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Human Identification Using Iris Recognition

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Abstract*: Iris recognition is an invasive biometric technique used to identify human being. Iris is defined as annular region between pupil and sclera of human eye which exhibits extraordinary texture that is unique for each individual. Hence, imposes various challenges in accurate iris segmentation and feature extraction techniques to provide many opportunities for researchers in pursuing their research work in this area. This paper presents a study about different techniques used previously for iris recognition*.

Keywords*: Human Identification, biometrics, Iris.*

I. Introduction

Biometrics is the study of methods for measuring physical or behavioral traits of an individual that can be used for uniquely recognizing or verifying that individual's identity [3, 11] Biometric methods are divided to physical and behavioral methods, which in turn can be divided into invasive and non invasive methods. Invasive methods are those that require the cooperation of the individual in order to acquire data needed to compare his biometric features to the ones stored in a database. Non invasive biometrics does not require the cooperation of the individuals; in fact data capture may be done without their knowledge. Applications for biometrics are most common in security, medical, and robotics areas related to fingerprint, face, iris, and gait. These biometric areas have gained the most attention among the research community. Iris recognition is an automated method of biometric identification that uses mathematical pattern-recognition techniques on video images of one or both of the irises of an individual's eyes, whose complex random patterns are unique, stable, and can be seen from some distance.

Retinal scanning is a different, ocular-based biometric technology that uses the unique patterns on a person's retina blood vessels and is often confused with iris recognition. Iris recognition uses video camera technology with subtle near infrared illumination to acquire images of the detail-rich, intricate structures of the iris which are visible externally. Digital templates encoded from these patterns by mathematical and statistical algorithms allow the identification of an individual or someone pretending to be that individual [1]. Databases of enrolled templates are searched by matcher engines at speeds measured in the millions of templates per second per (single-core) CPU, and with remarkably low false match rates.

Several hundred millions of persons in several countries around the world have been enrolled in iris recognition systems for convenience purposes such as passport-free automated border-crossings, and some national ID programs. A key advantage of iris recognition, besides its speed of matching and its extreme resistance to false matches is the stability of the iris as an internal and protected, yet externally visible organ of the eye. The given figure shows the image of iris.

John Daugman developed and patented the first actual algorithms to perform iris recognition, published the first papers about it and gave the first live demonstrations, the concept behind this invention has a much longer history and today it benefits from many other active scientific contributors. In a 1953 clinical textbook, F.H. Adler [2] wrote: *"In fact, the markings of the iris are so distinctive that it has been proposed to use photographs as a means of identification, instead of fingerprints."* Adler referred to comments by the British ophthalmologist J.H. Doggart, [3] who in 1949 had written that: *"Just as every human being has different fingerprints, so does the minute architecture of the iris exhibit variations in every subject examined. [Its features] represent a series of variable factors whose conceivable permutations and combinations are almost infinite."*

Figure 1.1 Image of iris [1].

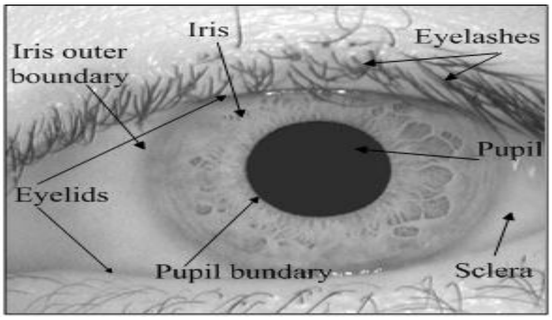

Figure 1.2 External anatomy of iris.

II. Literature Survey

Hamel Patel [1] presented novel and efficient approach of partial iris based recognition of human using pupil circle region growing and binary integrated edge intensity curve which defeats the difficulties of eyelids occlusions. The experimental results are obtained on CASIA database version-1 and show good performance with EER of 5.14%. The advantage of the proposed approach is its computational simplicity and good recognition accuracy as it avoids the eyelids portion from the iris region for further processing.

Libor Masek [2] proposed model consists of an automatic segmentation system that is based on the Hough transform, and is able to localise the circular iris and pupil region, occluding eyelids and eyelashes, and reflections. The extracted iris region was then normalised into a rectangular block with constant dimensions to account for imaging inconsistencies. Finally, the phase data from 1D Log-Gabor filters was extracted and quantised to four levels to encode the unique pattern of the iris into a bit-wise biometric template. The Hamming distance was employed for classification of iris templates, and two templates were found to match if a test of statistical independence was failed.

The system performed with perfect recognition on a set of 75 eye images; however, tests on another set of 624 images resulted in false accept and false reject rates of 0.005% and 0.238% respectively. Therefore, iris recognition is shown to be a reliable and accurate biometric technology.

Khin Sint Sint Kyaw [3] it focuses on image segmentation and statistical feature extraction for iris recognition process. They use straight forward approach for segmenting the iris patterns. The used method determines an automated global threshold and pupil centre.

Hao Meng and Cuiping Xu [4] proposed an effective method for feature extraction and code matching of iris. On the texture feature extraction, the transform of the Gabor wavelet is introduced. Dividing the frequencies of Gabor into two bands, different Gabor scale parameters are selected in every band and the appropriate location parameter are chosen. In order to resolve the effects of iris image rotation on the result of iris recognition, the binary iris code are achieved must be compared using the method of shifting in a fixed length. Experimental result shows that the iris recognition method proposed have better performance.

Chintan K.Modi [5] gives model of segmentation of dental X-ray image helps to find two major regions of dental X-ray image: 1) gap valley, 2) tooth isolation. Dental radiography segmentation is a challenging problem because of intensity variation and noise traditional model make use of gray and binary intensity integral curves. Using these curves the regions of gap valley and tooth isolation are extracted. They proposes a novel model of finding ROI for both gap valley and tooth isolation using binary edge intensity integral curves. The proposed algorithm uses region growing approach followed by canny edge detector. It automatically finds the ROI both gap valley and tooth isolation in 83% dental radiograph images without rotation.

Tze Weng Ng [6] proposed an iris recognition system using a basic and fast Haar wavelet decomposition method to analyze the pattern of a human iris. This system has two main modules, which are the feature encoding method and iris code matching modules. Among all feature extraction methods, Haar wavelet decomposition is chosen for its computational simplicity and speed in filtering the iris pattern. In the feature extraction module, unrolled iris images are filtered using high pass filter and low pass filter for four times to produce the corresponding coefficients. Subsequently in the second module, hamming distance between iris codes is calculated to measure the difference between the query iris image and the iris image in the database. Iris recognition is then performed by matching the iris pair with the minimum hamming distance. This system is tested with iris 450X60 pixels iris images from the CASIA iris database and the recognition of 98.45% is achieved.

Ashish kumar Dewangan [7] presented his work by developing an 'open-source' iris recognition system in order to verify both the uniqueness of the human iris and also its performance as a biometric. For determining the recognition performance of the system one databases of digitized grayscale eye images were used. The iris recognition system consists of an automatic segmentation system that is based on the Hough transform, and is able to localize the circular iris and pupil region, occluding eyelids and eyelashes, and reflections. The extracted iris region was then normalized into a rectangular block with constant dimensions to account for imaging inconsistencies. Finally, the phase data from 1D Log-Gabor filters was extracted and quantized to four levels to encode the unique pattern of the iris into a bit-wise biometric template. The Hamming distance was employed for classification of iris templates, and two templates were found to match if a test of statistical independence was failed. Therefore, iris recognition is shown to be a reliable and accurate biometric technology.

Asheer Kasar Bachoo [8] it focuses on a common yet difficult problem-segmentation of eyelashes from iris texture. Tests give promising results when using grey level co-occurrence matrix approach.

Li Ma[9] it describes a new scheme for iris recognition from an image sequence. They first asses the quality of each image in the input sequence and select a clear iris image from such sequence for subsequent recognition. A bank of spatial filters, whose kernels are suitable for iris recognition, is then used to capture local characteristics of the iris so as to produce discriminating texture features. Experimental results show that the proposed method has an encouraging performance. In particular, a comparative study of existing methods for iris recognition is conducted on an iris image database including 2,255 sequences from 213 subjects.

Wen-Shiung Chen[10] proposed system includes three modules: image preprocessing, feature extraction, and recognition modules. The feature extraction module adopts the gradient direction on wavelet transform as the discriminating texture features. The system encodes the feature to generate its iris feature codes using two efficient coding techniques: binary gray encoding and delta modulation. Experimental results show that the recognition rates up to 95.27%, 95.62% and 99.05% respectively, using different methods can be achieved.

Conclusion

This paper presents a review of the existing algorithms available for iris recognition. The algorithms are generally divided into four steps, viz. Localization, Normalization, Feature Extraction and Matching. Iris recognition technology is able to give highly accurate results for human identification. But this technology needs more attention to overcome the disadvantages of the existing algorithms. Daugman's algorithm gives maximum accuracy. Future work would be to make a database of large number of people which includes a large number of variations for illumination and size.

Bibliography

[1] Hamel Patel, Mita C.Paunwala, Suprava Patnaik and Chintan K.Modi, "*Human identification by partial segmentation using pupil circle growing based on binary integrated edge intensity curve*" , 2011 international conference on communication systems and network technologies.

[2] L.Masek, "*Recognition of Human Iris Patterns for Biometric Identification*," Technical Report, the University of Western Australia, 2003.

[3] K. S. S. Kyaw, "*Iris recognition system using statistical features for biometric identification"*, 2009 International Conference on Electronic Computer technology.

[4] Hao Meng and Cuiping Xu,*"Iris recognition algorithms based on gabor wavelet transforms*", Proceedings of the 2006 IEEE International Conference on Mechatronics Automation.

[5] Dr. C. K. Modi and N. P. Desai, "*A simple and novel algorithm for automatic selection of ROI for dental radiograph segmentation*", 24th Canadian Conference on Electrical and Computer Engineering, CCECE-2011, May 8-11, 2011, Niagara, Canada. (accepted)

[6] T. W. Ng, T. L. Tay, S. W. Khor, "Iris Recognition Using Rapid Haar Wavelet Decomposition," 2nd International Conference on Signal Processing Systems (ICSPS), 2010.

[7] A. K. Dewangan, M. A. Siddhiqui, "*Human Identification and Verification Using Iris Recognition by Calculating Hamming Distance*" International Journal of Soft Computing and Engineering (IJSCE) ISSN: 2231-2307, Volume-2, Issue-2, May 2012.

[8] A. K. Bachoo and J. R. Tapamo, "*Texture detection for segmentation of iris images*," in Proc. ACM Int. Conf. South African Institute of Computer Scientists and Information Technologists, pp. 236–243, White River, South Africa, Sep.2005.

[9] L. Ma, T. Tan, Y. Wang, and D. Zhang, "*Personal identification based on iris texture analysis*", IEEE Trans. Pattern Anal. Mach. Intell., vol. 25, no. 12, pp. 1519–1533, Dec. 2003.

[10] W. S. Chen, K. H. Chih, S. W. Shih and C. M. Hsieh, "*Personal Identification Technique based on Human Iris Recognition with Wavelet Transform*", IEEE 2005.

[11] Mohammad Ibrahim Saleh, Thesis, "*Human Identification Using Ears Based on Eigen Ears Using Neural Network*" Virginia Polytechnic Institute and State University.

