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Human Identification System Based On Iris Scan

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Abstract—* Biometrics includes various technologies for uniquely identifying an individual person in accordance with an examination of particular attributes of either the person's interior or exterior eye. The technologies have made biometric systems more accurate, convenient, and secure than the widely referred means of identification such as ID cards. In this paper, identification and verification approach based on human iris pattern is represented. The system is based on several steps from capturing the iris pattern, determining and localizing the iris boundaries, transformation of localized iris into rectangular and polar components, extracting the features from image based on wavelet transformation and at the end matching of the iris based on the calculating the Hamming codes of different irises. Publically available iris image database namely CASIA version 1.0 is used, instead of capturing CCD camera. In preprocessing region of interest (RIO) radius of pupil and center of pupil is calculated using scanning method, normalization of iris image is done using Daugman's rubber sheet model. Performance evaluation parameters, computation time, humming distance variation, False Acceptance Rate (FAR) , False Rejection Rate (FRR) are calculated through various fundamental and graphical performance measures.

***Index Terms*: iris recognition; segmentation; Wavelet transform; Hamming distance ; Match score; Performance evaluation**

I. INTRODUCTION

Human identification is a goal as ancient's humanity itself. As technology and services have developed in modern world, human activities and transactions have proliferated in which rapid and reliable personal identification is required. Examples includes passport control, computer login control, bank automatic teller machines and other transaction authorization, premises access control, and security system generally. all such identification efforts share the common goals of speed, reliability and automation. Biometric indicia is used for identification purposes requires that a particular biometric factor be unique for each individual that it can be voluntarily measured, and that it is invariant over time. Biometrics such as photographs, fingerprints, signatures, voiceprints and retinal blood vessel pattern all have significant drawbacks. Although photographs and signatures are despicable and easy to obtain and store, and easily forged. Electronically recorded voiceprints are significant drawback. Although photographs and signatures are despicable and easyible to changes in a person's voice,and they can be counterfeited

to obtain and store, and easily forged. Electronically recorded voiceprints are susceptible to changes in a person's voice, and they can be counterfeited. Human iris is an internal organ of the eye and well protected from the external environment, yet it is easily visible from within one meter of distance makes it a perfect biometric for an identification system with the ease of speed, reliability and automation.

Biometric Recognition System process starts by the image capturing or data sample acquisition. image capturing is the process of capturing all information related to biological attribute of the subject, the objective is to measure data that can be used to identify the important and unique properties of the subject which are stable and repeatable over time and and converts the measured data Into a format that is suitable for image analysis.

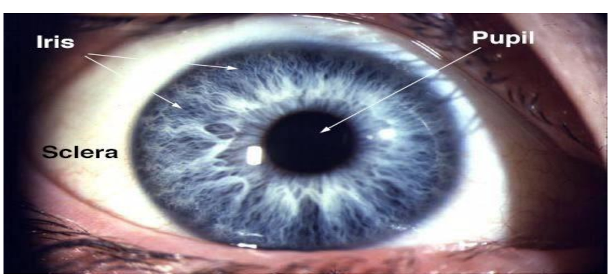

Fig 1: Example of an iris pattern

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A quality measure module determines whether the captured biometric image samples having the suitable feature for next processing. An enhancement check module is used to develop the signal quality. Both of these modules are included in first stage. Using feature extraction stage, only the useful significant information from a biometric trait that is used for the person identification task is encoded and a biometric template is formed. these templates are stored in the database called as registered database .In identification scheme, the subject's template is compared with the stored templates. A match system module compares two attribute sets during recognition and determines their measure of similarity. A decision module determines the user identity based on the similarity output by the matcher. If the comparison between biometric templates has almost comparable, it is implicit that both of these were extracted from the similar person, otherwise, they will be extracted from different persons.

The performance of a biometric system may also be summarized using single-valued measures such as the Equal Error Rate (EER) and the d-prime value. higher d-prime value indicates better performance.

II.SYSTEM BLOCK DIAGRAM

Identify or
Rejected
value

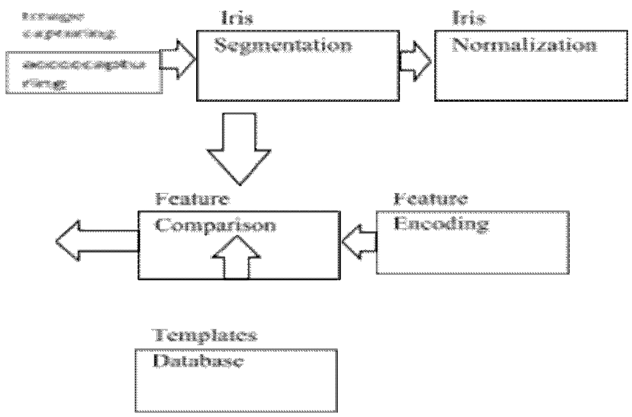

Fig. 2. illustrates the basic Block diagram of Human Identification systems.

A. Iris Segmentation stage

The first stage of Human Identification System is to isolate the actual iris region in a digital eye image. the iris region ,can be approximated by two circles, first one for the scalara boundary and second one, interior to first, for the pupil boundary. The eyelids and eyelashes are appears as upper and lower part of the iris region. The success of segmentation depends on the imaging quality of eye image.

The segmentation stage is difficult to the success of an iris identification system, so the data which is wrongly represented as iris pattern data will corrupt the generated biometric templates ,resulting in the poor recognition rates.

1) Iris Segmentation Techniques

a) *Active Contour Models*: Ritter et al. makes use of active contour models for localizing the pupil in eye images. Active contours respond to pre-set internal and external services by deforming internally or moving across an image until symmetry is reached. The contour contains number of vertices, whose position changed by two opposing forces that is internal forces, which is depends on the image. For pupil location ,the internal forces are calibrated due to which the contour forms globally increasing discrete circle. Each vertex is moved between time t and t + 1 by,

$$v_i(t+1)\ v_i(t+1) = v_i(t)\ v_i(t) + F_i(t)\ F_i(t) + G_i(t)\ G_i(t) \quad (1)$$

Where F_i F_i is the internal force, G_i G_i is the external force and $F_i(t)$ v_i v_i v_i is the position of vertex i . the external forces are normally establish using the edge information. To improve the accuracy Ritter et al. use the variance image ,rather than the edge image. The discrete circular active contour is created a point interior to the pupil is located from a variance image as its centre. The discrete circular active contour is then stirred at the presence of internal and external forces until

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it reaches equilibrium, and the pupil is localized.

B. Iris Normalization

Daugman suggested normal Cartesian to polar transformation that maps each pixel in the iris area into a pair of polar coordinates(r, θ), where r and θ are on the intervals of [0 1] and [0 2π] .this represent is called as Rubber Sheet Model.
Once the pupil is detected the iris section can be extracted easily. we have taken the small part of iris region for further processing .we use only lower half part of iris region because most of the times the upper iris region is covered by eyelashes which can reduce the accuracy of the system. After determining the limits of the iris, it should be isolated and stored in a separate image. We observed that there is a possibility of the pupil dilating and appearing of different size of pupil for different images. Due to this change the coordinate system by unwrapping the lower part of the iris and mapping all point within the boundary of the iris into polar equivalent using Daugman rubber sheet model as shown in figure 3.
Once the region of interest has been isolated ,it is transformed to a dimensionless polar system. The implemented algorithm is based on the Daugman's stretched polar coordinate system. For this transformation, the value of r is ranges from [0:32] and angular value spans the normal [0:180]. That means we consider only 32 pixel in angle
The remapping of the iris image I(x, y) from raw Cartesian coordinates (x, y) to the dimensionless non concentric polar coordinate system (r, θ) can be represented as:

$$I(x(r;\theta);\, y(r;\theta))\ \text{Ű}\!\rightarrow I(r;\theta) \quad (2)$$

where x(r, θ) and y(r, θ) are defined as linear combinations of two set of pupillary boundary points (xp(θ) ; yp(θ)) and the set of limbus boundary points along the outer perimeter of the iris (xs(θ); ys(θ)) bordering the sclera, which are found in the iris segmentation stage as:

$$x(r;\theta) = (1 - r) * xp(\theta) + (1 - r) * xs(\theta) \quad (3)$$
$$y(r;\theta) = (1 - r) * yp(\theta) + (1 - r) * ys(\theta) \quad (4)$$

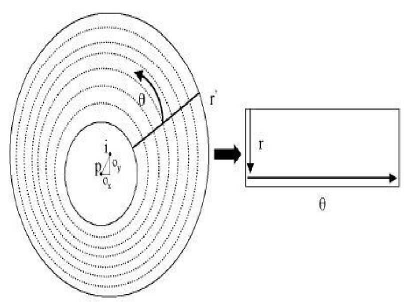

Fig. 3. Normalization of the iris image through the Daugman rubber sheet.

C. Feature Extraction

In order to provide accurate recognition of individuals, the most discriminating information present in an iris pattern which must be extracted. Only the significant features of the iris must be encoded so that comparison between templates can be made. Most iris recognition system makes use of a band pass decomposition of the iris image to create a biometric template.
The template that is generated in the feature encoding process will also need a corresponding matching metric, which gives a measure of similarity between two iris templates. This metric should give one range of values when comparing templates generated from the same eye, known as intra-class comparisons, and another range of value when comparing templates created from different irises, known as inter-class comparisons. These two cases should give distinct and separate values, so that a decision can be made with high confidence as to whether two templates are from the same iris or from two different irises.
The iris has an interesting structure and presents lavish texture information. So, it is eye-catching to search representation methods which can capture local crucial information in an iris. The uniqueness and variability is the key to successful human identifications, in order to distinguish between templates.

D. Feature Comparison

The method chosen to compare between iris signature is highly trained by the feature extraction strategy, the feature comparison is normally performed through the use of distance metrics: Hamming, Weighted Euclidean methods based on signal correlation.

III. SOFTWARE REQUIREMENT

A. Iris Image Databases

We describe the main characteristics of the public and freely available iris image databases for biometrics purposes.

1) Public and Free Databases: The biometrics research and development demands the analysis of human data. Obviously, it is unrealistic to perform the test of algorithms in data captured on them, due to the complexity. Therefore, when it comes to the test of recognition methods, standard biometric databases consider high relevance to the development process. In order to evaluate the performance of iris recognition system, the benchmark database plays an important role.

a) CASIA Database: CASIA iris image database the CASIA v.1 database includes 756 iris images from 108 eyes, hence 108 classes. For each eye, 7 images are captured in two sessions, where three samples are collected in the first and four in the second session.

IV. ACKNOWLEDGMENT

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