Preface

It is gratifying to be able to offer the community at large the second edition of the *Handbook of Digital Image and Video Processing.* The response to the first edition was very positive in every way, reflecting on both the timeliness of the topic and the excellence of the contributions made by our many fine authors. More so than five years ago, digital visual information processing and communication pervade nearly every aspect of our daily experience, and have even invaded our pockets in the form of camera-equipped cell phones and PDAs. With many exciting frontiers still facing engineers on visual research, digital image and video processing remains a "hot" topic and promises to be one for a very long time.

As with the first edition, this *Handbook* is intended to serve as the basic reference point on image and video processing in the field, in the research laboratory, and in the classroom. The success of this goal both in the first edition, and (I expect) in this revision, is a testament to the exceptional effort made by all of the contributing authors, both those from the earlier volume who updated their chapters to reflect the many and significant changes that have occurred in the field over the last half-decade, as well as new authors that have written chapters on more recent innovations, techniques, and theories. As before, each and every chapter in this *Handbook* has been written by carefully selected, distinguished experts specializing in that topic, ensuring that the greatest depth of understanding be communicated to the reader.

As before, the *Handbook* covers introductory, intermediate, and advanced topics, serving equally well as a classroom textbook and reference resource. Indeed, many colleges and universities have adopted the *Handbook* as the textbook of choice for their image/video processing classes. Of course, the *Handbook* also offers the best available resource for researchers and developers in the laboratory, academia, or in the field. As a textbook, the *Handbook* offers easy-to-read material at different levels of presentation, including introductory and tutorial chapters on the most basic image processing techniques. Further, there is now included a chapter on image processing education which should prove invaluable for those developing or modifying their curricula.

The current edition of the *Handbook* retains the basic structure of ten major sections—now encompassing 73 chapters. Thus, the new edition is some 30% larger than the previous hefty volume! The Introduction is followed by Section II of the *Handbook,* which introduces the reader to the basic methods of gray-level and binary image processing, and to the essential tools of image Fourier analysis and linear convolution systems. This section now concludes with the aforementioned chapter on image processing education, which includes examples of educational libraries and visual datasets for image processing education. Section III covers basic methods for image and video recovery, including enhancement, restoration, and reconstruction. Section IV deals with the basic modeling and analysis of digital images and video, and includes chapters on wavelets, color, human visual modeling, segmentation, and edge detection. Two new chapters in this section are devoted to exciting new models for photographic images of natural scenes, and the important topic of tracking of motion in image sequences. Three more new chapters have been contributed on the rapidly expanding field of partial differential equations (PDEs) in image processing. Section V deals with image compression, including the JPEG and JPEG-2000 standards, and includes a new chapter on recovering images that have been distorted by compression. Section VI, on video compression, contains chapters on the various MPEG and H.26X video compression standards that have been considerably reworked, owing to repaid strides that have been made, as well as two new practical chapters on video transcoding and on embedded video coding, respectively. Section VII contains expanded presentation on the practical aspects of image and video acquisition, sampling, and interpolation. Section VIII contains a chapter on image quantization, halftoning, and printing, as well as two new chapters on the exciting and fast-changing topic of image quality assessment. Section IX is devoted to image and video databases, image storage, retrieval, and communication, including new chapters on wireless video and on visual cryptography. Finally, the *Handbook* concludes with Section X, eleven exciting chapters dealing with applications. These have been selected for their timely interest, as well as their illustrative power of how image processing and analysis can be effectively applied to problems of significant practical interest. Four new chapters now appear in this section concerning face recognition, iris recognition, audio-visual processing, and computer-assisted microscopy.

As editor and co-author of this second edition of the *Handbook,* I would like to thank the image processing community for recognizing the quality, effort, and care that has been made (by many) in creating such a successful and useful product. I would also like to thank the staff at Elsevier—especially the senior editor, Chuck Glaser, for his good humor, faith, and gentle encouragement as this project proceeded; Michael Troy for his excellent efforts in spearheading the accurate and rapid typesetting of the book; and of course Gary Ragaglia for his wonderful artwork in creating such an interesting and eye-catching cover for the *Handbook.*

Finally, I would again like to thank the many co-authors, both old and new, who have contributed such wonderful work to this *Handbook.* They have been models of professionalism, responsiveness, and patience with respect to my cheerleading, cajoling, and occasional bursts of temper. All in all, I am very happy both with the experience and with the end product of our efforts. I feel certain that this second edition of the *Handbook of Image and Video Processing* will continue as an essential and indispensable resource—at least until the next edition becomes necessary.

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