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RESEARCH ARTICLE

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IRIS RECOGNITION SYSTEM USING 2-D DCT AND HAMMING DISTANCE TECHNIQUES

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ABSTRACT

Biometric is a part of science which helps to provide verification and identification of any individual by using different algorithms. Biometrics is classified in to two parts: physiological and behavioral. Physiological part includes hand, DNA, Iris, fingerprint and face. Behavioral part consists of keystroke, signature and voice. This paper works on implementation and verification processes by using Iris patterns. In this work two processes are performed i.e. Implementation and Verification. Results are evaluated in terms of FAR, FRR and Recognition Rate.

Keywords-Iris recognition, UBIRIS, 2-D DCT, Canny edge detector, Hamming distance.

I. INTRODUCTION

A biometric system can be utilized in two contexts: verification and implementation.

Verification is a process to match one-to-one person's identity. In this process, system tries to verify identity of a person by providing a new data template to the system as input, the system calculate the distance between the newly taken input data and its corresponding gallery sample (previously stored in the database), then it compares the computed distance with a Hamming distance inner class value. If the measured distance issmall then the new sample is accepted, otherwise it is rejected. If an input data template and the stored template are from the same subject then it is known as genuine person and if the input data and the stored data are not from the same subject then it is known as imposter. A Receiver Operating Characteristic (ROC) curve plots the comparison curve between FAR and FRR. The Equal Error Rate (EER) is obtained by using FAR and FRR values. A smaller EER indicates a better performance of the system in case where FAR became equal to FRR. Implementation process is performed in Iris Recognition System to provide authentication to a new user. In this context, feature extracted data template of the user get saved in database. The percentage of total number of false accepted images is known as False Acceptance Rate. The percentage of false rejected images is known as False Rejection Rate. The percentage of true accepted images is known as Recognition Rate.

II. ADVANTAGES OF IRIS RECOGNITION TECHNOLOGY

1) Iris patterns remain unique throughout person's life.

2) No physical contact of any hardware device with eye is required, while capturing eye image of any person.

3) Verification process time of Iris

Recognition System is less (in seconds).

III. LITERATURE REVIEW

Table I: Literature review

Researchers Name	Journal	Algorithms Used	Results
Aparna Gale, S.S.Salankar [1]	International Journal of Engineering and Advanced Technology, ISSN: 2249 – 8958, Volume-4 Issue-4, April 2015	Hough transform, Daugman rubber sheet model, Haar transform, Block sum algorithm, Hamming distance technique. DATABASE: CASIA	FAR=5% FRR=4% RR=95.5%
Saloni Chopra [2]	International Journal of Scientific Research Engineering & Technology (IJSRET), ISSN 2278 – 0882, Volume 3, Issue 3, June 2014	Canny edge detector, Daugman rubber sheet model, 2-D Reverse biorthogonal wavelet transform, Hamming distance. DATABASE: UBIRIS	FAR=0.22% FRR=5.33% RR=97.22%
AnapManishaBaban [3]	International Journal of Application or Innovation in Engineering & Management, Volume 3, Issue 5, May 2014	Hough transform, 2-D log Gabor filter, Hamming distance technique. DATABSE: CASIA	FAR=0.07% FRR=0% RR=99.96%
Mohd. T. Khan [4]	Contemporary Computing (IC3), Sixth International Conference, 8-10 Aug. 2013, Publisher: IEEE	Freeman's chain code, 1-D log Gabor filter, Hamming distance technique. DATABASE: UBIRIS	FAR=3.87% FRR= 9.29% RR= 93.42%
Shabaan A. Sahmoud [5]	Elsevier Ltd., DOI: 10.1016/j.patcog.2013.06.004, 2 June 2013	K-means clustering, Circular Hough transform, Libor Masek technique, Hamming distance. DATABASE: UBIRIS	FAR=1.5% FRR=5.82% RR=96.34%

IV. METHODOLOGY

Methodology is divided into two parts: implementation and verification.

A) Implementation process: This process helps to provide authentication to a new person by storing new binary data template in database.

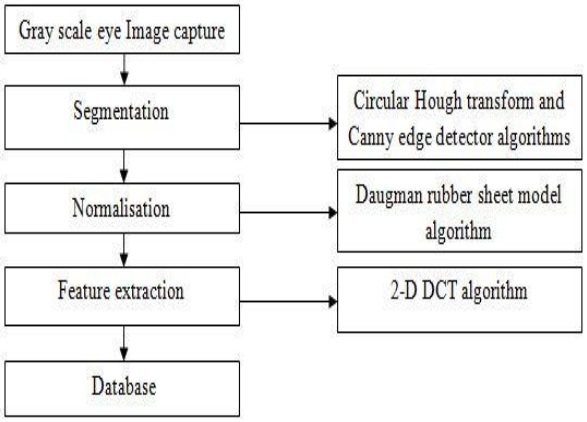

Figure 1:Implementation process

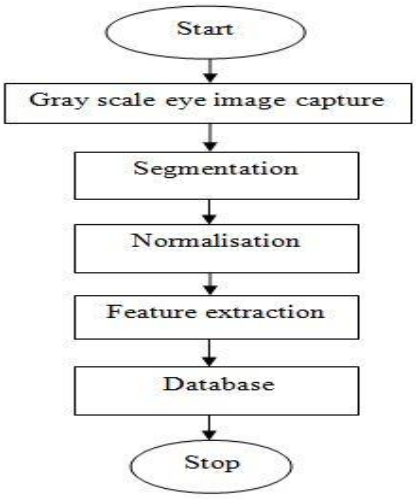

Figure 2: Implementation flow chart

B) Verification process: This process helps to verify the identity of any person by comparing new data template with stored data template.

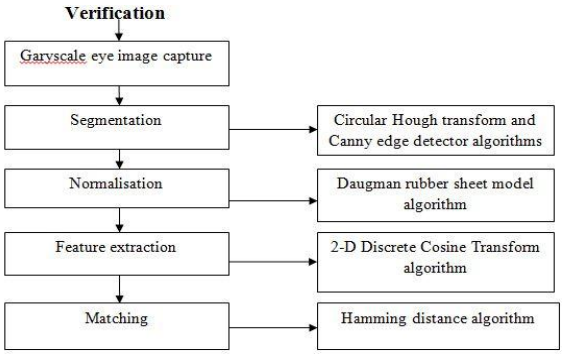

Figure 3: Verification process

V. PROPOSED WORK

A) Implementation:There are three steps involved in implementation process explained below. UBIRIS database grayscale images are captured by using Nikon E5700 camera.

1) Segmentation: In this segmentation grayscale eye images are segmented by using Canny edge detector algorithm.

2) Normalisation: In this step Iris region in radial form is transformed into angular form by using Daugman rubber sheet model.

3) Feature extraction: In this step 2-D DCT algorithm is used which helps to divide image into 16*16 matrix and compress the pixel values. Further compressed image is converted into binary form by usingbinarisation method. These binary data templates are stored in database.

B) Verification: In verification new grayscale image is provided to system as input. Process involves four steps:

1) Segmentation: New input image is segmented as shown in figure (5).

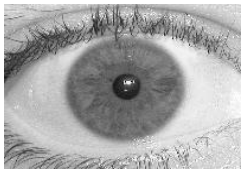

Figure (4): Input Grayscale image

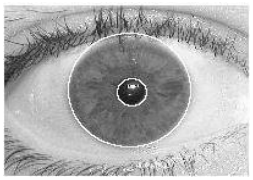

Figure (5): Segmented eye image

2) Normalisation: Segmented image is normalized and features get enhanced by histogram equalization.

Figure (6): Normalised Iris image

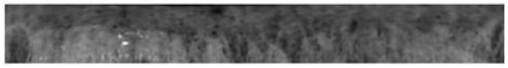

Figure (7): Cropped Iris image

Figure (8): Final features enhanced image

3) Feature extraction: Features are extracted by using 2-D DCT algorithm and converted into binary data template.

4) Matching: In this step, Hamming distance algorithm is used which helps to match new input data template with previously stored data template in database by using following equation.

$$HD = \frac{1}{N}\sum_{j=1}^{N} X_j \oplus Y_j$$

If Hamming distance between new template and stored template is less than threshold, then person is genuine otherwise imposter. In the present case, the person is found genuine.

VI. IMPLEMENTATION RESULTS

System is tested on 200 UBIRIS grayscale images by using MATLAB R2012a. Results are evaluated in terms of FAR, FRR and RR.

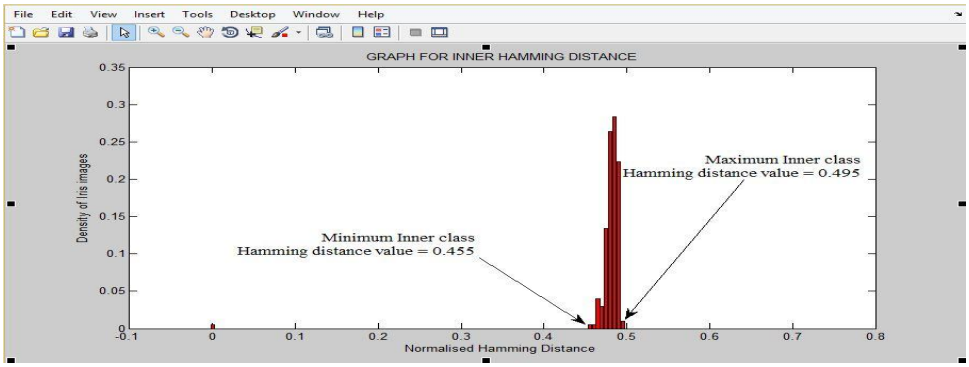

Figure (9): Inner class Hamming distance graph

Minimum Inner class HD is 0.455 and maximum HD is 0.495 as shown in figure (9).

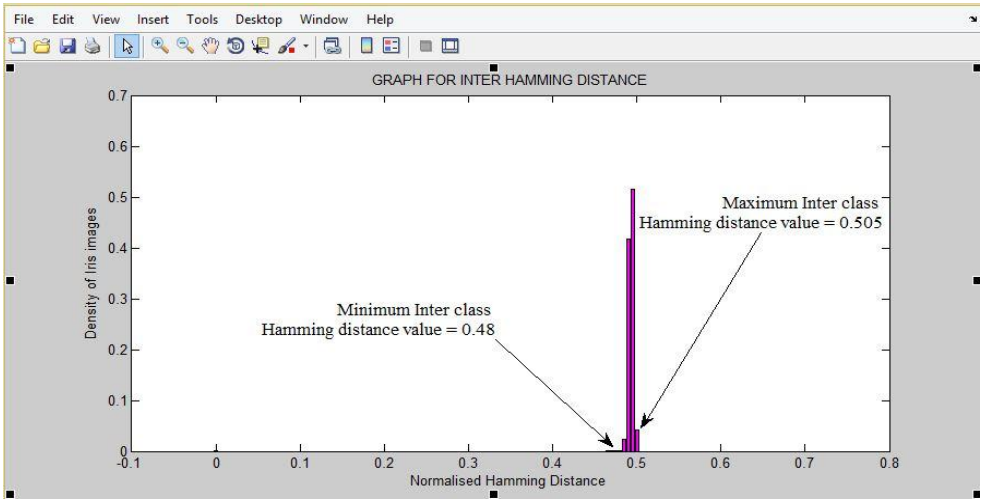

Figure (10): Inter class Hamming distance graph

Minimum Inter class HD is 0.48 and maximum HD is 0.505 as shown in figure (10).

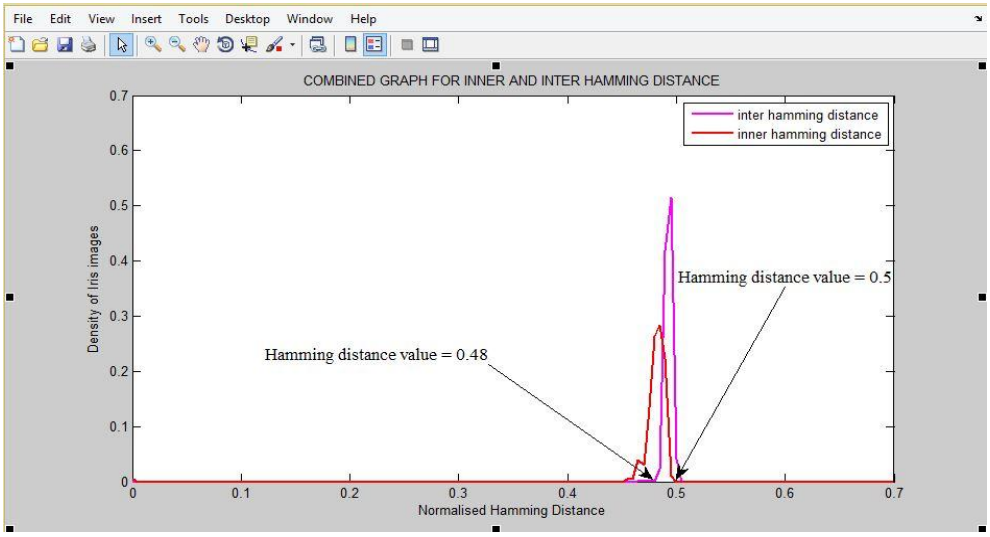

Figure (11): Combined Inner and Inter Hamming distance graph

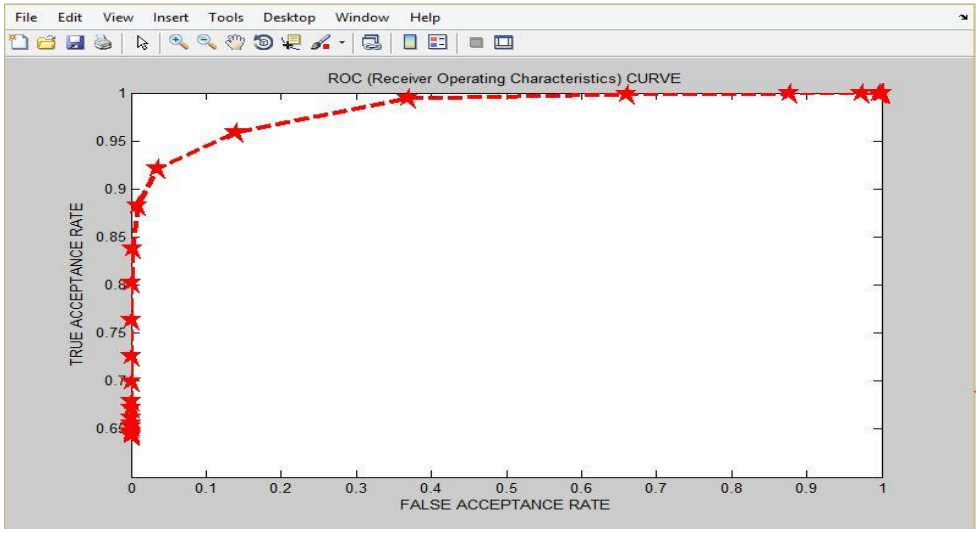

Figure (12): ROC curve(Receiver Operating Characteristics)

ROC curve shows high True Acceptance Rate and low False Acceptance Rate.

Table 2: Comparison table

Researchers name	Recognition Rate	FAR	FRR	Database
Saloni Chopra	97.22%	0.22%	5.33%	UBIRIS
Proposed work	99.99%	0.0087%	0%	UBIRIS

VII. CONCLUSION

This paper presents an Iris Recognition System with high Recognition Rate and low FAR, FRR values. In this work Canny edge detector, Daugman rubber sheet, 2-D DCT and Hamming distance algorithms are used. Comparison table is mentioned which shows better results of proposed work than previous work on UBIRIS database.

VIII. REFERENCES

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