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Preface

Person authentication is a crucial element of unattended services. It has a natural social dimension that defines as well as challenges privacy matters. With the increase in mobile communication, a significant growth in the demand for personal services to people on the move is observable. The number of citizens utilising such services on the Internet has been on the increase in proportion to the growth of e-commerce, e-health care, and e-government. The demand for versatile authentication is driven by not only consumers but also goods and service providers. Due to the increased reliance on authentication, the shortcomings associated with password based protection systems constitute a growing threat to the information society. Thus, biometric person authentication offers a more effective solution, in use alone or in conjunction with passwords.

Biometric authentication in dynamic environments is a challenging problem that requires significant computation and communication resources. Despite the bursting of the financial tech-bubble, the merging of communication and information technology is proceeding at an impressive pace. As with Moore's law, the research community and the industry continue to deliver mobile devices with ever increasing Baud, Mbyte and Mflop capacity per gram, making the use of technology intensive biometric applications more widely accessible.

Because of increased use of mobile technology, authentication of an individual must be performed in ever changing environments and conditions. Thus, the versatility of a biometric modality (e.g. face, fingerprint) is just as important as its false

acceptance and false rejection characteristics. In this respect, multi-modal biometrics offer more versatility whilst affording increased resilience to attack. The down side is that it requires more resources in the form of sensors, computation, storage and communication. For this reason, in this special issue, we present papers dedicated to the exploration of system issues as well as papers discussing crucial aspects of multi-modal biometrics. Static image based modalities are represented by papers dedicated to recognition of faces, fingerprints, and hand geometry, while biometric modalities relying on time-varying signals are represented by papers describing gait and speech based authentication.

The featured papers are extended versions of contributions to the 3rd International Conference on Audio and Video based Biometric Person Authentication (AVBPA 2001, Halmstad, Sweden). They were selected for inclusion in this special issue by voting of conference attendants, and have undergone the usual review process of Pattern Recognition Letters. We present the contributions in the following groupings and order:

I. *System characteristics*. The paper entitled "Biometrics break-ins and band-aids" by Ratha et al. offers a taxonomy of the threats to biometric systems and quantifies some of the relevant issues by means of a fingerprint system. The paper "Information fusion in biometrics" by Ross et al. offers a study of a multi-modal system based on fingerprints, hand geometry and face recognition.

II. *Fingerprint and hand*. The paper "A robust two step approach for fingerprint identification", by Tan and Bhanu proposes a minutiae triplet

based search strategy to reduce the potential matches in one to many searches of fingerprint databases. The related problem of fingerprint alignment is addressed in the paper “Localization of corresponding points in fingerprints by complex filtering” by Nilsson and Bigun, which suggests an estimation of global translation and rotation parameters between two imprints by use of complex filtering. Finally, the paper “Combining implicit polynomials and geometric features for hand recognition” by Oden et al. presents a novel approach to hand geometry based biometric authentication.

III. *Face*. The contribution “Face recognition using independent component analysis and support vector machines” by Deniz et al. presents experimental results comparing the computationally costly ICA features with the cheaper PCA when SVM is used as a classifier. The paper entitled “Using mixture covariance matrices to improve face and facial expression recognition” by Thomaz et al. points out that group covariance matrices in high dimensional feature spaces, as used by biometric face authentication, are severely

rank deficient, such that the inverse of the matrices, used in discriminating the clients, does not exist. The authors suggest the use of a weighted sum of the sample covariance and the total sample covariance so as to avoid singularity. Quantitative results on face features are presented.

IV. *Voice and gait dynamics*. The paper “Improving speaker identification in noise by sub-band processing and decision fusion” by Dampier and Higgins investigates speaker identification in the presence of narrow band noise via HMM experts trained on sub-bands. The contribution “Automatic gait recognition by symmetry analysis” by Hayfron-Acquah et al. suggests at the first stage the use of optical flow on silhouette frames. In the following stage a symmetry measure is extracted and Fourier transformed over a gait cycle in order to represent the personal biometrics inherent in gait.

Guest Editors

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