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Research and Implementation of Iris Biometric Authentication System

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***Abstract*—The new developments of information technology and the growing necessity for security have resulted in a rapid development of intellectual personal identification based on biometrics. Iris recognition usually contains iris segmentation, feature extraction and matching. The planned algorithm firstly uses the shared technique of wavelet analysis and comparison of circle to identify iris inner edge. Then, the circular detection operative method is practical to classify iris outer edge. The experimental images are providing by the CASIA iris database. The experimental results show the usefulness and accuracy of the proposed algorithm. Also the speed and the perfection of iris recognition and identification are improved. The proposed algorithm provides a new way for iris recognition.**

***Index Terms*—CASIA Iris database, Biometric, Iris Authentication, Image processing, Wavelets.**

I. INTRODUCTION

Iris with rich texture is highly unique, and is a very promising biometric identification method. The key steps of iris recognition technology are iris location and feature extraction. This paper presents the method of wavelet analysis combined with the comparison of a circle for the iris inner edge of iris and pupil location. And the outer edge location uses the circle detection operator method. Based on the precise iris location, according to the characteristics of the wavelet packet decomposition with the ability of analyzing the signal high-frequency detail information, the method of the wavelet packet decomposition is applied to extract the iris feature vectors. Iris location algorithm is to find the centers and radiuses of iris and pupil in the human eye image and split the iris image for the subsequent feature extraction algorithm.

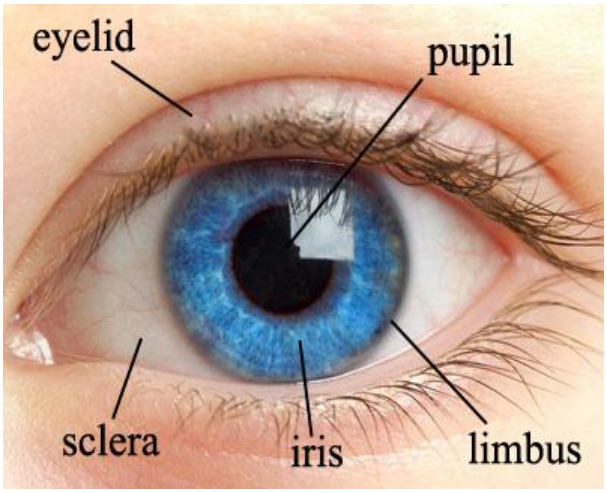

Fig.1. Structure of iris

The recent progresses of information technology and the growing requirement for safety have resulted in a rapid development of intelligent personal identification based on biometrics. Physiological or behavioral characteristics unique to an individual are called biometric measurement (such as fingerprints or voiceprints) which has the capability to reliably distinguish between an authorized person and an imposter. Generally, physiological and behavioral characteristics used in biometrics include the following: facial features and thermal emissions, retina, iris, gait, voiceprint, gesture, fingerprints, palm-prints, handwritten signature, hand geometry etc. These biometric measurements provide a robust approach to a wide range of presentations such as uniqueness verification and contact control. Of all these patterns, fingerprint identification has received considerable attention over the last 25 years. Face recognition and speaker recognition have also been studied widely, whereas iris recognition is a more recent method for personal identification.

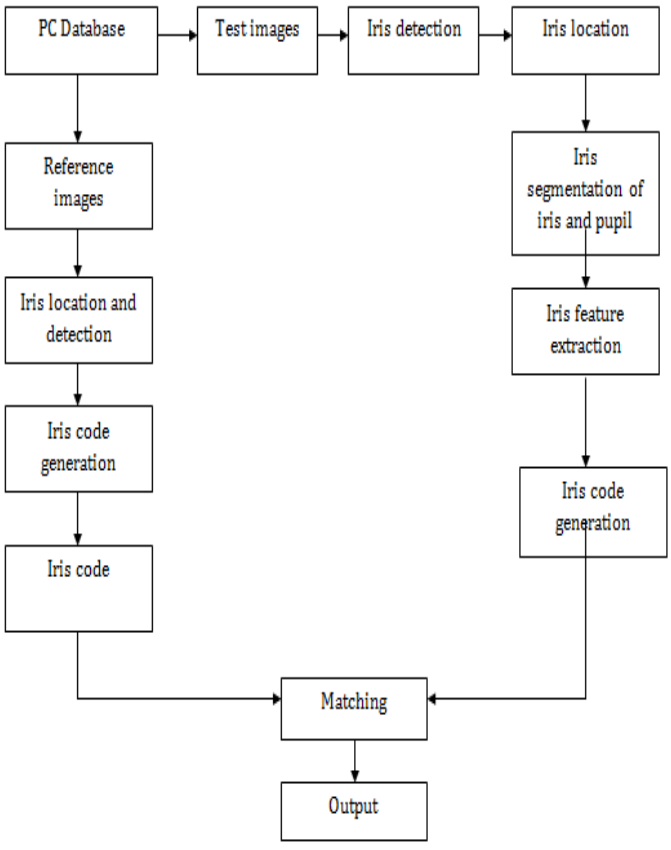

Fig.2. Block diagram of iris identification

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II. ALGORITHM

A. Image Acquisition

Here all methodology used for acquisition. Some are hardware and some software. In hardware camera click iris image which is considered as test image. However software method use database like UC, CASIA etc. So extract one test image from database and perform operation.

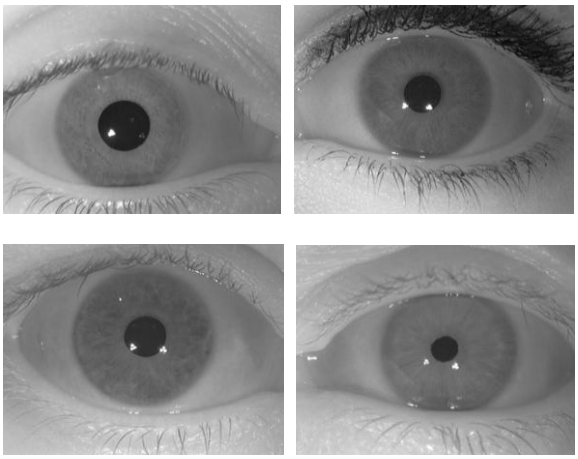

Fig.3. CASIA database examples

B. Iris noise removal

The stabilized iris image still has low contrast and may have non-uniform lighting caused by the location of light sources. In order to find more well-distributed texture image, we improve iris image by means of local histogram equalization and remove high frequency noises by filtering the image with a low-pass Gaussian filter. Also morphological contour operation used to fill the holes of noise.

C. Iris Segmentation

In segmentation two circles are obtained by using edge detection and Hough transform in a certain region firm in the first step. In current system partial differentiation method is used to find edge of iris and pupil. For finding edge change in pixels values counted, this way points those pixels. Then all the points on edge of iris and pupil are connected by circular contour method.

In the spatial frequency domain, we can extract the information of an image at a convinced scale and at a certain orientation by using some exact filters, such as multichannel Gabor filters. In recent years, Gabor filter based methods have been broadly used in computer vision, particularly for texture analysis.

Gabor simple functions are Gaussians modulated by oriented complex sinusoidal functions. Here, we make use of a circular symmetric filter (CSF) which is developed on the basis of Gabor filters. The difference between Gabor filter and circular symmetric filter lies in the modulating sinusoidal functions. Finally circular contour method connects all points and make iris and pupil segment for feature extraction.

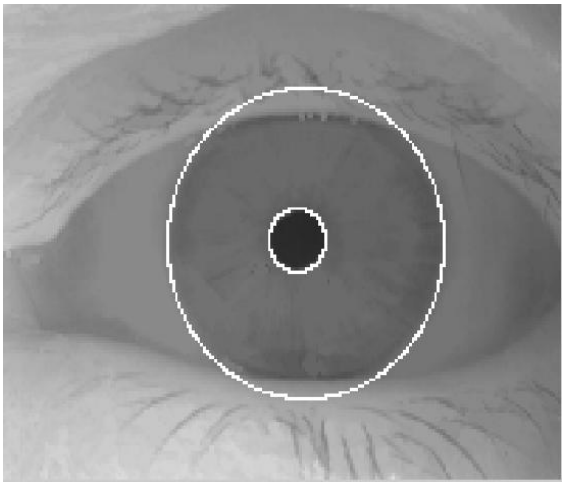

Fig.4. Segmentation of iris and pupil

$$\text{Max}(\gamma, x0, y0) = \left\{ \delta/\delta r \int_0^{2\Pi} (r^* \cos\theta + x0, r^* \sin\theta + y0) \right\}$$

The first handling step involves in finding the inner and outer limitations of the iris and second step to stabilize iris and third step to increase the original image .The Daugman's system, Integro differential operators is used to detect the center and diameter of iris and pupil correspondingly. Where (x0, y0) denotes the potential center of the examined circular boundary, and r its radius.

D. Feature Extraction

The most central step in programmed iris recognition is the ability of removing some unique attributes from iris, which help to produce a specific code for each individual. Gabor and wavelet transforms are characteristically used for examining the human iris shapes and extracting features from them, Phases for feature Extraction:

- Apply 2DDWT with Haar up to 5-level decomposition Using 4th level, 5th level decomposition details build the feature vector.
- Binaries the details getting from step no.3
- Collection these feature vectors.

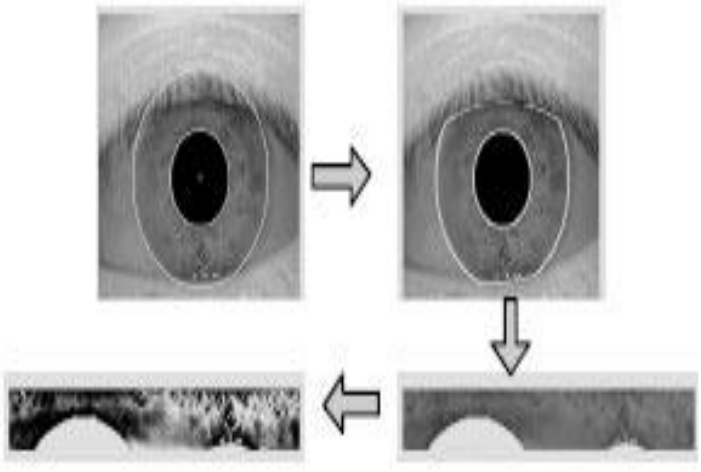

Fig.5. Example of feature extraction

E. Matching

The Hamming distance (HDs) between input images means test image and images (database) in each class are planned, and then the two dissimilar classifiers are being applied as follows. In the first classifier, the minimum HD between input iris code and codes of each class (database) is computed. In the second classifier, the vocal mean of the n HDs that have been noted yet is assigned to the class. Steps for corresponding using hamming distance:

1) Relate feature vector of database images with feature vector of query image.

2) Compute the hamming distances for each database feature vector.

3) Find out the minimum hamming distance.

The iris codes in the database are used to find out which iris codes come from the same eye. Hamming distance is chosen because of its speed in calculating dissimilarity between binary codes. In hamming distance here all binary values of iris image matched with database. So this can be done by using shift bit method where least value of hamming distance is more matched test image with database image. In iris database CASIA all image code already generated.

So this is easy or fast processing identification. Both iris test image and iris database compared their features and find perfect match for test image accepted or rejected. This is matching technique is very simplifies for all users.

III. APPLICATION

Iris identification used in many areas for example It provides a more secure and convenient way for personal authentication like airport security enter high-security areas. It used for online transactions, law enforcement, time and attendance monitoring, and access control. Secure access to bank accounts at cash machines i.e. ATM.Forensics; birth certificates; tracing missing or wanted persons, Anti-terrorism.

IV. CONCLUSION

This paper presents a new iris recognition algorithm which performs identification fast as well as accurate. The algorithm implements the iris inner edge location by the wavelet analysis combined with the circle equation. Suggested algorithm focus on the rapid and accurate iris identification even if the images are checked supplementary algorithm will also focus on robust iris recognition, even with gazing-away eyes or pointed eyelids which solves all the security connected glitches.

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