

Preface

This volume of papers has been assembled to honor Azriel Rosenfeld on his 65-th birthday. For about half of these 65 years, he has been a dominant figure in the field of computer vision and image processing. Azriel is a distinguished University Professor and the Director of the Center for Automation Research at the University of Maryland in College Park. Over a period of 30 years he has made many fundamental and pioneering contributions to nearly every area of computer vision and image processing. He wrote the first textbook in the field (1969), was founding editor of its first journal (1972), and was co-chairman of its first international conference (1987). He has published over 25 books and over 500 book chapters and journal articles, and has directed about 50 Ph.D. dissertations.

Azriel's 65 years symbolize coming of age of a discipline which he has grown with and which has mostly been viewed as a nascent field. The contributions to this volume illustrate to some degree the changes that have occurred in the research problems of interest and the methodologies employed. The papers are by a handful of the many people who have known and worked with Azriel over the years. All of the researchers we were able to contact were overwhelmingly supportive of the idea of this Festschrift honoring Azriel. Many others would have contributed if not for the tight publication schedule. The contributed papers address five major themes: image segmentation, feature extraction, three-dimensional (3-D) shape estimation from two-dimensional (2-D) images, object recognition, and applications technologies. These themes have been used to organize the papers into five main sections.

The first section on segmentation of images into regions consists of six papers. Jacob Beck presents results of an experiment that delves into the ability of humans to segregate texture patterns in color images. The experiment looks at the effects of hue, spatial scale, and background luminance. Rama Chellappa and S. Krishnamachari describe the use of Markov random field models for image segmentation in a multi-resolution framework. Mike Brady and Zhi-Yan Xie address the problem of selecting wavelet-based features for segmentation of texture images. Narendra Ahuja describes a new transform for extraction of low-level image structure at all of the unknown scales present in an image. Anil Jain and Pat Flynn give an overview of unsupervised clustering techniques used as a basis for image segmentation. Herb Freeman revisits one of the earliest topics in image analysis, that of encoding the boundary of a 2-D image region.

The four papers in the second section address different aspects of the problem of extracting features, such as edges, from 2D images. The paper by Richard Qian and Tom Huang presents a new algorithm for edge detection in 2D images using a scale-space framework. Jan Koenderink and Andrea van Doorn investigate what is needed in order to be able to make general statements about local image operators, such as edge detectors, in a scale space framework. Steve Zucker's paper is also concerned with multiscale structure and argues that the scale space concept is broadly applicable. Robert Haralick looks at the problem of propagating the effects of noise at one level of processing in a vision system to the next level.

The third section is concerned with the estimation of 3-D Shape from 2-D images. The two papers in this section present very different techniques for perceiving 3-D shape from

2-D images. Freddy Bruckstein, R. Onn and T.J. Richardson discuss the generation and perception of depth in “autostereograms.” An autostereogram is a single 2-D image that contains information from which surface shape (depth) can be perceived. Liangyin Yu and Charles Dyer present a method that an “active observer” can use to recover 3-D surface shape from the projected deformation of stationary contours and markings on object surfaces.

Object recognition is the focus of the papers in the fourth section. Bob Hummel advances the view that matched filtering in the feature domain can be viewed as performing what we typically think of as pattern recognition or model-based vision. Michael Kelly and Martin Levine present an approach to extracting the location and approximate structural description of objects in the imaged scene. The paper by Kah-Kay Sung and Tommy Poggio describes some networks that can learn to recognize faces, or to find specific objects in cluttered scenes. Jake Aggarwal, J. Ghosh, D. Nair and I. Taha present a comparative study of three popular paradigms for object recognition: Bayesian statistics, artificial neural networks, and expert systems.

The fifth section consists of papers about some major applications areas of computer vision technologies. D. M. Gavril and Larry Davis describe a system that performs 3-D model-based tracking of unconstrained human motion. Ruzena Bajcsy and Hans-Hellmut Nagel examine the role of computer vision technology in formulating mobility tasks for indoor and outdoor robots. Ramesh Jain and Amarnath Gupta discuss the role of computer vision in visual information management for multimedia systems. Hanan Samet presents work on interior-based representations of objects in images aimed at answering geometric queries.

The final paper by Sandy Pentland is as much about the role of perception in intelligence as it is about computer vision specifically. In this paper, Pentland argues that progress in building computer vision systems is best made by “... creatively assembling 2-D image processing modules of the sort developed by Azriel Rosenfeld and other pioneers, rather than by developing exotic new mathematical formulations, detailed understanding of photometry, or using sophisticated 3-D representations.”

As an old Urdu poem goes, “... ask time the joys of being a traveler, for it has no destination but journeys day and night ...” – we are bound to witness more milestones of familiar research personalities reaching 65, 70 and beyond, only more frequently. We are happy about the ripening of the field that this means, and we look forward to many more opportunities to ruminate upon and take pride in the achievements of the likes of Azriel Rosenfeld.

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