Review on Iris Recognition System

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***Abstract*- Automatic identification of an individual based on a robust authentication biometric system is iris [1]. Iris is one of among all the biometrics which are possess unique features & characteristics of individual physiology and does not change with age. In Iris biometric system, firstly, a sample of features of an individual through a camera is taken for iris recognition. Then sample are pre-processed and some form of mathematical operations has to be done on samples to transform it in a template. The templates are normalized pre-processed form of sample. The biometric template possess high single out features, which are discriminate, it to other template and compare with other template to decide identity.**

***Keywords*: Biometrics, Identification, Iris, Rotational**

I. INTRODUCTION

Recently, iris recognition is becoming one of the most important biometrics used in recognition when imaging can be done at distances of less than 205 Centimeters or 80 inches. This importance is due to its high reliability for personal identification for human. Iris has great mathematical advantage that its pattern variability among different persons is enormous, because iris patterns possess a high degree of randomness [2]. In addition, iris is very stable over time. Since the concept of automated iris recognition was proposed in 1987, many researchers worked in this rang and proposed many powerful algorithms. These algorithms were based on the texture variations of the iris and can be divided into many approaches, phase based methods, texture analysis, zero-crossing Representation, and intensity variations. The most relevant algorithms and widely used in current real applications are the algorithms developed by Daugman.

There are many commercial iris capture systems capture images of the iris using near-infrared illumination, such as the LG 2200 and LG 4000. Most systems in use today need explicit user cooperation, requiring that the user is positioned correctly to acquire a high-quality image. These systems provide auditory feedback to the user to ensure that they are properly positioned for image acquisition [3]. In the United Kingdom, the Iris Recognition
Immigration System (IRIS) is a voluntary system that allows travelers to pass through border control stations at several airports, railway quickly, checking their identify using automated ―barriers. CANPASS in Canada is a similar program to allow frequent travelers to quickly move through security checkpoints at airports.

Fig1. Iris image from a sensor

It is very interesting to note that in fingerprint recognition task, It is not a ridge and furrows which are used to distinguished the fingerprint but the known as minutia is used for distinguish the fingerprints. Minutia can be considered as some abnormal points of the ridges.

II. IRIS RECOGNITION METHODS

Although there are many proposed iris recognition systems all of them approximately share the following main stages: iris Segmentation feature extraction iris normalization and feature comparison as shown in Figure 2.

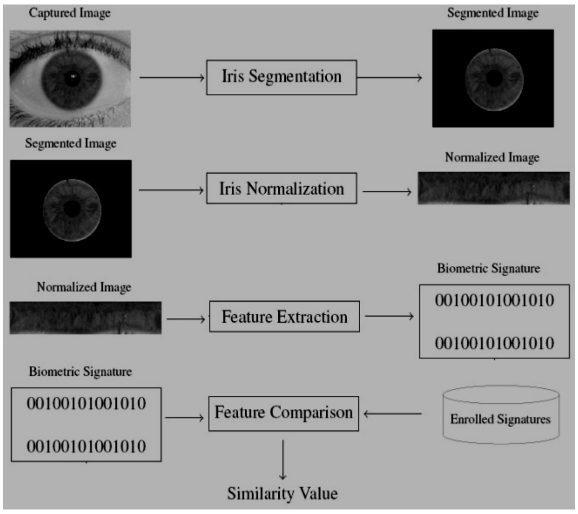

Fig 2: Verification vs Identification

1. Daugman's Method

Daugman's 1994 patent described an operational iris recognition system in some detail. In 2004 his new paper said that image acquisition should use near-infrared illumination so that the illumination could be controlled [3].

2. Wildes' Method

It was Wildes [11] described an iris biometrics system uses different techniques from that of Daugman. To accomplish iris segmentation Wildes used a gradient based binary edge map construction followed by circular Hough transform. This method became the most common method in iris segmentation many researchers later proposed new algorithms depend on this method.

Wildes [11] applied a Laplacian of Gaussian filter at multiple scales to produce a template and compute the normalized correlation as a similarity measure after normalizing the segmented iris. He used an image registration technique to compensate scaling and rotation then isotropic band-pass decomposition is proposed derived from application of Laplacian of Gaussian filters to the image data. In the Comparison stage a procedure based on the normalized correlation between both iris signatures is used. Although Daugman's system is simpler than Wildes' system Wildes' system has a less intrusive light source designed to eliminate specular reflections. Wildes' approach is expected to be more stable to noise perturbations; it makes less use of available information due to binary edge abstraction therefore might be less sensitive to some details. Also Wildes'approach encompassed eyelid detection and localization [12].

3. Key Local Variations Method

Li Ma Tieniu Tan Yunhong Wang and Dexin Zhang proposed a new algorithm for iris recognition by characterizing key local variations. Basic idea is that local sharp variation points noting the appearing or vanishing of an important image structure is utilized to represent the characteristics of the iris. First the background in the iris image is removed by localizing the iris by roughly determine the iris region in the original image and then use edge detection and Hough transform[11] to exactly compute the parameters of the two circles in the determined region. In order to achieve invariance to translation and scale the annular iris region is normalized to a rectangular block of a fixed size using the methods in. Then lighting correction and image enhancement is applied to handle the low contrast and non-uniform brightness caused by the position of light sources. Figure 3 shows the stages of segmentation and normalization.

III. LITERATURE REVIEW

Most researchers study causes of texture distortion which distort the texture appearance but just a few work in analyzing the iris code bits and determining which are the best bits or inconsistent bits. Papers in this topic are very few and there are only six papers until the writing of this thesis. In this section the previous work in analyzing iris codes is viewed.

K. Hollingsworth K. Bowyer and P. Flynn Studies on Iris Code The first published [16] work studied the consistency of the different bits in an iris code is the paper of K. Hollingsworth K. Bowyer and P. Flynn. Their experiments proved the existence of fragile bits. They found that all subjects had three different regions apparent in their iris code areas consistently equal to 0 areas consistently equal to 1 and inconsistent areas. The inconsistent areas tend to occur at the boundaries between regions of zeros and regions of ones. If a bit was equal to one the majority of the time but was equal to zero 30% of time then they said that the bit ―flipped‖ in 30% of the iris codes. And if a bit was zero the majority of the time but one for 30% of the time they still said that the bit ―flipped‖ in 30% of the iris codes. In their study they found that on average 15.99% of the bits in an iris code were perfectly consistent; that is 15.99% of the unmasked bits were always equal to 1 or always equal to 0 for all iris code for an iris. Subject with the smallest fraction had 4.74% of the bits perfectly consistent and the subject with the largest fraction had 33.9% of the bits perfectly consistent. Also they found that no gender appears to be difference in the consistency of iris code bits.

S. Ring and K. Bowyer detection method of Iris Texture Distortions S. Ring and K. Bowyer assumed that some local distortions [11] of the iris texture are not detected to the segmentation stage and that these generate corresponding regions of local distortion in the iris code derived from the image. So they introduced an approach to detect such region of local distortion in the iris code through analysis of the iris code matching results. Unlike existing approaches to detecting local distortions in the iris texture focus on analysis of the iris image. In contrast their approach to detecting local distortions to the iris texture in images of the same iris focuses on analysis of the iris code matching these results. This approach has the advantage of making only the most general assumption about the cause of the local distortion in the iris texture also this approach can be applied independently of and in combination with any improved iris segmentation algorithm. It's the first work that attempts to detect distortions of iris texture through analyzing the iris code matching results.

Minimize the Number of Iris Code Bits Needed for Iris Recognition

G. Dozier[14] K. Frederiksen, D. Hopes, R. Meeks, M. Savvides, K. Bryant, and T. Munemoto use the concept of fragile bits and demonstrated how the concepts of bit inconsistency and genetic search can be used to minimize number of iris code bits needed for iris recognition. In addition they compare two systems: GRIT-I (genetically refined iris templates I) and GRIT-II. Their results show that GRIT-I (by evolving the bit mask of iris templates) was able to reduce the number of iris code bits needed by approximately 30% on average. GRIT-II by contrast optimizes the bit mask as well as the iris code bits that have 100% consistency and 100% coverage with respect to the training set. GRIT-II was able to reduce the number of iris code bits needed by approximately 89%.

IV. CONCLUSION

This research proposes new algorithms to solve two problems in iris recognition system, segmenting irises in non-ideal environments and pupil dilation. At the last, the bits of the iris code are analyzed. First, a new effective and fast segmentation algorithm is proposed to segment the non-ideal iris images captured with less constraining imaging conditions which will generate several types of noises, such as iris obstructions.

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