

# Preface

Biometrics is the science of recognizing individuals on the basis of their physical (such as face, fingerprint, and iris) or behavioural traits (such as voice and gait). It holds a lot of promise over traditional password-based systems, such as PIN and password, therefore revolutionizing the way authentication is done. Biometric applications include border crossing, national civil registry, smartphone security, mobile payment and access to restricted facilities.

Continual improvements in accuracy, transaction speed, affordability of biometric systems and technologies have increased their ease of use and cost-effectiveness. While biometric technology continues to be adopted, an intrinsic characteristic of the technology is that system error rate simply cannot attain absolute zero in real-world applications. The main cause for mismatch errors is the variable acquisition conditions in semi- and uncontrolled environments, due to changes in pose, illumination, human–sensor interactions, occlusions, expressions, ageing, etc.

In addition to complex operational environments that change over time, biometric systems are typically designed a priori using limited and unbalanced data and without any knowledge of underlying data distributions. Therefore, biometric models may be often poor representatives of the biometric trait to be recognized, and should be adapted over time in response to new or changing input features, quality of the input data samples, change in sensor/matching algorithm and environments. Several innovative techniques have recently emerged to adapt the biometric system over time. These systems are collectively termed as *adaptive biometric systems*.

Recently, adaptive biometrics has gained much attention from the research community, and is expected to continue this momentum because of its key promulgated features. First, with this system, one no longer needs to collect a large number of biometric samples during enrollment. Second, it is no longer necessary to re-enroll or re-design the biometric system (classifier) from scratch in order to cope up with changing environments. This convenience can significantly reduce the cost of maintaining a biometric system. Third, the actual observed intraclass

variations like aging can be incorporated into the system. In fact, biometric vendors such as BIOsingle (fingerprint) and Recogsys (hand geometry) have incorporated the automated adaptation mechanism into their technologies. However, there are many challenges and research issues to be solved such as the possibility of corruption of biometric models or template galleries with impostor intrusion due to the overlap in their respective genuine and impostor score distribution, the informative patterns, the stopping criteria of adaptive biometric system, etc.

Overall, this book aims to present a clear understanding of, recent advances and challenges to promote the field of adaptive biometric systems. Further, this book is a collection of numerous techniques to biometric system adaptation under unified taxonomy. Furthermore, adaptation procedures specified in this field are applicable to any pattern recognition system. This book is suitable for final-year undergraduate students, postgraduate students, engineers, researchers and academicians in the field of computer engineering who are engaged in various disciplines of system sciences, information security and identity businesses. We are indebted to a number of individuals in academic circles who have contributed in different, but important, ways to the preparation of this book. In particular, we would like to extend our appreciation to Arun Ross, Walter Scheirer, Reza Derakhshani, Massimo Tistarelli, Phalguni Gupta, Aurobindo Chatterjee, Gian Luca Marcialis, Norman Poh, Vinay Budhraja, Vijeta Rattani, Zahid Akhtar, Hunny Mehrotra, Davide Ariu, Biagio Freni and Ruggero Donida Labati. The objective of this book is also to engage researchers from academia and industry on the state-of-the-art biometric research and technology, and the potential problems in real applications.

Adaptive Biometric Systems

Recent Advances and Challenges

Rattani, A.; Roli, F.; Granger, E. (Eds.)

2015, X, 134 p. 44 illus., 24 illus. in color., Hardcover

ISBN: 978-3-319-24863-9