Guest Editors’ Introduction to the Special Section on Perceptual Organization in Computer Vision

David W. Jacobs, Member, IEEE, and Michael Lindenbaum, Member, IEEE

This issue contains the second installment of the special issue on perceptual organization in computer vision. In the April issue of TPAMI, we published 11 papers addressing basic principles, algorithms, and applications. This month’s papers continue along these lines and raising new issues as well.

The first paper in the special section contributes to one of the most significant trends in perceptual organization, the use of graph algorithms to efficiently find regions that globally optimize, or approximately optimize, a grouping property. P. Soundararajan and S. Sarkar present an analysis and experimental evaluation of a set of graph algorithms, showing that some of the common algorithms are practically equivalent with respect to performance.

In the next paper, J.H. Elder, A. Krupnik, and L.A. Johnston describe a probabilistic formulation for contour grouping that combines Gestalt grouping cues with prior knowledge about the shape of the objects whose boundary is being detected. They apply this approach to the problem of detecting exact lake boundaries in satellite imagery.

S. Wang and J.M. Siskind also study graph algorithms as a grouping mechanism. They present a novel algorithm based on the ratio of two properties of graph edges that are cut in a segmentation. This leads to a polynomial time algorithm that finds globally optimal groupings, which they then enhance using a set of heuristics.

Finally, it is fitting that our issue concludes with S.-C. Zhu’s paper, which reviews a large set of past work on modeling visual patterns, an area fundamental to perceptual organization. Professor Zhu presents a broad taxonomy of methods, stressing the importance of generative models in image modeling.

The 15 papers we have presented provide a wide range of viewpoints and attack a variety of problems using diverse tools. We find this appropriate since the challenges of perceptual organization are great and many angles on the problem should continue to be explored. Hopefully, the special section will provide a useful snapshot of the state of many of these approaches.

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Guest Editors

David W. Jacobs received the BA degree from Yale University in 1982. From 1982 to 1985, he worked for Control Data Corporation on the development of database management systems and attended graduate school in computer science at New York University. From 1985 to 1992, he attended the Massachusetts Institute of Technology, where he received the MS and PhD degrees in computer science. From 1992 to 2002, he was at the NEC Research Institute, Princeton, New Jersey, where he was a senior research scientist. In 1998, he spent a sabbatical at the Royal Institute of Technology (KTH) in Stockholm. Since 2002, he has been an associate professor of computer science at the University of Maryland, College Park. His research has focused on human and computer vision, especially in the areas of object recognition and perceptual organization. He has also published papers in the areas of motion understanding, memory and learning, and computational geometry. He is an associate editor of the IEEE Transactions on Pattern Analysis and Machine Intelligence. He and his coauthors received honorable mention for the best paper award at CVPR 2000. He is a member of the IEEE and the IEEE Computer Society.

Michael Lindenbaum received the BSc, MSc, and DSc degrees from the Department of Electrical Engineering at the Technion, Israel, in 1978, 1987, and 1990, respectively. From 1978 to 1985, he served in the Israeli Defense Forces. He did his postdoctoral work at the NTT Basic Research Labs in Tokyo, Japan, and, since 1991, he has been with the Department of Computer Science, Technion. He was also a consultant to Hewlett-Packard Labs, Israel, and recently spent a sabbatical at the NEC Research Institute, Princeton, New Jersey (in 2001). He worked in digital geometry, computational robotics, learning theory, and various aspects of computer vision. Currently, his main research interest is computer vision and, especially, statistical analysis of object recognition and grouping processes. He is a member of the IEEE.