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A new biometric database based on corneal topography

Nassima Kihal¹, Isabelle Brunette² and Jean Meunier¹

¹University of Montreal, Canada

²Maisonneuve-Rosemont Hospital, Canada

Biometrics offers a natural and reliable solution to certain aspects of identity management with fully automated or semi-automated schemes to recognize individuals based on their inherent physical and/or behavioral characteristics including fingerprint, face, voice, iris, signature, hand and ear. Our goal is to use cornea as a new biometric trait for identity authentication by modeling it in 3D geometry. For this reason, we propose to start with the realization of a new corneal biometric database. The acquisition of the cornea is carried out by a Pentacam Topographer (Oculus). The Pentacam measurement process takes less than two seconds and minute eye movements are captured and corrected simultaneously. By measuring 25,000 true elevation points, precise representation, repeatability and analysis are guaranteed. These data points are then used to generate corneal maps used for diagnosis and treatment. Our database contains 344 corneal topographies captured from 43 different people of different ages using a both eyes. For each eye, we captured two sessions of corneal topography. The time interval between the two sessions was equal or greater than one month. In each session, 8 corneal topographies (4 left eyes and 4 right eyes) were captured. These multiple measurements are useful to assess repeatability, performance, collectability, etc. The corneal shape was recorded as a uniformly spaced (X-Y) grid (image) of raw elevations (Z). This elevation can be represented with an appropriate mathematical model such as a Zernike polynomial expansion. The model parameters (e.g., Zernike coefficients) can then be post-processed (e.g., with linear discriminant analysis LDA) to become a 'signature' or 'template' of the cornea. Our proposed database was tested for person recognition in a preliminary study and gave an impressive equal error rate of less than 1%.

Biography

Nassima Kihal is a PhD student at the University Beb Ezzouar of Algeria and Research Intern at the University of Montreal. She has a particular interest in New Biometric data and multimodal biometric system for person recognition.

kihalnassima@gmail.com

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