Guest Editorial
Special Issue on Biometric Systems

BIOMETRICS has evolved into a scholarly scientific area with an increasing body of research works, as presented here, that address the myriad of issues related to automatically recognizing a person using distinguishing traits. From a technical viewpoint, biometrics spans various technologies, such as fingerprint and face recognition; mathematics and statistics; performance evaluation; integration and system design; integrity; and last, but not least, privacy and security. From a practical point of view, biometric systems are becoming reliable and are overcoming some of the limitations that plague the traditional means of positive personal identification. It is still a challenging task, however, to design automated biometric systems that handle large population identification with acceptable performance and reliability. This is a grand challenge for biometric systems, some of which are beginning to be either widely used or are under development for widespread use. There is a dichotomy between more established and newer biometric approaches. Some biometric technologies, such as fingerprint identification and speaker verification, are relatively mature and have drawn considerable attention over the last 40 years, both from a research and a development point of view. Other, less mature biometric technologies, such as recognition based on face, hand, palmprint, and iris, have brought much recent innovation and excitement and are starting to be successfully deployed in commercial systems.

In view of these developments, this special issue of IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C aims to provide an overview of the current important issues in biometrics research and to disseminate the latest innovative research results. The issue consists of eight regular articles selected from 39 submissions covering a wide range of current biometrics issues: statistics and learning, machine representations of biometric samples, multibiometrics, and detection of biometric liveness. In addition, five articles were accepted as short articles based on the peer review of 157 submissions to the International Conference on Biometric Authentication (Hong Kong 2004). These five articles cover other biometrics acquisition problems, such as illumination and real-time focusing. They are concerned with statistical techniques such as score normalization and multiclassifier approaches, plus a popular and intriguing biometric identifier, the iris. All these articles describe and discuss various approaches in-depth and explore innovative ideas to solve the many issues in biometrics.

The Guest Editors hope you will enjoy reading this special issue and find it useful. We further hope that this issue will become a standard reference for the biometrics state of the art in 2005.

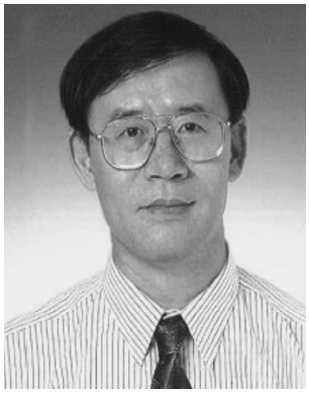
DAVID ZHANG, *Guest Editor*
Biometrics Research Centre
Department of Computing Hong Kong Polytechnic University
Hung Hom, Kowloon, Hong Kong

JOSEPH P. CAMPBELL, *Guest Editor*
MIT Lincoln Laboratory
Lexington, MA 02420-9185 USA

DAVIDE MALTONI, *Guest Editor*
Scienze dell'Informazione
Università di Bologna
Cesena (FO), Italy

RUUD M. BOLLE, *Guest Editor*
IBM T. J. Watson Research Center
Hawthorne, NY 10532 USA

Digital Object Identifier 10.1109/TSMCC.2005.848152



David Zhang (SM'95) graduated in computer science from Peking University in 1974. He received the M.S. and the Ph.D. degrees in computer science and engineering from the Harbin Institute of Technology (HIT) in 1983 and 1985, respectively. From 1986 to 1988, he was a Postdoctoral Fellow at Tsinghua University and then an Associate Professor at the Academia Sinica, Beijing. In 1994, he received his second Ph.D. degree in electrical and computer engineering from the University of Waterloo, Waterloo, ON, Canada.

He is currently with Hong Kong Polytechnic University, Hong Kong, China, where he is the Founding Director of the Biometrics Research Centre supported by the Hong Kong SAR Government. He also serves as Adjunct Professor in Tsinghua University, Shanghai Jiao Tong University, HIT, and University of Waterloo. His research interests include automated biometrics-based authentication, pattern recognition, and biometric technology and systems. He is the Founder and Editor-in-Chief, INTERNATIONAL JOURNAL OF IMAGE AND GRAPHICS; Book Editor, Kluwer International Series on Biometrics; Program Chair, the First International Conference on Biometrics Authentication; Associate Editor of more than 10 international journals, including IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PARTS A AND C and PATTERN RECOGNITION; and author of more than 130 journal papers and 35 books/book chapters.

As a principal investigator since 1980, he has brought to fruition many biometrics projects and won numerous prizes. In 2002, his Palmprint Identification System won a Silver Medal at the Seoul International Invention Fair, following that in 2003 by taking a Special Gold Award, a Gold Medal, and a Hong Kong Industry Award. He holds a number of patents in both the United States and China and is a current Croucher Senior Research Fellow.

Joseph P. Campbell (F'05) received the B.S., M.S., and Ph.D. degrees in electrical engineering from Rensselaer Polytechnic Institute, Troy, NY, in 1979, The Johns Hopkins University, Baltimore, MD, in 1986, and Oklahoma State University, Stillwater, in 1992, respectively.

He is currently a Senior Member of the Technical Staff at the Massachusetts Institute of Technology Lincoln Laboratory, Lexington, MA, in the Information Systems Technology Group, where he conducts speech-processing research and specializes in advanced speaker recognition methods. Dr. Campbell served 22 years at the National Security Agency (NSA). From 1991 to 1998, he was a Senior Scientist in NSA's Biometric Technology research group, where he led voice verification research. From 1994 to 1998, he chaired the Biometric Consortium, the U.S. Government's focal point for research, development, test, evaluation, and application of biometric-based personal identification and verification technology. From 1991 to 1999, he was an Associate Editor of the IEEE TRANSACTIONS ON SPEECH AND AUDIO PROCESSING. He was an IEEE Signal Processing Society Distinguished Lecturer in 2001. From 1991 to 2001, he taught Speech Processing at The Johns Hopkins University.

Dr. Campbell is currently a member of the IEEE Signal Processing Society's Board of Governors; a Coeditor of DIGITAL SIGNAL PROCESSING journal; a Cochair of the International Speech Communication Association's Speaker and Language Characterization Special Interest Group (ISCA SpLC SIG); a member of ISCA, the Acoustical Society of America, and Sigma Xi.

Davide Maltoni (M'05) is an Associate Professor in the Department of Electronics, Informatics and Systems (DEIS) at the University of Bologna, Cesena, Italy. He teaches "Computer Architectures" and "Pattern Recognition" at Computer Science, University of Bologna, Cesena. His area of research interests are pattern recognition and computer vision. Mainly, he is active in the field of Biometric Systems (fingerprint recognition, face recognition, hand recognition, performance evaluation of biometric systems). He is Codirector of the Biometric Systems Laboratory (BioLab), which is internationally known for its research and publications in the field. Several original techniques have been proposed by the BioLab team for fingerprint feature extraction, matching and classification, hand shape verification, face location, and performance evaluation of biometric systems. In particular, BioLab developed and published the first algorithm able to meet the FBI error requirements for automatic fingerprint classification and developed SFinGe, the first effective method for generating realistic synthetic fingerprint databases. Recently, in cooperation with Professors A. K. Jain and J. Wayman from Michigan State University, and San Josè University, respectively, BioLab organized the First, Second and Third International Competitions for Fingerprint Verification Algorithms (FVC2000, FVC2002, and FVC2004). He is coauthor of the *HANDBOOK OF FINGERPRINT RECOGNITION* (Springer, 2003).

Ruud M. Bolle (F'96) was born in Voorburg, the Netherlands. He received the bachelor's degree in analog electronics and the master's degree in electrical engineering, from Delft University, Delft, the Netherlands. He also received a master's degree in applied mathematics and the Ph.D. degree in electrical engineering from Brown University, Providence, RI.

In 1984, he joined the Department of Computer Science, IBM Thomas J. Watson, Hawthorne, NY, as a Research Staff Member. From 1988 to 2003, he was the Manager of the Exploratory Computer Vision Group, which is part of Security Research. Currently, his research is focused entirely on biometrics, such as large-scale search systems and performance analysis of biometric systems. In general, his research interests are in video processing, multimodal video databases, multimodal human–computer interaction and biometrics/security.

He is a fellow of the IAPR and a member of the IBM Academy of Technology. He coauthored the recently published *GUIDE TO BIOMETRICS* (Springer-Verlag).