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Advanced Studies in Biometrics

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Revised Selected Lectures and Papers

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Preface to the Lectures Book of the 1st Summer School for Advanced Studies on Biometrics 2003

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The ability to automatically recognize an individual has increasingly been acknowledged as a significant step in many application domains. In the last decade, several recognition and identification systems based on biometric measurements have been proposed. Many different biological signals have been utilized: fingerprints, face and facial features, retinal scans, iris patterns, hand geometry, DNA traces, and gait, and others. Not only have research tools been developed, but a notable number of new applications have been observed, making studies on biometrics a very stimulating but also a challenging arena.

All these issues pushed us to organize the 1st Summer School on Biometrics, which addressed the two facets of personal identity authentication: verification and identification. The school not only stressed the different techniques involved in the two processes, but also provided an in-depth roadmap on the algorithmic and technological issues involved in the development and integration of biometric systems.

This special LNCS volume offers the efforts and major achievements of both the school lecturers and some of the most outstanding students in the classes. The papers present different biometric authentication techniques in an attempt to provide a comprehensive selection of state-of-the-art methods used to address applications demanding robust solutions.

The volume is divided into two parts. The first part, composed of seven papers, covers a selection of the lectures given at the school classes, while the second part contains the four best contributions of the students.

In Part I, the first paper, by Bigun et al., covers a topic expected to alleviate concerns on performance and convenience, a combination of several sensing modalities or multimodal biometrics. The lecture discusses major issues involved in multi-biometrics to improve machine recognition performance while it exposes some recent findings on the human ability in person recognition. The second and third papers, by Boyd and Little, and Maltoni, respectively, address two specific biometric modalities: gait and fingerprint recognition. These papers describe two classical examples of behavioral (gait recognition) and physiological (fingerprint recognition) biometric modalities. The paper by Boyd and Little presents the psychophysics of gait recognition and different computational models to process image sequences to extract dynamic information for recognition. The paper by Maltoni is a comprehensive tutorial on fingerprint recognition, describing in detail all relevant issues in data acquisition and processing, including the latest advances in the state of the art. The fourth paper, by Tistarelli et al., analyzes the biological motivations for face-based

authentication. The lecture, while exploring the psychophysics of human vision relevant to person authentication, highlights several biologically inspired processes to improve automatic face-based recognition. The application of statistical classifiers and the learning theory for robust biometric authentication are discussed in the fifth paper, by Verri et al. The application of support vector machines, firstly proposed by V. Vapnik, to biometric authentication and recognition is fully described. The sixth paper, by Yeshurun and Dganit, describes an exciting methodology and practice when using hand recognition. This contribution is well coupled with the last paper in this part, by Cipolla et al., which describes an interesting methodology to detect and track human gestures. A remarkable difference from other approaches is the use of 3D rather than 2D information for hand tracking and gesture recognition.

The presentations from the students, which we found to deserve further attention from the scientific community, were chosen to be included In Part II. The first student paper, by Castellani et al., introduces an interesting technique to exploit 3D stereoscopic data for face recognition. On a similar topic is the last paper in this section, by Conde et al.; in this case the influence of feature localization accuracy for classification is addressed. The second paper, by Gokberk et al., applies genetic algorithms to drive the feature extraction process. The proposed model is applied to a set of facial features extracted from Gabor filtered images. The paper by Campadelli and Lanzarotti, the third in this part, describes a novel method for face recognition based on elastic bunch graph matching. Differently from other approaches the set of features (jets vector) is extracted automatically from gray level and color images.

Last but not least, we wish to thank all lecturers and students and others who actively cooperated to make this event. We hope that the school contributed to the dissemination of state of the art in biometrics, as well as to advanced studies of it.

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