

AB081. Multi-unit ocular biometric system based on corneal shapes

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Background: Our goal is to build a multi-unit ocular biometric system based on the fusion of left and right corneal shapes for identity authentication.

Methods: Ocular biometrics such as iris, periocular, retina, sclera and eye movement have become established biometric traits, primarily due to extensive efforts made by the biometrics community in the field of iris recognition. In this work, we propose an ocular biometric trait based on the 3D shape of the cornea to improve biometric authentication. We show how the fusion of the left and right corneas can be used as a biometric trait for person recognition. First, we started by realizing our own cornea database by using a Pentacam Topographer (Oculus) which contains 288 corneal topographies of both eyes captured from 36 different people of different ages. For each eye, data acquisition was done during two different sessions to establish the repeatability of the measurements over time. The time interval between the two sessions was equal or greater than one month. In each session; 8 acquisitions (4 left eyes and 4 right eyes) were taken. Then, features were extracted by modeling the shape of the left and right corneas with a Zernike polynomial expansion. The fusion of the left and right shapes of cornea was performed at the matching score level using the weighted-sum rule.

Results: For each individual, we had eight feature vectors (eight measures in two sessions) of size 36 (Zernike polynomial coefficients) from their corneal topographies. The experimental results on our cornea database constructed for this study showed encouraging performance of the proposed ocular biometric system with Equal Error Rate decreasing to 1.38% with the weighted-sum rule compared to the analysis of the left (4.5%) or right (3.7%) cornea alone.

Conclusions: The objective of this work was to investigate corneal topography as an accurate biometric modality using shape discriminating features. Our idea was to propose an ocular multi-unit system based on the fusion of the left and right corneal shapes. The corneal feature extraction was done by Zernike polynomial decomposition. Multi-unit cornea fusion was performed at the matching score level to generate a unique score. This allowed a significative decrease of the EER to 1.38%.

Keywords: Ocular biometric; left cornea; right cornea; fusion; multi-unit system

doi: 10.21037/aes.2018.AB081

Cite this abstract as: Kihal N, Brunette I, Meunier J. Multi-unit ocular biometric system based on corneal shapes. *Ann Eye Sci* 2018;3:AB081.