; their approach includes a Wold model decomposition of the original image generating both stochastic and structural texture image components.

The next two papers deal with technologies used in semantic image and video object analysis. In the first paper, Tsechpenakis et al. propose a model-based snake approach for object tracking, using a priori shape knowledge;

a probabilistic rule-based approach is thus derived that copes with objects in cluttered and partially occluded scenes. In the second paper, Caldelli et al. analyze how estimation of objects' motion parameters can effectively be obtained, using appropriate MRF modeling and simple motion models.

The following two papers deal with content-based image retrieval. They both start with unsupervised image segmentation. In the first, R. Zhang and Z. Zhang use color object analysis and compute fuzzy color, texture, and shape parameters of the objects of the images. They also use clustering to obtain efficiency in the retrieval. In the second, Mezaris et al. extract similar low-level descriptors, forming a simple object ontology, which is used next for defining semantic objects. Relevance feedback is used here in the retrieval process.

The last two papers deal with specific applications of image and video analysis. In the first, Maragos et al. present an integrated system for the estimation of the bioecological quality of soils from analysis of soil section images, focusing on efficient extraction of multiscale geometric features from the data and object-oriented image analysis and using a neurofuzzy inference procedure. In the second paper, M. Kampmann proposes a maximum a posteriori algorithm for efficient chin and cheek contours estimation in video sequences, exploiting a priori knowledge about the shape and position of the contours.

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Kiyoharu Aizawa received his B.E., M.E., and Dr.E. degrees in electrical engineering all from the University of Tokyo in 1983, 1985, and 1988, respectively. He is currently a Professor at the Department of Electrical Engineering and Department of Frontier Informatics, the University of Tokyo. He was a Visiting Assistant Professor at the University of Illinois from 1990 to 1992. His current research interests are in digital life log, image coding and processing, three-dimensional image processing, multimedia applications for wearable and ubiquitous environments, and computational image sensors. He received the Young Engineer Award in 1987, Best Paper Awards in 1990 and 1998, Achievement Award in 1991, Electronics Society Award in 1999 from IEICE Japan, Fujio Frontier Award in 1998, and Best Paper Award from ITE Japan in 2002. He received IBM Japan Science Award in 2002. He serves as Associate Editor of IEEE Transactions on Circuit and Systems for Video Technology and is on the editorial board of the IEEE Signal Processing Magazine, the Journal of Visual Communications, and EURASIP Journal on Applied Signal Processing. He has served for many national and international conferences including IEEE ICIP, and he was the General Chair of SPIE VCIP99. He is a Member of IEEE, IEICE, and ITE.

Thomas Huang received his B.S. degree in electrical engineering from National Taiwan University, Taipei, Taiwan, China; and his M.S. and Sc.D. degrees in electrical engineering from the Massachusetts Institute of Technology, Cambridge, Massachusetts. He was in the faculty of the Department of Electrical Engineering at MIT from 1963 to 1973, and in the faculty of the School of Electrical Engineering and Director of its Laboratory for Information and Signal Processing at Purdue University from 1973 to 1980. In 1980, he joined the University of Illinois at Urbana-Champaign, where he is now William L. Everitt Distinguished Professor of electrical and computer engineering, and Research Professor at the Coordinated Science Laboratory. He is also the Head of the Image Formation and Processing Group at the Beckman Institute for Advanced Science and Technology and Cochair of the Institute's major research theme, Human Computer Intelligent Interaction. Dr. Huang's professional interests lie in the broad area of information technology, especially the transmission and processing of multidimensional signals. He has published 14 books, and over 500 papers in network theory, digital filtering, image processing, and computer vision. He is a Member of the National Academy of Engineering.

Stefanos Kollias was born in Athens in 1956. He obtained a diploma in electrical engineering from the National Technical University of Athens (NTUA) in 1979, an M.S. in communication engineering from UMIST in England in 1980, and a Ph.D. in signal processing from NTUA in 1984. In 1974 he obtained an honorary diploma in the Annual Panhellenic Competition in Mathematics. In 1982 he was given a COMSOC Scholarship from the IEEE Communication Society. From 1986 to 1996 he has served as Lecturer, and Assistant and Associate Professor in the Department of Electrical and Computer Engineering of NTUA. From 1987 to 1988 he was a Visiting Research Scientist in the Department of Electrical Engineering and the Center for Telecommunications Research of Columbia University, New York, USA. Since 1997 he has been a Professor at NTUA and Director of the Image, Video and Multimedia Systems Lab. His research interests include image and video processing, analysis, coding, retrieval, multimedia systems, computer graphics, artificial intelligence, neural networks, HCI, and medical imaging. He has published more than 200 papers, 90 of which in international journals. During the last decade he has been leading or participating in more than fifty projects at European level.

Petros Maragos received his Ph.D. from Georgia Institute of Technology, Atlanta, USA, in 1985. Then, he joined the faculty of the Division of Applied Sciences at Harvard University, Massachusetts, where he worked for 8 years as a Professor of ECE, affiliated with Harvard Robotics Lab. In 1993 he joined the ECE faculty of Georgia Tech. During parts of 1996–1998 he was on academic leave working as Senior Researcher at the Athens Institute for Language and Speech Processing. Since 1998 he is working as a Professor of ECE at the National Technical University of Athens. His research and teaching activities include

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Ralf Schäfer received his Dipl.-Ing. and Dr.-Ing. degrees both in electrical engineering from the Technical University of Berlin in 1977 and 1984, respectively. In October 1977, he joined the Heinrich-Hertz-Institut (HHI) in Berlin and since 1989, he has been the Head of the Image Processing Department, where he is responsible for 50 researchers and technicians, 25 students, and about 20 R&D projects. The main R&D fields are image processing, image coding, multimedia communication over (wireless) Internet, immersive telepresence systems and RT-SW implementations, and HW design including VLSI. He participated in several European research activities like COST, EUREKA, RACE, ACTS, ESPRIT, and IST. He was the Chairman of the task force on "Digital Terrestrial Television—System Aspects" of the DVB project, which specified the DVB-T standard. Currently, he is a Member of the German "Society for Information Technology" (ITG), where he is the Chairman of experts committee "TV Technology and Electronic Media" (FA 3.1) and Chairman of the experts group "Digital Coding" (FG 3.1.2). Furthermore, he is a Member of the German "Society for Television and Motion Picture Technology" (FKTG), where he belongs to the URTEL Award Committee.