
Preface

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Biographical notes: Qinghan Xiao received his BSc and MSc from the Department of Automation, Tsinghua University, Beijing, China, in 1982 and 1985 respectively, and his PhD from the Department of Computer Science, University of Regina, Canada, in 1994. Currently, he is a Defence Scientist at the Defence R&D Canada – Ottawa. His research interests include biometric and RFID technologies. He was a co-editor of the technical report for multi-biometric fusion, ISO/IEC TR 24722, published by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). Since 2008, he has served as the Chair of the Task Force on Biometrics, Intelligent Systems Applications Technical Committee of the IEEE Computational Intelligence Society. He is the recipient of the 2010 IEEE Ottawa Outstanding Engineer Award for his contributions to the area of biometrics.

James Benjamin Hutchinson is a Senior Director for MorphoTrust USA. His current focus is the development of biometric and identity technology for the US Intelligence Community and the US Department of Defense (DoD). He has held positions as a Technology Consultant for the US Army and the US

Department of State. He co-led the NATO team developing 'Study 4715 – NATO Biometrics Data, Interchange, Watch Listing, and Reporting Standard'. He served as an expert in the US National (INCITS/M1) and the International (ISO/IEC JTC 1/SC 37) Standards Bodies on Biometrics. He received his BA in International Economics (2000), his MA in French Language and Literature (2002) and his MA in International Affairs (2004) from the University of Kentucky, USA.

Wei-Yun Yau received his BEng degree from the National University of Singapore (1992), and MEng (1995) and PhD degrees (1999) from Nanyang Technological University. Currently, he is a Programme Manager at the Institute for Infocomm Research, A*STAR. He also serves as a member of the IAPR's Technical Committee on Biometrics and Chairman of IPTV Working Group and Biometrics Technical Committee, Singapore. He is the recipient of TEC Innovator Award 2002, Tan Kah Kee Young Inventors' Award 2003 (Merit), IES Prestigious Engineering Achievement Awards 2006 and Standards Council Distinguished Award 2007. His research interest includes biometrics, active vision system, and interactive TV and has published widely, with eight patents granted and over 100 publications. One of his papers received the Pattern Recognition Journal Honourable Mention 2010.

Mario Savastano received his Degree in Electronic Engineering from the Federico II University of Napoli, Italy in 1979. Since 1982, he has been with the National Research Council of Italy (CNR) and, currently, he is a Senior Researcher at the Institute of Bio-Structures and Bio-Images (CNR-IBB). He was one of the members of the Biometric Evaluation Methodology (BEM) Working Group and has been the Convener of the ISO/IEC JTC1 SC 37 'Biometrics' Working Group 6 'Cross-jurisdictional and Societal Aspects' since 2002. He was the scientific responsible of contracts signed by CNR-IBB with the Italian Ministry of the Defence in the area of high security access controls and has actively collaborated with the Italian Ministry of the Interior and of Justice. In 2008, he became one the members of the UK's Biometric Assurance Group (BAG).

In recent years, there has been increasing interest in using biometric technologies to recognise or verify the true identity of a person. Biometric systems are being developed by different vendors in many countries for various applications, such as access control, time and attendance tracking, voting registration, video surveillance, and e-passports. As with other emerging technologies that are rapidly developed, adopted, and implemented, it is necessary to standardise biometric technology to ensure the reliability, interoperability, usability, security, and scalability of biometric systems. Currently, six specific areas of biometric standards are addressed under the purview of International Organization for Standardization and the International Electrotechnical Commission, Joint Technical Committee 1, Subcommittee 37 (ISO/IEC/JTC 1/SC 37): biometric vocabulary, technical interfaces, data interchange formats, application profile standards, performance testing and reporting, and cross-jurisdictional and societal aspects. Much effort has been devoted to these standards and some of them are already established and well accepted by the industry. This special issue is targeted at a variety of audiences, including research scientists, system developers and policy makers, to familiarise them with the published biometric standards and significant drafts currently under development. The goal is to provide the reader with an opportunity to build a strong, fundamental understanding of biometric standards and, thus, to understand the

technology guidelines required to develop biometric systems with high maturity, interoperability, and scalability.

As the use of biometrics grows, it is critical that biometric products be developed based on open and internationally accepted standards. Because vendors come and go, a vendor's products may be replaced by another vendor using the next generation of technology. Biometric standardisation provides a foundation to develop interoperable, compatible, flexible, and updatable biometric products. The first article entitled 'Advances in biometric standardisation – addressing global requirements for interoperable biometrics' by Podio, Chair of the ISO/IEC JTC 1/SC 37 – Biometrics, describes the current status of biometric standards development activities including published standards and those currently under development. Examples are presented to demonstrate the critical role standards play in the adoption and successful implementation of biometric verification and identification applications.

Data interchangeability is one of the keys to enabling interoperable biometric applications across multiple vendors. Several standards have been developed to support data exchange either between data collection and backend matching systems, or between different systems, and agencies. The second paper entitled 'The ANSI/NIST-ITL standard update for 2011 (data format for the interchange of fingerprint, facial and other biometric information)' by Wing presents the American National Standards Institute/National Institute of Standards and Technology – Information Technology Laboratory (ANSI/NIST-ITL) standard. As it is designed to facilitate interoperability for biometric-related forensic data among law enforcement-related organisations, the ANSI/NIST-ITL standard is widely used in law enforcement, military, intelligence, border management, and homeland security applications.

There is currently a growing interest in using biometrics on smartcards since biometric technology provides an enhanced security, while match-on-card technology protects the user's privacy. However, due to the complexity of matching algorithms, it is difficult to implement the whole match process on a low-cost smartcard. Chen et al. describe the methodology for biometric matching on smartcard as described in the standard ISO/IEC 24787 and propose an algorithm to solve this challenge in their paper 'ISO/IEC standards for on-card biometric comparison', which divides the fingerprint match process into two separate sections: off-card alignment and on-card comparison. Based on their proposed algorithm, the authors have built a prototype using Java Card Development Kit 2.1 and have tested it with the Fingerprint Verification Competition (FVC) 2000 and 2002 databases. Experimental results demonstrate that the accuracy and time performance of the prototype are comparable to a fingerprint matcher executed on a personal computer with floating point unit.

Since most applications store biometric templates in a central database, but not on smartcards, template security becomes a critical issue in such applications. Various template protection techniques have been proposed to protect the biometric template, which can be categorised into two groups: biometric cryptosystem and cancelable biometrics. Isobe et al. contribute the fourth article 'Security performance evaluation for biometric template protection techniques' to illustrate the International Telecommunication Union-Telecommunication Standardization Sector (ITU-T) Study Group 17 Question 9: Telebiometrics, which provides a general guideline for testing and reporting the performance of biometric template protection techniques based on biometric cryptosystems and cancelable biometrics.

Conformance testing is a method that is used to validate whether a product is in compliance with a set of standards or conforms to the specified requirements from these standards. Biometrics end-users benefit greatly from conformance testing because biometric devices made by different vendors that pass the conformance testing have a higher likelihood of being interoperable. The fifth paper, ‘Automated conformance testing for ISO/IEC 19794-5 Standard on facial photo specifications’, by Nguyen et al. proposes a set of metrics for quantitative conformance testing on face image data. It is worth emphasising that not only does this paper describe the algorithms used to extract facial features for conformance testing, but it also provides detailed explanations on how these features are calculated.

When adopting biometric technology, a key consideration is the biometric system’s performance and its potential matching error rates. The last paper entitled ‘Multi-purpose biometric performance grading scheme’ by Lazarick describes the ISO/IEC 19795-5:2011 standard that is used for evaluating and assigning grade levels to the performance metrics of the biometric portion of an access control system. The objective is to provide product suppliers, regulators, system owners, and evaluation teams with adequate, implementable, and unbiased test procedures.

The special issue guest editors would like to express their thanks and appreciation to Editor-in-Chief Prof. Khalid Saeed and Associate Editor Dr. Jiancheng (Kevin) Jia, for their encouraging words and guidance throughout the course of the special issue preparation. The papers forming this special issue include published and ongoing significant biometric standards to provide the readers with an opportunity to build a strong, fundamental understanding of biometric standards and, thus, to find technology guidelines in developing biometric systems with high maturity, interoperability, and scalability. It is our hope that after reading this special issue, readers will learn the most important and current aspects in biometric standardisation, therefore, chose the right guidelines in their work to develop high maturity, interoperable, and scalable biometric systems.

Testimonials

“Biometric standards provide a level of consistency that makes them the cornerstone for interoperability and data sharing. Standards allow the Department of Defense to interconnect with multiple and unique databases from other U.S. Government agencies such as the Federal Bureau of Investigation and Department of Homeland Security. By doing so, we greatly enhance the ability of warfighters, law enforcement and criminal justice entities to fight crime and terrorism and to protect our citizens throughout the nation and the world.”

Dr. Thomas Killion,
Director, Biometrics Identity Management Agency (BIMA)

“This special issue will be the first collection of research papers that are authored and edited by a group of top experts on biometrics standardization in international journals. The issue provides update information and current status on the research of standardization of biometrics and will be a very voluble source and first-hand reference for the academic researchers, engineers, managers, and corporation and government policy makers.”

Dr. Kevin Jia,
Associate Editor of *IJBM*