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Iris Localization and Segmentation for Less Constrained and Non Ideal Iris Images

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Abstract – Recognition of iris is one of the fastest identity verification systems. The accuracy of the iris recognition system is also better in comparison of other biometric traits like fingerprint, voice, hand etc. Because of its increased accuracy and uniqueness, it is used in areas which are very security sensitive, medical field, industrial area. The most important process in iris recognition is iris localization because it extracts part of iris which is valid. Iris images are often acquired under less constrained environment which includes near infrared illumination, bad lightning conditions, reflection. The images captured also have noise due to eyelids, eyelashes, eyeglasses. This creates the problem in iris localization and hence decreases accuracy. The goal of this paper is to discuss the literature of recently proposed methods in iris localization and also to compare the performance of these techniques.

Keywords: Iris localization, less constrained environment, non-ideal data, accuracy in pupil and iris localization, a comparison in performance evaluation of different methods.

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I. INTRODUCTION

Reliable recognition of individuals is required at public [1] and government sectors; for example; airports, medical field, border areas. Biometrics tends to accurately recognize each person using physiological or behavioral characteristics [5] which include face, fingerprints, iris, retina, speech recognition. Choice of a feature for biometrics is crucial. There are several elements that can make an impact on this choice which is uniqueness, universality, social acceptance. In this context, the stability and accuracy [14] of iris recognition makes it the most important biometric trait. Every Iris is perfectly distinctive. Even an individual's right and the left iris is different. Another important factor is the stability of iris. Other biometric traits such as fingerprint, facial recognition, hand geometry changes over time. Iris is a thin circle that stretches across the eye's interior portion. The initial stage is iris segmentation which deals with localizing the iris inner and outer borders. The framework from capturing the iris image to its matching is represented in Figure 1. Highly accurate and stable iris recognition requires capturing the image under constrained environment [1]. Full cooperation of the subject is also required. Capturing the image under constrained environment works in a controlled way, such as subject is very close to the camera, wearing no sunglasses [10] or contact lens and also directly sees into the camera. Non ideal data is captured in an unconstrained environment which contains noisy images due to heavy iris occlusions by blurring, non-uniform illumination, low contrast, eyelids, eyelashes, glass and contact lens. As a result, localization of iris is a challenging task as any inaccuracy can affect the performance of iris recognition.

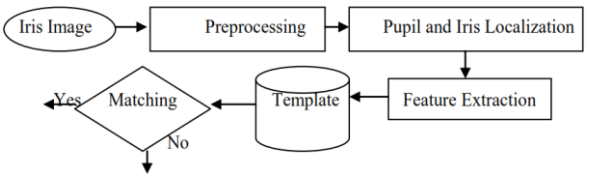

Figure 1 Framework of Iris recognition

Daugman's [2,3] and Wildes' [14] proposed iris recognition methods under constrained environment and for ideal images. Iris localization was based on integro-differential operator technique and circular hough transform. In the next step, the localized iris part was translated into the polar coordinate system. This is called normalization. Based on the extraction of features, approaches used in iris recognition can be separated into three classes: Phase based methods, Zero crossing method and Texture analysis based method. Final stage involves matching between iris image which is normalized and the iris stored in the template, producing dissimilarity value. If there is no match, the image belongs to different subject [10] otherwise if there is a match then both images belong to the same person.