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Person Identification using Biometrics (Iris Recognition)

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Abstract: - *Biometric-based personal verification and identification methods have gained much interest with an increasing emphasis on security. Iris recognition is a fast, accurate and secure biometric technique that can operate in both verification and identification modes since the iris texture pattern has no links with the genetic structure of an individual and since it is generated by chaotic process.*

In this paper, we present a method for iris recognition based on a wavelet packet decomposition of iris images. Each iris image is described by a subset of band-filtered images (sub images) containing wavelet coefficients. From these coefficients, which characterize the iris texture, we compute a compact iris feature code using the appropriate energies of these sub images to generate binary iris codes according to an adapted threshold. Thereafter, we show how an efficient and reliable Hamming distance can be used in order to classify iris codes. Results are presented that demonstrate significant improvements in iris recognition accuracy through the use of the public iris database CASIA.

Keywords: - *Biometrics, Iris identification, CASIA Iris database*

I. INTRODUCTION

Today's e-security are in critical need of finding accurate, secure and cost-effective alternatives to passwords and personal identification numbers (PIN) as financial losses increase dramatically year over year from computer-based fraud such as computer hacking and identity theft. Biometric solutions address these fundamental problems, because an individual's biometric data is unique and cannot be transferred. Biometrics which refers to identifying an individual by his or her physiological or behavioral characteristics has capability to distinguish between authorized user and an imposter. An advantage of using biometric authentication is that it cannot be lost or forgotten, as the person has to be physically present during at the point of identification process .Biometrics is inherently more reliable and capable than traditional knowledge based and token based techniques. The commonly used biometric features include speech, fingerprint, face, Iris, voice, hand geometry, retinal identification, and body odor identification.

II. WHAT IS IRIS?

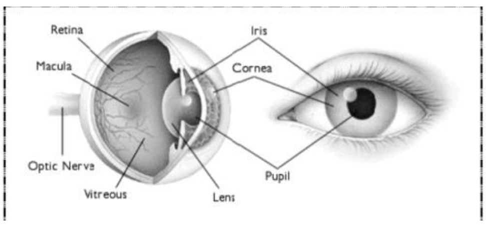


Figure 1: Structure of Iris

Iris as shown in Figure 1 is a biometric feature, found to be reliable and accurate for authentication process comparative to other biometric feature available today which is as shown Table1 (a) (b).

Table1 (a): Biometric comparison List

Method	Coded Pattern	Mis-identific	Security	Application
Iris Recognition	Iris pattern	1/1200000	High	High security facilities
Finger printing	Fingerprints	1/1,000	Medium	Universal
Hand Shape Size,	Length and thickness	1/700	Low	Low-security facilities
Facial Recognition	Outline, shape and distribution of	1/100	Low	Low-security facilities
Signature	Shape of	1/100	Low	Low-security
Voice printing	Voice characteristic	1/30	Low	Telephone service

Table1 (b): Biometric comparison List

Biometrics	Crossover Accuracy
Retinal Scan	1:10,000,000+
Iris Scan	1:131,000
Fingerprints	1:500
Hand Geometry	1:500
Signature Dynamics	1:50
Voice Dynamics	1:50

As a result, the iris patterns in the left and right eyes are different, and so scan be used quickly for both identification and verification applications because of its large number of degrees of freedom. The highly randomized appearance of the iris makes its use as a biometric well recognized. Its suitability as an exceptionally accurate biometric derives from :-

i. The difficulty of forging and using as an imposter person;
ii. It is intrinsic isolation and protection from the external environment;
iii. It's extremely data-rich physical structure.
iv. It's genetic properties—no two eyes are the same.
v. It's stability over time.

III. STEPS FOR IRIS RECOGNITION SYSTEM

In general, the iris recognition system is composed of the following steps. According to this flow chart, iris recognition process work[1].

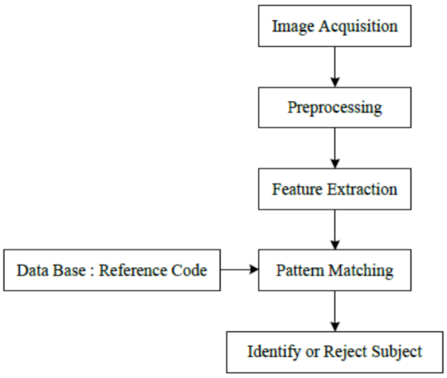


Figure 2. General steps of the iris recognition system

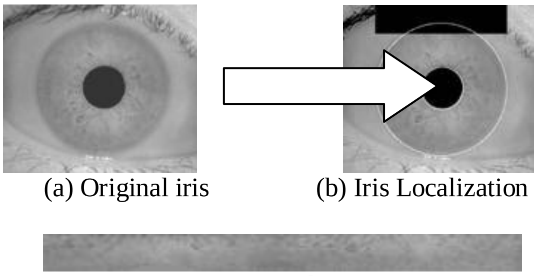
A. *Image Acquistion*

An image of the eye to be analyzed must be acquired first in digital form suitable for analysis. In further implementation we will be using CASIA database.

B. *Preprocessing*

1) *Iris image Segmentation*

The iris is an annular part between the pupil (inner boundary) and the sclera (outer boundary). Different iris localization approaches have been reported in the literature: Integro-Differential, Circular Hough, Hough Transform and edge and contour detection. In our approach, this task is performed by detecting the image intensity changes using the canny edge detection and hough transform which exploits two principal steps: (1) Define pupillary boundary, limbic-iris boundary and define upper and lower eyelid boundary(Figure2b), (2) Unwrap the circular iris portion to a rectangular image block(Figure 2c). For iris feature vector extraction, we use this approach .



(a) Original iris (b) Iris Localization

(c) Normalization

FIGURE 3. IRIS IMAGE SEGMENTATION

C. *Feature Extraction*

1) *Iris Feature Code Generation*

After the iris image segmentation process is completed, the iriscode is performed using Haar wavelet packets as well as the energy of the packets sub-images to extract texture phase structure information of the iris and to compute the iris 64-bits codes.

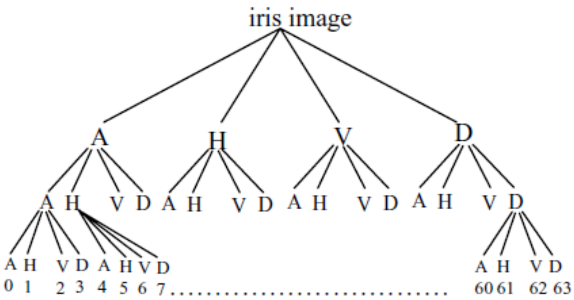


Figure 4. Wavelet packets decomposition for iris image

The Iris code generation process can be summarized
in the following steps:

1. Wavelet packets decomposition: We have used the Haar wavelet in a 3-level wavelet packet decomposition to extract the texture features of the unwrapped images. This generates 64 wavelet packets (output iris subimages), numbered 0 to 63.

The images contain approximation (A), horizontal detail (H), vertical detail (V) and diagonal detail (D) coefficients respectively as shown in Figure 3.

2. Wavelet packets energy computation: In order to obtain the most texture information in packet sub images, we have used an energy measure. The mean energy distribution allows evaluating which packets are used to compute the normalized adapted threshold for our iris code generation. The energy measure E_i for a wavelet packet sub image W_i can be computed as follows:

$$E_i = \sum_{j,k} W_i(j,k)^2 \qquad \text{........ (1)}$$

We use the appropriate wavelet packet energies of each iris image to compute the adapted threshold to encode the 64 sub images. Let $E_1 \ldots E_\lambda$ be the appropriate wavelet packet energies of the packets

1…λ respectively. We define the normalized adapted threshold S as follows:

$$S = Coeff \cdot \frac{\mu(E_1,\cdots,E_\lambda)}{Max\,(E_1,\cdots,E_\lambda)}$$ ……….(2)

Where μ(Ei,….,E_λ) represents the mean wavelet peak energy value, Coeff as a constant and λ is the number of the appropriate energies.

***2. Iris feature coding*:**

After determination the appropriate wavelet packets energies and the normalized adapted threshold, we can carry out the coding of the 64 wavelet packets energies to generate a compact iris code by quantizing these energies into one bit according to each appropriate energy. Let E_λ be the appropriate energy of the peak λ. Then the iris code C_λ computed according to E_λ we define by the following:

$$C_\lambda(j) = \begin{cases} 1 & \text{if } \frac{E_j}{E_\lambda} > S \\ 0 & \text{otherwise} \end{cases}$$

Where j = 0…63. ……..(3)

D. Pattern Matching

The iris codes matching task is performed by pairing the iris codes extracted from the input and the template iris images. The most common comparison method of iris signatures is the 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. Hamming distance two Boolean is as shown in:-

$$HD = \frac{1}{N}\sum_{i=1}^{N} X_I \otimes Y_I$$ ..(4)[1]

Where N is the number of bits in the feature vector, Xi is the Ith feature of the tested iris, and Yi is the ith feature of the iris template. If two bit patterns are completely independent, such as iris templates generated from different irises, the Hamming distance the two patterns will be close to 1. If two patterns are derived from the same iris, the Hamming distance between them will be close to 0, since they are highly correlated and the bits should agree between the two iris codes.

The maximum Hamming distance that exists between two irises belonging to the same person is 0.32. Thus, when comparing two iris images, their corresponding binary feature vectors are passed to a function responsible of calculating the

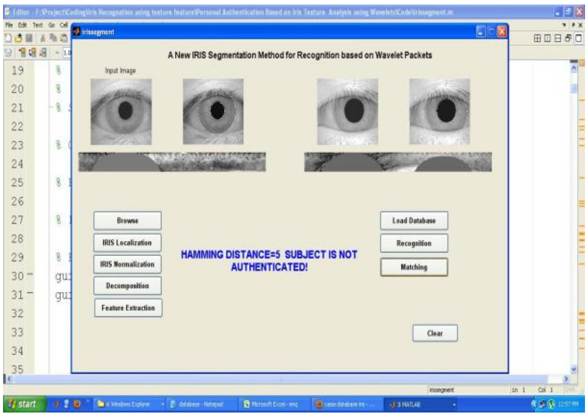
Hamming distance between the two. The decision of whether these two images belong to the same person depends upon the following result:

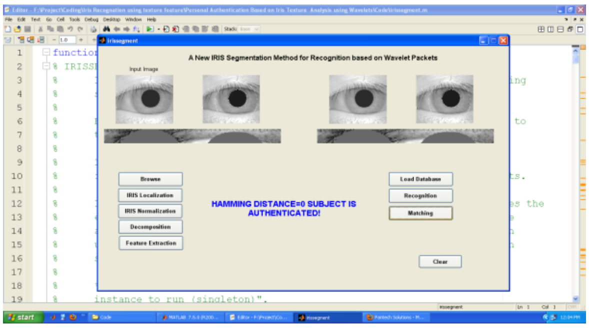
1. If HD <= 0.35 decide that it is same person
2. If HD > 0.35 decide that it is different person

shows the iris code matching process.

IV. RESULTS & CONCLUSION

The primary focus of this work is a personal authentication system based on human iris verification using wavelet packets decomposition. The proposed technique uses appropriate packets with dominant energies to encode iris texture according the adapted thresholds.





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REFERENCE

[1] Vanjanaroselin.E.Chirchi,Dr.L.M.Waghmare,E.Rchirchi-Iris Biometric Recognition For Person Identification In Security Systems,International Journal Of Computerappliactions(0975-8887)Volume24-No.9,June 2011

[2] Christel-Loïc TISSE1, Lionel MARTIN1, Lionel TORRES

[3] 2, Michel ROBERT ―Person Identification Technique Using

[4] Human Iris Recognition

[5] Shimaa M.Elsherief, Mhamoud E.Allam And Mohamed

[6] W.Fakhr, ‖ Biometric Personal Identification Based On Iris

[7] Recognition ‖ ,IEEE,2006.

[8] John Daugman. ―Recognizing Persons By Their Iris Patterns

[9] ―Cambridge University, Cambridge, UK.

[10] A. K. Jain, "Fundamentals Of Digital Image Processing" Prentice

[11] Hall Publication Pvt Ltd.