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SURVEY OF IRIS RECOGNITION TECHNIQUES

Prof. Ratnamala D. Chaudhari[1], Prof. A.B.Nehete[2]

[1,2]*Assistant Professor, E & Tc Engg.Dept. J.T.M.C.O.E.Faizpur, MS, India.*

Abstract:- *The authentication of individuals using iris based recognition is a widely developing technology Iris is gaining lots of attention due to its accuracy, reliability and simplicity as compared to other biometric traits. The human iris is an annular region between the pupil and sclera. It has many important characteristics such as freckles, coronas, stripes, furrows, crypts and so on. This paper gives a brief review of iris recognition techniques.*

Keywords: *Biometrics, Haar transform, iris recognition, reinitialization.*

1. INTRODUCTION

Human face image analysis, detection and recognition has become some of the most important research topics in the field of computer vision and pattern classification. The potential applications include topics such as face detection, face identification and recognition, and facial expression analysis. Among these research topics, one fundamental but very important problem to be solved is automatic eye detection. The eye is the most significant and important feature in a human face, as extraction of the eyes are often easier as compared to other facial features. Eye detection is also used in person identification by iris matching. Only those image regions that contain possible eye pairs will be fed into a subsequent face verification system. Localization of eyes is also a necessary step for many face classification methods. For comparing two faces, the faces must be aligned. As both the locations of eyes and the inter-ocular distance between them are relatively constant for most people, the eyes are often used for face image normalization. Eye localization also further facilitates the detection of other facial landmarks. In addition, eyes can be used for crucial face expression analysis for human computer interactions as they often reflects a person's emotions.

As one of the most salient features of the human face, eyes & their movement plays an important role in expressing a person's desires needs, cognitive processes, emotional states & interpersonal relation. Although eye detection is crucial process by making review we find that for unconstrained background the structure of eye region is used as a robust cue to find eye pair in the entire image. Eye pair located by support vector machine based eye verifier then we used eye variance filter to detect to eyes. A simple an efficient eye detection method for face detection task in color image. Using skin color model face region detected then eye pair candidate is extracted. A robust eye detection algorithm for gray intensity image without spectacles in this case the feature based method and Template based method combine to the face region and to rough region of both eyes on the face. For Morphological image processing first the skin region is detected using color based training algorithm and six sigma techniques operated on RGB, HSV and NTSC scales.

1.1Iris Definition

The iris is a thin circular diaphragm, which lies between the cornea and the lens of the human eye. The iris is perforated close to its centre by a circular aperture known as the pupil. 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 from10% to 80% of the iris diameter. Front view of the iris is shown in Figure 1. The iris consists of a number of layers; the lowest is the epithelium layer, which contains dense pigmentation cells. The stromal layer lies above the epithelium layer, and contains blood vessels, pigment cells and the two iris muscles. The density of stromal pigmentation determines the color of the iris.

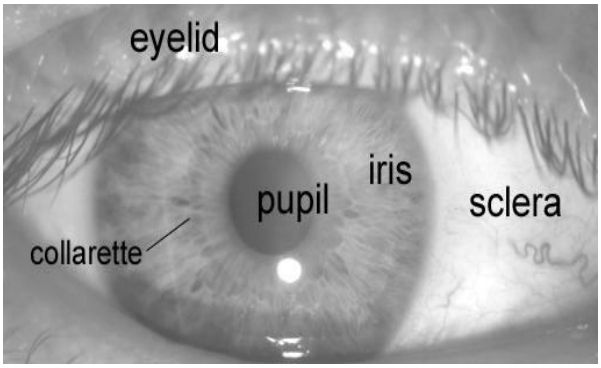

Fig 1 Iris Front view

Iris offers high accuracy in applications related to the personal identification such as secure access to bank accounts at ATM machines, national border controls, secure access to condominium buildings, and passports control etc. Any iris recognition system typically consists of four stages: iris segmentation, normalization, feature extraction and matching[2].

2. LITERATURE SURVEY

- E. Elfakhrany and Ben Bella S. Tawfik [1] described main two phases in design are training and testing. The main phases of building the system, personal identification using iris, are introduced and each phase is explained. Feature used by authors is moment variants for recognition. These features are four features located in the features space. Two different classifiers (minimum distance using Euclidean distance and Mahalanobis distance) are used for classification. Finally system consist of three stages such as preprocessing, feature extraction and classification. For data, they have captured 180 raw images (three sets). Two sets (120 iris images) are used for training and one for testing. In this process, first the images are prepared for features extraction. Then the four features are calculated for each person and finally, mean value of each person is calculated and located in the features space. For Mahalanobis distance, the recognition rate reaches 100%. This work gives the importance of the preprocessing stage which yields in high detection results. From experimental results, the conventional invariant moments with only three features can achieve high recognition success. Author concluded that Iris rectangular image has special characteristics; one of these is the small variation of the pixel intensity. Mahalanobis distance classifier is the best in iris recognition; because it depends on the statistics of the whole data.

- Radman et.al. [2] Proposed a new iris segmentation algorithm based on the Daugman's integro differential operator IDO. This algorithm includes three major modules, namely, reflections removal, iris and pupil detection with a fast IDO and eyelid detection using the live-wire technique. To remove reflections the iris image is complemented and the holes are filled up, holes are a set of dark pixels surrounded by brighter pixels and cannot be reached from the edge of the image, then, the resultant image is complemented again. The IDO searches Parameters of the circular iris and pupil boundaries over the entire image to fulfill the segmentation and then complex parabolic model is used to localize eyelid boundaries by the IDO. Author compared the recognition performance of this segmentation algorithm with those of state-of-the-art iris segmentation methods. Each iris image was segmented by author's method and all other methods; then, the segmented irises were processed with the same normalization, encoding and matching techniques. The recognition performance results showed that the proposed iris segmentation method achieved the higher discriminating capabilities; that mean the proposed method achieved the highest GARs with the lowest EERs for both UBIRIS.v1 iris images. Also, the proposed algorithm contributed to the iris recognition performance through accelerating the iris segmentation process and improving the discriminating capabilities.

- A. Radman et.al. [3]proposed iris recognition method in which pupil localization is done by using negative function and four neighbors so that irrespective of pupil's contour, either circle or ellipse, the pupil's boundary is detected accurately. For iris outer boundary detection, contrast enhancement, special wedges and thresholding techniques are used to isolate the specific iris regions without eyelid and eyelash occlusions .Then the resultant iris portion alone is transformed into polar coordinate system for normalization process. Authors used Histogram equalization technique for enhancing the normalized iris image. Then, cumulative sum-based change analysis and hamming distance are employed for feature extraction and matching process. This method was tested on CASIA iris image database from Institute of Automation, Chinese Academy of Science (CASIA) with 108 different subjects. Iris localization and iris segmentation processes are exact and accurate, even if some of the iris images are occluded by eyelids and eyelashes. As the feature extraction process involves only cumulative-sum based method, which has successive addition and subtraction operations alone, less computational complexity is produced while compared with existing methods using Gabor and Wavelet transforms.

- Yung-Hui Li et.al introduced method for automatic iris mask generation. In this work, they used Figueiredo and Jain's Gaussian Mixture Models (FJ-GMMs) to model the underlying probabilistic distributions of both valid and invalid regions on iris images. They also explored possible features and found that Gabor Filter Bank (GFB) provides the most discriminative information for our goal. Finally, authors applied Simulated Annealing (SA) technique to optimize the parameters of GFB in order to achieve the best recognition rate. Experimental results showed that the masks generated by the algorithm increase the iris recognition rate on both ICE2 and UBIRIS dataset. They used a Gaussian Mixture Modeling (GMM) to model the posterior probability distribution of both iris texture and occlusion regions. GMMs has been widely used in all kinds of pattern recognition problems such as speech processing , human skin detection , real-time tracking , hazardous chemical agents detection , and bearing damage detection for induction motors. The advantage of GMM is its modeling ability and its mathematical equation is easy to evaluate; thus the classification speed is very high during the test stage.

This is useful in problem of automatic mask generation. This method only needs to use one training image from each class to get such a satisfactory result for estimating iris masks. Due to the easy evaluation of the Gaussian function, proposed method is very efficient in the test stage, which is another important advantage when being used in a practical online recognition system.

- V.Saravanan et.al. [5] Analyzed the iris biometric authentication because it has low error rates compared to other biometric authentication methods and its robustness of the algorithms provided. Various types of feature extraction are already available such as Haar wavelet transform, 1-d dyadic wavelet transform but they have limited application. This paper uses Gabor filters for feature extraction methods for iris authentication, which is more advantageous than available methods. Binary Hamming distance and Euclidean distance are used as matching algorithm for comparing the Feature extraction methods. Then Features are extracted. Optimized Gabor filter is used for iris recognition to reduce complexity and improve efficiency. The basic principle of the method is as follows: First, it locates the iris and fits the contour of lower eyelid, then makes normalization to the iris image and gets 512 columns multiplying 64 rows rectangular iris image, ensures the effective iris area adaptively. Second, makes segmentation according to the parameters of Gabor filter and adopts optimized multi-directional Gabor filter to make filter for each sub-block in the effective iris area, gets edge response of different directions. Analog devices Blackfin processor is used for the implementation of the iris verification system. ADSP-Blackfin processor is a dual core processor which is focusing on multimedia applications. From results, iris verification algorithm after implemented in a DSP processor is power efficient, and achieves fast verification rate compared to other algorithms.

- N.Mahadeo et.al. [6] Proceed their work by the elimination of reflection and the reduction of lighting variations in eye images. Artifacts such as defocus, reflections and lighting variations are present in the real life images of the eye. Localization of iris borders facilitates elimination of those artifacts, authors described the process of eliminating reflections followed by the implementation of an illumination invariance based technique for image quality improvement. After illumination they implemented the MSR algorithm. The MSR algorithm is suitable for eye images in different lighting conditions because it can achieve both dynamic range compression and tonal/lightness rendition and hence is particularly suited for eye images captured in different lighting conditions. A 2-D toroidal filter based on the 1-D Petrou-Kittler edge filter was used for pupil and iris localization. This model is further fine-tuned by taking into account the properties and characteristics of the pupil and the iris and their relation to each other. High performance is achieved on a large dataset non-ideal images from WVU.

- Kong [7] developed an algorithm which is derived from geometric properties of a convex polyhedral cone but does not depend on any prior knowledge (e.g., iris images). From this paper we can say that a template produced by Iris Code or its variants is a convex polyhedral cone in a hyperspace. Its central ray, which is a rough representation of the original biometric signal, can be computed by a simple algorithm that can be implemented in one MATLAB command line. The central ray is an expected ray and also an optimal ray of an objective function on a group of distributions. Authors used two iris databases, the UBIRIS.v1 and West Virginia University (WVU) iris databases , and one palm print database were used for testing the algorithms. They have used only red component of color images for evaluation as the iris texture in this component is the clearer. The palm print database contains 7, 500 images from the right and left palms of 250 persons. They extracted the central parts of palm prints. Iris Code was used as a tester by central rays of Ordinal Code. Central rays of Ordinal Code and the original images are matched using Iris Code. In each set of experiments, cross-matching between all original images was first performed, and estimated the corresponding genuine and imposter distributions. Then central rays were matched with their parent8 images and all other iris images from the same eye. Finally we can say that this paper reconstruct high quality images from templates as well as provide a deeper understanding of the geometric structures of Iris Code and its variants and investigate the risk from this geometric information.

- D. Sanchez and et.al [8] proposed a new model of a Multi-Objective Hierarchical Genetic Algorithm (MOHGA) which is based on the Micro Genetic Algorithm (μGA) approach for Modular Neural Networks (MNNs) optimization. The data is automatically divided into granules or sub modules, and chooses data for the training and testing phase. First, they generated a random population. This is divided in two parts: a non-replaceable and replaceable portion. The database of human Iris is used from the Institute of Automation of the Chinese Academy of Sciences. When the reinitialisation criterion is activated, two non dominated vectors are taken of the external memory which are compared with two vectors of the Replaceable portion. If the

two vectors taken of the replaceable portion are dominated by the others, those vector are replaceable for the two vectors of the external memory. This reinitializes the working population and establish the parameters of the genetic operators. This algorithm can be used to obtain good results using less data for the training phase.

- C Perez and et.al [9] developed a real-time robust method for detection of irises on faces with coronal axis rotation within the normal range of −40◦ to 40◦. This method allows head movements with no restrictions to the background. This method is based on anthropometric templates applied to detect the face and eyes. Key features of faces used by templates are elliptical shape, and location of the eyebrows, nose, and lips. For iris detection, a template following the iris–sclera boundary shape is used. The method was compared to Maio–Maltoni's and Rowley's methods for face detection on five video sequences (TEST 1). Also the method was assessed in an additional set of five video sequences for iris detection (TEST 2). This method was developed in three stages such as coarse face detection, fine face detection, and iris detection. First stage find the approximate face location within the image. Second stage detects the face location determining the face rotation angle and size, while in third to create generic templates ,eyes' relative location within the face limits was measured. This method can follow head movements with no restrictions to the background which is based on anthropometrical templates built with information from the face and eye region from the individuals. Authors compared this method with the method of Maio–Maltoni and Rowley's method for face detection, showing better results.. From the results ,this method can process frames at a rate near to 50 frames/s, and therefore it can be applicable in real time in a standard personal computer.

- Peng Lu and et.al [10] presented an iris detection and marking method based on Haar features from images of figures. First they applied Haar feature detection algorithm. In this first the RGB color images is converted into gray images, and the integral images were calculated corresponds to the gray images. Then simple Haar wavelet features was obtained in different levels of the integral images. Next to boost the classification the AdaBoost learning algorithm is applied , giving cascade of classifiers, which was used to detect objects. U-curves were obtained based on Haar features and Canny edge detection, and the sample points are further optimized and fitted to an ellipse using least squares method. The results showed that this algorithm gives improved accuracy and detection speed.

3. CONCLUSION

In this paper number of methods of iris recognition are reviewed . Various studies showed that the iris is so unique that no two irises are alike, even among identical twins, in the entire population. Iris recognition bas been acknowledged as one of the most accurate biometric modalities out of various biometrics such as finger and band geometry, face, ear and voice recognition because of its bib recognition rate. From this survey we can say that iris detection can be a best option for human authentication and for many other fields of security. Iris recognition is able to give accurate results for human identification.

REFERENCES

1) E. Elfakhrany,*Ben Bella S. Tawfik* 'IRIS Recognition using Conventional Approach' IEEE 9th international colloquium on signal processing and its applications, pp-89-94,8 - 10 mac. 2013, Kuala Lumpur, Malaysia

2) A. Radman, K. Jumari, N. Zainal,' Fast and reliable iris segmentation algorithm', IET Image Process.,Vol.7, Iss. 1, pp. 42–49, 2013.

3) R. Ramkumar, Dr. S. Arumugam, 'A Novel Iris Recognition Algorithm' IEEE ICCCNT',26th_28th July 2012, Coimbatore, India.

4) Yung-Hui Li, and M. Savvides, 'An Automatic Iris Occlusion Estimation Method Based on High-Dimensional Density Estimation' IEEE Transactions On Pattern Analysis And Machine Intelligence, Vol. 35, No. 4,Pp-784-796, April 2013.

5) V.Saravanan, R.Sindhuja , 'Iris Authentication Through Gabor Filter Using DSP Processor', Proceedings of IEEE Conference on Information and Communication Technologies , pp.568-571. 2013.

6) Nitin K. Mahadeo, Andrew P. Paplinski, Sid Ray,' Model-Based Pupil and Iris Localization', EEE World Congress on Computational Intelligence June, 10-15, 2012 - Brisbane, Australia.

7) Adams Wai-Kin Kong ,'Modeling IrisCode and Its Variants as Convex Polyhedral Cones and Its Security Implications IEEE Transactions On Image Processing, Vol. 22, No. 3,pp- 1148-1160, March 2013.

8) Daniela Sánchez, Patricia Melin, Oscar Castillo, Fevrier Valdez, 'Modular Granular Neural Networks

OptimizationWith Multi-Objective Hierarchical Genetic Algorithm For Human Recognition Based On Iris Biometric' IEEE Congress on Evolutionary Computation, pp772-778,June 20-23, 2013.Cancún, México.

9) Claudio A. Perez, Vanel A. Lazcano, and Pablo A. Estevez, 'Real-Time Iris Detection on Coronal-Axis-Rotated Faces', IEEE Transactions On Systems, Man, And Cybernetics—Part C: Applications And Reviews,Pp-971-978, Vol. 37, No. 5, September 2007 .

10) Peng Lu, Hui Xiang, Yanfei Dai, Wenxiu Zhang, 'Iris Detection and Marking Based on Haar Features', IEEE transaction ICALIP, pp-518-522,2010.

11) Chun-Wei Tan, Ajay Kumar, 'Towards Online Iris and Periocular Recognition under Relaxed Imaging Constraints', IEEE Transaction 2013.