Eye Colour Detection using image processing

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Abstract

Iris Recognition is one of the most challenging and fastest growing areas in the field of biometrics. This paper focuses about the brief summary of iris recognition system for identification and verification of iris images. This paper also provides the Comparative analysis of various preprocessing approaches such as Adaptive Histogram Equalization (AHE), Histogram Equalization (HE), Gamma, Log etc. Feature Extraction algorithms namely Discrete Cosine Transform (DCT), Discrete Wavelet Transform (DWT), Local Binary Pattern (LBP), HAAR transform and so on., for extracting the iris features and classification algorithms such as Support Vector Machine (SVM), Euclidean Distance (ED), Nearest Neighbor (NN) and so on.The popular public databases such as UPOL and CASIA were available to carry out the experiments. The results obtained by various algorithms/methods provide better accuracy in terms of their recognition rate.

Keywords—**Iris, AHE, LPQ, HAAR-Transform, DWT.**

INTRODUCTION

In today's world to secure the transmission of information, various technologies such as computer vision, pattern recognition, and statistical inference were considered. The purpose of using such technologies helps to make real-time, highly confident to recognize a person's identity by mathematical analysis of random-patterns. Biometric identifiers are unique to individuals which results more reliable in verifying the identity. Biometrics relates to human characteristics such as Physiological Characteristics includes fingerprint, palm- veins, face recognition, DNA, palm print, Hand geometry, Iris and so on. Behavioral characteristics relates to pattern of behavior of a person such as key.

For Biometric Identification, Iris recognition is an automated method, as iris complexpatterns are unique, stable and can be visible from far distance too, as it uses mathematical pattern-recognitiontechniques on video images of one or both iris of an

individual's. This distinguishes it from other biometrics,which can be difficult to recognize after years. Eye is externally visible highly protected internal organ of human body.

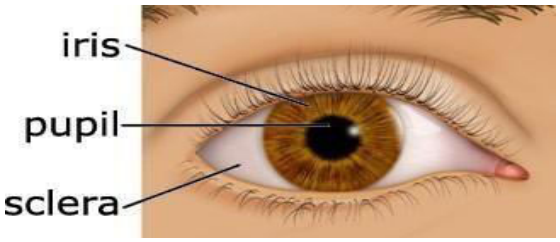

Figure: 1.1 Human Eye Diagram

Iris recognition biometric approach is been used in various fields like substituting for passports in automated border crossing, security screening in airports, accessing to restricted areas, school and hospital settings for matching the mother and infant in maternity cases. Compared to the various biometric techniques, iris recognition is considered as highly secured method in termsof accuracy as shown in figure: 1.2.

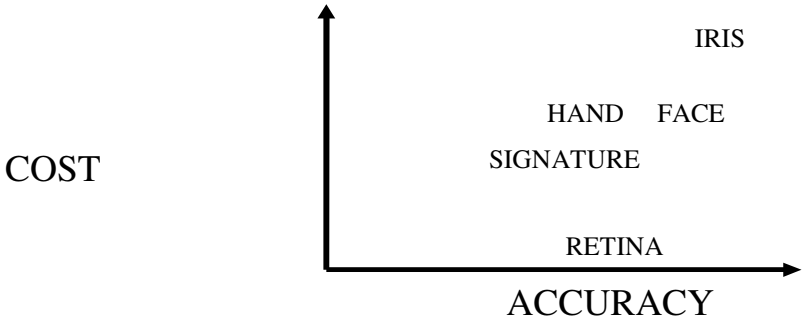

Figure 1.2: Comparison between cost and accuracy

Iris recognition system consists of two important stages: Enrollment Section and Verification Section. The Enrollment Section includes image acquisition which computes sequence of Iris images using physical device such as High Definition (HD) Cameras and Sensors. The captured images from these devices should clearly concentrate on the retina eye especially Iris part, Sclera, pupil-part, lower and upper eye lid. Segmentation is a process of finding the iris in an eye image where Iris and pupil were considered as two circles using Circular.Hough transform that helps to localize the Iris and pupil part. After the

localization process now then Linear Hough Transform is applied to detect and remove the noise region in the iris. Variations in the eye like pupil dilation and the other inconsistence nature in the image, iris normalization is needed. Normalization process involvesun- wrapping the iris and converts it into its polar equivalent using Dougaman's Rubber sheet model, but fails to compensate for rotational inconsistencies.

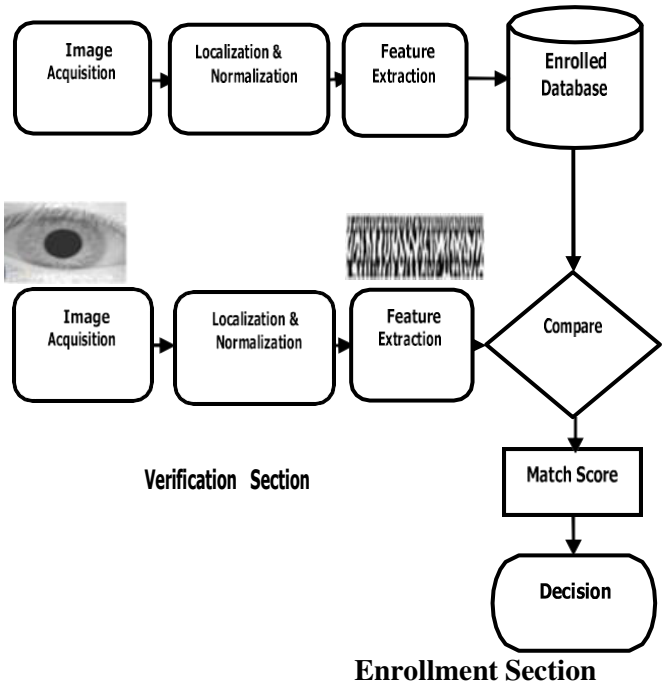

Figure 1.3: Iris Recognition System

Various pre-processing approaches such as HE, AHE, Gradient, Gamma, DOG, LOG were applied to enhance the quality of iris image. In Feature Extraction approach features of iris are extracted using different algorithms such as DWT, DCT, LOG-Gabor-Filter, LBP,LPQ, HAAR-Wavelet etc., and the extracted features were stored in database.

In Verification section, the extracted features from real-time iris image will be compared with an enrolled database images using different classifiers such as Hamming distance, Euclidian distance, SVM, NN etc., that helps to distinguish between genuine and candidate. Depending upon the matching score level result, decision to accept or reject the images.

The rest of the paper is organized as follows: Section-II presents detailed study of various algorithms/methods reported in various publication records and research works. Section-III presents Observations of different algorithms for Iris recognition with various databases. Section-IV discusses the conclusion and further work to be carried to improve the

accuracy of Iris recognition.

RELATED WORK

Ankita Satish *et.al*., considers Canny edge operator is used for segmentation which results in detecting edges with threshold values. Gabor Filtering is used extracting the features and K-out-of-n as a classifier for pattern matching. The experiments were conducted on CASIA database v2.0. The FAR and FRR was calculated for K-out-of-n classifier gave better accuracy of 95% and 99% accuracy for the proposed system using EuclideanDistance classifier.

Mohtashim Baqar *et.al*. proposed Iris recognition method based on deep learning. Gaussian filtering is used for preprocessing technique that helps to remove specular highlight from an Iris image. Weighted centroid-of-eye is used as reference for extractingcontour points. RVLR-NN is used as classifier for classification purpose. Experiments were conducted on CASIA Iris database and the results obtained from the proposed model shows superior results with recognition rate of 99.92%.

B H Shekar *et.al*.,proposed novel technique for feature extraction and encoding purpose. Extracting the features from both left and right iris where further encoding procedure should be carried separately for both of them that perform bit level fusion. Experiments were conducted on IITD, MMU v-2 and CASIA v-4 database. The results obtained from the proposed technique gets better recognition rate of 99%, 95.62% and 91.27% respectively.

Kavita Joshi *et.al*., conveyed the maximum reduction in FAR and FRR were noticed. Canny Edge Detection approach is used for segmentation of Iris image which helps to localize the inner iris boundary that in turn locates the outer iris boundary. ID Log-Gabor Filter and HAAR Wavelet transform were used for extracting the features. Hamming Distance is used as classifier for matching purpose. Experiments were conducted on CASIA- Iris v-4 database and the results obtained shows the improvement in its FRR but it could not reduces to zero. So the results obtained from the combination of Gabor and HAAR feature extraction method shows better in their FRR.

Rocky et.al., author is to identify the iris with the help of databases among the non- ideal and ideal iris. Median and Gaussian filters were used for preprocessing technique to enhance the image. 3D GLCM was used for feature extraction and then the features were trained using Elman Recurrent Neural Network algorithm. Experiments were conducted on CASIA v4 database for non-ideal iris and CASIA v1 for ideal iris databases and the results obtained

shows improvement in its recognition rate

Habiebeh Naderi et.al, author presented a tri- modal biometric recognition system combining Iris, Palm- print, and fingerprint. Canny edge detection and Hough Transform used to detect and select the area of interest.

Wavelet transform and Gabor filter to extract features of the image. Hamming Distance used for classification purpose. Experiments were conducted and shows improved better rateof MIR with CASIA database.

Chiara Galdi et.al., author gave a different and fast method to recognize the iris in mobile devices by considering their Experiments were conducted and show improved results on Apple I phone 5(ip5) and Samsung galaxy-s4 (gs4) with AUC rate of 0.98 and 0.80 respectively.

Sarika Solanke et.al., author gave an idea on characteristics of iris recognition technology to make it more attractive to use as an authenticate system. Average filter and median filter are used to enhance the iris image.1-D log polar Gabor transform and DCT to extract the features of an iris image. Hamming Distance classifier is used for classification purpose. Experiments were conducted and shows improved better rate of 9.5% on UBIRIS V2, 4.3% on FRGC databaseand 25% on CASIA V4 database.

OBSERVATIONS OF VARIOUS ALGORITHMS OF IRIS RECOGNITION

TABLE I. Comparative Analysis along with the future scope of various methods of iris recognition.

Author	Method /Model	Preprocessing	Extraction	Classifier	Data base	Recognition Rate	Future Scope
Ankita.Satish et.al[1]	Swarm Optimization Algorithm	Canny-edge detection	Gabor filtering	K-out-of-n ED	CASIA	95% 99%	Algorithms should develop to robust in its results.
Mohtashim Baqar et.al[2]	Deep-Belief networks for Iris recognition based on Contour Detection	Canny-edge detection & Gaussian Filtering	Depending upon filter response contour points are extracted	RVLR-NN	CASIA	99.92%	Need extend to larger database and new deep method should be developed to get accuracy.
Kavita.Joshi et.al[4]	Robust Intrusion Detection system	Canny-edge detection & HAAR transform	Log Gabor Wavelet and HAAR Wavelet	Hamming Distance	CASIA	100%	Work to be carried for other artificial intelligence techniques to improve FRR.
Rockey.Yefrenes.Dillaket.al[5]	Iris Recognition using two databases	Gaussian Filter CHT method	3D-GLCM	NN	CASIA v4 CASIA v1	91% 94.22%	Work to be carried with other approaches like NBP method.
Habiebeh naderi et. al[6]	Fusing both Iris, palm-print and fingerprint	Hough Transform and Canny detection	Wavelet Transfom & Gabor filter	ED	CASIA	97%	.....

CONCLUSION

Iris Recognition is one of the most challenging and fastest growing areas in the field of biometrics. This paper gives the brief summary of Iris recognition system that includes iris detection, feature extraction and classification for identification and verification of iris Images. And also provides the Comparative Study of various preprocessing and feature extraction algorithms for Iris recognition. The result obtained by the various algorithms provides better accuracy in terms of their recognition rate.

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REFERENCES

[1]. Ankita Satish Adhau and D Shedge, "Iris Recognitionmethods of a Blinked-Eye inNon-ideal Condition," IEEE International conference on Information Processing, ISBN4673-7758, pp. 75-79,2015

[2]. Mohtashim Baqar, Azfar Ghani, Azeem Aftab, Saira and Sajid Yasin, "Deep Belief Networks for Iris Recognition based on Contour Detection," IEEE International conferenceon Open source Systems andTechnologies, ISBN 5090-5586, pp. 72-77, 2016.

[3]. B H Shekar, Sharada S Bhat, "Steerable Riesz Waveletbased Approach for Iris Recognition," IEEE AsianConference on Pattern Recognition, ISBN 4799-6100, pp. 431-436, 2015.

[4]. Kavita Joshi and Sunil Agrawal, "An Iris RecognitionBased Robust Intrusion Detection System," IEEE Annual India Conference, ISBN 4673-6540, pp. 1-6, 2015.

[5]. Rocky Yefrenes, Dillakr Martini and Ganantowe intiri, "A Novel Approach for Iris Recognition," IEEERegion Symposium, ISBN 5090-0931, pp. 231-236,2016.

[6]. Habibeh Naderi, Behrouz Haji Soleimani, Babak Nadjar Araabi and Hamid Soltanian Zadeh, "Fusing Iris, Palmprint and Fingerprint in a Multi-Biometric Recognition System,"IEEE International Conference on Computer and Robot vision, ISBN 5090-2491,pp. 327-334, 2016.

[7]. Chiara Galdi and Jean-Luc Dugelay, "Fusing Iris Colour and Texture information forfast Iris Recognition on mobile devices," IEEE International conference on Pattern Recognition, ISBN 50903- 4847, pp. 160-164, 2016.