A Robust Pre-Processing Algorithm for Iris Segmentation From Low Contrast Eye Images

Badejo, J.A.[a], Atayero, A.A.[a], Ibiyemi, T.S.[b]

[a]Department of Electrical and Information Engineering, Covenant University, Ota, Nigeria

[b]Department of Electrical Engineering, University of Ilorin, Ilorin, Nigeria

{joke.badejo, atayero}@covenantuniversity.edu.ng, ibiyemits@yahoo.com

Abstract

Iris recognition systems offer highly accurate personal identification both on small and very-large scale systems needed in government, forensic and commercial applications. The automatic segmentation of a noise-free iris region is imperative for optimal performance of the system. However, image characteristics such as brightness and contrast, the differing levels of pigmentation, occlusion by eyelashes and/or eyelids, coupled with varying sensor and environmental conditions, makes iris segmentation a huge and difficult task. This paper proposes an image pre-processing algorithm for robust iris segmentation of low contrast images, aimed at reducing mis-localization errors of basic curve-fitting algorithms. Similar to face detection, the algorithm performs iris detection with a k-NN classifier trained with features extracted by a rotation-invariant texture descriptor based on the co-occurrence of local binary patterns. The integration of the proposed algorithm into an existing open-source iris segmentation module offered a 40% improvement in execution time; a segmentation accuracy of 92% was also recorded over 1,898 low contrast eye images acquired from African subjects. The low contrast eye images were acquired to support diversity in iris recognition.

Keywords—Iris Detection; Iris Dataset; Iris Segmentation; Pattern Recognition; Local Binary Patterns; Texture Descriptor.