An Iris Authentication: Best Method of Biometric Authentication

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Abstract:- BIOMETRICs is the measurement of humans physiological characteristics for security reasons. There are so many types of biometrics existed including finger print, iris recognition, voice recognition. From the above mentioned biometric techniques Iris recognition gives better security and it has more advantages over other types of biometric authentication methods. Iris biometric authentication as it has low error rates compared to other biometric authentication methods. Basic idea of the method is as follows: First of all, it locates the image of iris and then it fits the contour of lower eyelid, after that normalization to the iris image is done and gets 512 columns x 64 rows rectangular iris image. Next thing is that it makes segmentation according to the filter parameters and then it adopts optimized multi directional filter so that it gives filter for each sub-block in the effective iris image area, and also gets edge response of iris image in different directions. These simulations are done in a MATLAB.

Keywords*:* Iris recognition, Biometric authentication, Normalization, Segmentation.

I. INTRODUCTION

I Introduction

A] Biometric Technology

Now A days in many applications, the identity of a person is necessary. For the secure access of anything personal identification is needed. There are some conventional methods for the recognition of individual. The methods include the use of cards or passwords which are not always reliable or accurate, because these cards or passwords can be stolen or forgotten. But in Biometric technology, it uses Artificial Intelligence (AI), for the identification of particular features for the particular human body. By using the particular feature, the biometric authentication system identifies the specific user. The physical structure of the some part of human body like hand geometry, DNA, retina, iris and palm is unique. A biometric system gives automatic recognition of an individual based on unique feature possessed by the individual. Biometric systems have been developed based on fingerprints, facial features, voice, palm recognition, handwriting, and the retina. [1]

B] Advantages of Using Biometrics:

- Easier fraud detection
- Better than password/PIN or smart cards
- No need to memorize passwords
- Requires physical presence of the person to be identify
- Unique physical or behavioural characteristic
- Cannot be borrowed, stolen, or forgotten.

C] Human Iris

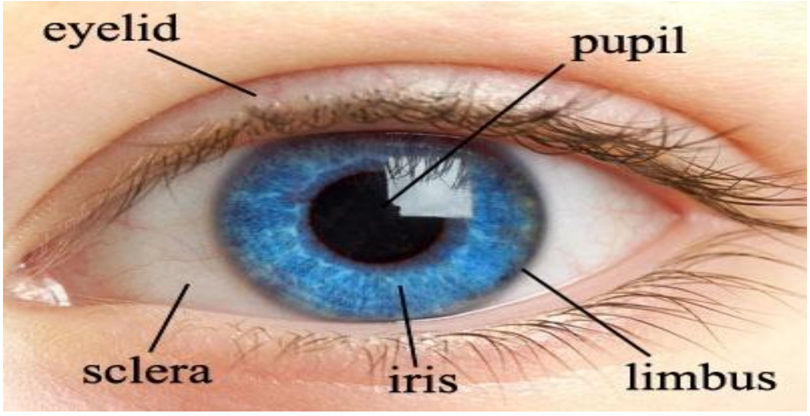

Fig. 1.1 Front View Of Human Eye

The front view of human eye is as shown in the above figure 1.1. Basically the shape of iris is thin circular disk. In the above figure anyone can see the shape of iris, which is blue coloured. Iris is lies between the cornea and the lens of the human eye. The inner part of iris is a circular aperture known as the pupil. Pupil is also thin circular shape disk, which is shown in block coloured in the figure1.1. The function of the iris is to control the amount of light entering through the pupil, and this is done by the sphincter and the dilator muscles, which adjust the size of the pupil. The average diameter of the iris is 12 mm, and the pupil size can vary from 10% to 80% of the iris diameter [2].

II APPROACH

A] Segmentation

The first step of iris recognition is to differentiate iris region in a digital eye image which can be taken from CASIA iris database. The iris region, shown in Figure 1.1, can be divided in two circles, one for the iris /sclera boundary and another, interior for the iris/pupil boundary. The eyelids and eyelashes present at the upper and lower parts of the iris region. Spectacular reflections can present in the iris region in some of the images which corrupts the iris pattern. A technique is required to isolate and exclude these artefacts. Also, locating the circular iris region is required. The success of segmentation depends on the quality of images. Images in the CASIA iris database do not contain spectacular reflections due to the use of near infra-red light for illumination [7]. Circular Hough transform is most of the time used for differentiating the iris and pupil boundaries. First it applies Canny edge detection to create an edge map. Vertical and horizontal gradients were weighted equally for the inner iris/pupil boundary. A modified version of Kovesi's Canny edge detection was implemented, which allowed for weighting of the gradients. The range of radius values to search for was set manually and that can be depending on the database used. For the CASIA database, values of the iris radius range from 90 to 150 pixels, while the pupil radius ranges from 28 to 75 pixels. For the making the circle detection process more accurate, the Hough transform for the iris/sclera boundary was performed first, then the Hough transform for the iris/pupil boundary was performed second within the iris region, instead of the whole eye region. After this process was complete, six parameters are stored, the radius, and x and y centre coordinates for both circles. The localized iris image is

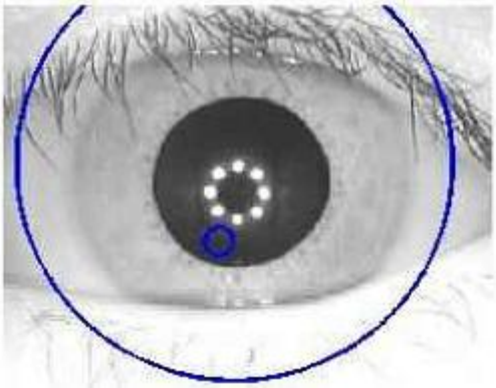

Fig.2.1 Localised Iris

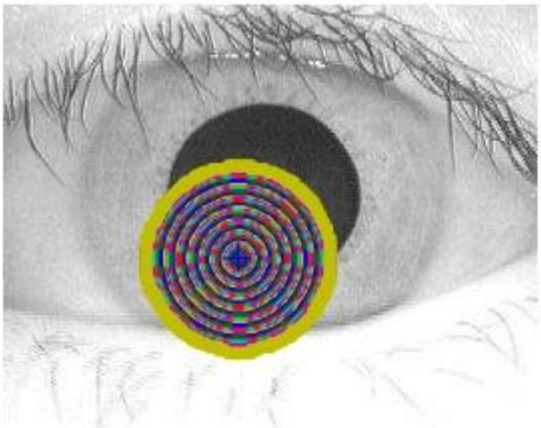

Fig.2.2 Normalised Iris

as shown in fig.2.1

B] Normalisation

The centre of the pupil was considered as the reference point, and radial vectors pass through the iris region. A number of data points are selected along each radial line and this is defined as the radial resolution. The number of radial lines going around the iris region is defined as the angular resolution. Since the pupil can be non-concentric to the iris, a remapping formula is needed to rescale points depending on the angle around the circle. The normalisation process is able to rescale the iris region so that it has constant dimension. The normalised iris is as shown in above fig. 2.2

C] Feature Encoding and Matching

The iris has a particularly interesting structure and provides abundant texture information. For the accurate recognition of individuals, the most discriminating information present in an iris pattern must be extracted. Only the significant features of the iris must be encoded so that comparisons between templates can be made.

Feature Encoding Algorithms

Feature encoding was implemented by convolving the normalised iris pattern with 1D Log-Gabor wavelets. The 2D normalised pattern is broken up into a number of 1D signals, and then these 1D signals are convolved with 1D Gabor wavelets. The rows of the 2D normalised pattern are taken as the 1D signal, each row corresponds to a circular ring on the iris region. The angular direction is taken rather than the radial one, which corresponds to columns of the normalised pattern, since maximum independence occurs in the angular direction. The intensity values at known noise areas in the normalised pattern are set to the average intensity of surrounding pixels to prevent influence of noise in the output of the filtering. The output of filtering is then phase quantised to four levels using the Daugman method [4], with each filter producing two bits of data for each phasor. The output of phase quantisation is chosen to be a grey code, so that when going from one quadrant to another, only 1 bit changes. This will minimise the number of bits disagreeing, if say two intra-class patterns are slightly misaligned and thus will provide more accurate recognition. The encoding process produces a bitwise temp late containing a number of bits of information, and a corresponding noise mask which corresponds to corrupt areas within the iris pattern, and marks bits in the template as corrupt. Since the phase information will be meaningless at regions where the amplitude is zero, these regions are also marked in the noise mask.

Matching Algorithms

Hamming distance

The Hamming distance gives a measure of how many bits are the same between two bit patterns. Using the Hamming distance of two bit patterns, a decision can be made as to whether the two patterns were generated from different irises or from the same one. In com paring the bit patterns X and Y, the Hamming distance, HD, is defined as the sum of disagreeing bits (sum of the exclusive-OR between X and Y) over N, the total number of bits in the bit pattern. If two bits patterns are completely independent, such as iris templates generated from different irises, the Hamming distance between the two patterns should equal 0.5. This occurs because independence implies the two bit patterns will be totally random, so there is 0.5 chance of setting any bit to 1, and vice versa. Therefore, half of the bits will agree and half will disagree between the two patterns. If two patterns are derived from the same iris, the Hamming distance between them will be close to 0.0, since they are highly correlated and the bits should agree between the two iris codes.

III. EXPERIMENTAL RESULTS

All the features obtained should enter a comparison process to determine the user whose iris photograph was taken .This comparison is to be made with the user's template, which will be calculated depending on the comparison algorithm used. As a result of feature extraction using Gabor filter performance metrics have been calculated, and the performance metrics of 1-D dyadic wavelet transform is also calculated. Matching algorithms such as binary hamming distance is to compare the two feature vector methods. On calculating the performance metrics in terms of three different rates. One is false acceptance rates (FAR), false rejection rate (FRR), and equal error rate (EER). EER is a cross point between FAR and FRR. We have to obtain a null FAR in order to get very low rates of false rejection that implies this system is optimal for high security environments. FRR rates have also to be lowered, example rejecting the system after three consecutive errors in terms of negative user of a credit card in automatic teller machine. All these experiments are calculated by using simulation in MATLAB 9.0. The results are obtained using 1-D dyadic wavelet transform possess a high FAR rates compared to Gabor filters and FRR rates also cannot be lowered. EER rates are also high in 1-D dyadic wavelet transform methods. The results are obtained Gabor filter possesses a null FAR and FRR value can also be lowered. Also it achieves a low EER rates compared to other feature extraction algorithms. The "FAR" (False Acceptance Ratio) is 3.32%. & "FRR" (False Rejection Ratio) is 1.85%. The time required & accuracy of the process is greater than 98% as per calculation.

IV. CONCLUSION

The recognition of person through this iris authentication system is simple and requires few components. This system is effective enough to be integrated within security systems that require an identity check. There are negligible errors that occurred when this system used and that can be easily overcome by the use of proper and stable equipment. Iris recognition is a recent technique in the area of the personal identification and it is considered as one of the most reliable ways of biometrics.

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