Introduction to the Special Section on Empirical Evaluation of Computer Vision Algorithms

P. Jonathon Phillips, *Member*, *IEEE,* and Kevin W. Bowyer, *Fellow*, *IEEE*

Computer vision emerged as a subfield in computer science and in electrical engineering in the 1960s. Two main motivations for research in computer vision are to develop algorithms to solve vision problems and to understand and model the human visual system. It turns out that finding satisfactory answers to either motivation is significantly harder than common wisdom initially assumed.

Research in computer vision has actively continued to the current time. Most of the research in the computer vision and pattern recognition community is focused on developing solutions to vision problems. With three decades of research behind current efforts and with the availability of powerful, inexpensive computers, there is a common belief that computer vision is poised to deliver reliable solutions. The area of empirical evaluation of computer vision algorithms is developing the methods and tools for measuring the ability of algorithms to meet requirements to be fielded, for determining the state-of-the-art, and for pointing out future research directions.

The goal of this special theme section of *IEEE Transactions on Pattern Analysis and Machine Intelligence* (PAMI) is to highlight progress in empirical evaluation and identify it as a maturing area of computer vision. Out of 18 submissions, three were accepted for this special section. In addition, one submission was accepted to appear in a regular issue, and two others are being revised for consideration as regular papers.

"Filtering for Supervised Texture Segmentation: A Comparative Study" by T. Randen and J.H. Husøy presents a comparative study of methods for texture classification. The emphasis of the study is filtering methods from signal processing. Most major filtering approaches are evaluated. For reference, a statistical algorithm and a model-based algorithm are also evaluated. The paper presents performance results on a number of mosaic texture images. In a first for PAMI, the raw image files for these images are being made available as part of the electronic version of the paper. (The electronic version of the paper is part of the Computer Society's digital library, accessible online at www.computer.org.) It is hoped that future papers on texture segmentation will take advantage of this in order to present directly comparable experimental results.

"Performance Evaluation and Analysis of Monocular Building Extraction From Aerial Imagery" by J.A. Shufelt evaluates end-to-end performance of four systems on their ability to extract buildings from 83 aerial images of 18 sites. The methodology allows for an examination of traditional assumptions made in designing algorithms that extract buildings from monocular imagery.

"Evaluation of Methods for Ridge and Valley Detection" by A.M. Lopez, F. Lumbreras, and J. Serrat evaluates ridge and valley detectors. The authors discuss what are desirable properties of ridge and valley detectors and the methods for measuring desirable properties. Then they present an evaluation using these methods.

We hope the papers in this special section are interesting and present challenges for future researchers.

P. Jonathon Phillips received his BS in mathematics and MS in electronic and computer engineering from George Mason University and his PhD in operations research from Rutgers University. Dr. Phillips is a leading technologist in the fields of computer vision, biometrics, and face recognition. At the National Institute of Standards and Technology (NIST), Dr. Phillips serves as project leader for the Visual Image Processing Group's face recognition project. Prior to joining NIST, he directed the Face Recognition Technology (FERET) program at the U.S. Army Research Laboratory. He developed and designed the FERET database collection and FERET evaluations, which are the de facto standards for the face recognition community. Dr. Phillips also has conducted research in face recognition, biomedical imaging, computational psychophysics, and autonomous target recognition. He was codirector of the NATO Advanced Study Institute on Face Recognition: From Theory to Applications, coorganizer of the *IEEE Workshop on Empirical Evaluation Methods for Computer Vision Algorithms*, and co-program chair of the *Second International Conference on Audio and Video-Based Biometric Authentication*. He has coedited two books. The first, *Face Recognition: From Theory to Applications*, was coedited with Harry Wechsler, Vicki Bruce, Francoise Fogelman-Soulie, and Thomas Huang. The second, *Empirical Evaluation Techniques in Computer Vision*, was coedited with Kevin Bowyer. His current research interests include computer vision, biometrics, face recognition algorithms, digital video processing, collecting video databases, developing methods for evaluating digital video algorithms, and computational psychophysics.

- *P.J. Phillips is with the National Institute of Standards and Technology, Building 225, Room A216, 100 Bureau Drive, Stop 8490, Gaithersburg, MD 20899. E-mail: jonathon@nist.gov.*
- *K.W. Bowyer is with the Department of Computer Science and Engineering, University of South Florida, 4202 E. Fowler Avenue, ENB 118, Tampa, FL 33620-5399. E-mail: kwb@bigpine.csee.usf.edu.*

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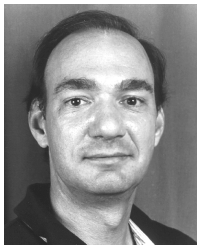

Kevin W. Bowyer completed his PhD in computer science at Duke University and is currently a professor in the Department of Computer Science and Engineering at the University of South Florida. Prior to joining the University of South Florida, Professor Bowyer was a member of the faculty of the Department of Computer Science at Duke University and then was a member of the faculty of the Institute for Informatics at the Swiss Federal Technical Institute (Zurich). Professor Bowyer's research interests are in the general areas of image understanding, pattern recognition, and medical image analysis. Professor Bowyer was elected as a Fellow of the IEEE in 1997. He served as General Chair for the 1994 *IEEE Computer Vision and Pattern Recognition Conference* and served as chair of the IEEE Computer Society Technical Committee on Pattern Analysis and Machine Intelligence from 1995 to 1997. Professor Bowyer is currently serving as Editor-in-Chief of *IEEE Transactions on Pattern Analysis and Machine Intelligence*. He recently completed a four-year term as North American Editor of the *Image and Vision Computing Journal*. In addition, Professor Bowyer is a member of the editorial boards of *Computer Vision and Image Understanding*, *Machine Vision & Applications*, and the In*ternational Journal of Pattern Recognition and Artificial Intelligence*. Professor Bowyer received an Outstanding Undergraduate Teaching Award from the University of South Florida's College of Engineering in 1991 and Teaching Incentive Program Awards in 1994 and in 1997.