International Journal of Scientific and Technical Advancements
IJSTA
ISSN: 2454-1532

Comparison of Moving Average Filter based Iris Recognition on CASIA and UBIRIS

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***Abstract*—**Human Iris is one of the most efficient and secured biometric parameter available today. In this paper, the John Daugman rubber sheet model along with the use of moving average filters has been used to evaluate the performance of iris recognition system. The results are tested on two different iris databases namely CASIA and UBIRIS in MATLAB and the comparison results are graphically represented.

***Keywords*—**Iris; Daugman; CASIA; UBIRIS; MATLAB.

I. INTRODUCTION

An increasing attention is been given to security systems in the past decade. The automated personal identification systems based on biometrics have played a very important role to intensify the levels of security systems. The biometric systems are thus receiving an extensive attention in the evolution of high level security systems. Multiple biometric systems have been like fingerprints, face, hand geometry, speech, etc. have been used over the years to enhance the security systems, but most of these biometrics deteriorate over a human life span and become difficult to recognize properly or completely unrecognizable. The answer to his problem is use of human iris as a biometric. The human iris is the structure which appears as the colored part of the human eye and is responsible for the regulation of the size of the pupil, which in turn regulates the amount of light which enters the eye [1]. The purpose of iris recognition is to recognize a person from his or her iris prints. In fact, iris prints are characterized by high level of stability and distinctiveness. Every individual has a unique iris and the difference even exists between identical twins and between left and right eye of same person. The pioneer work was done by John Daugman, which consists of using a Daugman's integro-differential operator, circular Hough transforms to auto segment the iris image and 2D Gabor filter to normalize the segmented image. The hamming distance is used as the recognition criteria.

II. METHODOLOGY

The block diagram of typical iris recognition system is shown below.

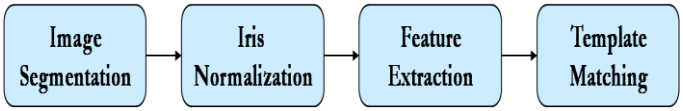

Fig. 1. Block diagram of iris recognition system.

The Iris recognition system consists of four major stages as shown in figure 1. The first stage is iris segmentation which includes localization of iris image from eye image and isolation of eyelids, eyelashes and reflection areas in the eye from the iris. This is achieved using Daugman's integro-differential operator and circular hough transforms. The second stage is iris image normalization. The segmented iris image obtained in the first stage has to be normalized to eliminate the dimensional inconstencies between iris regions. This is done by using Daugman's rubber sheet model shown in figure 2 [2].

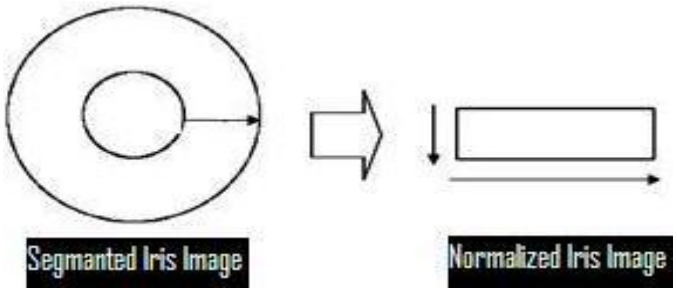

Fig. 2. Representation of Daugman's rubber sheet model.

The third stage is the iris feature extraction and encoding. The features of iris are encoded by convolving the normalized iris region with Gabor filters and phase quantization to produce biometric iris template. The fourth stage is template matching. The hamming distance is used as the matching criteria and it gives the disagreement of number of bits between two biometric templates. The final testing is to be performed to test efficiency of the developed system on the iris database [2]. In this research the iris recognition system has been modified to improve feature encoding using moving average filters to eliminate high frequency noise components from the iris image and improve the working of the recognition system. The system modification shown here is developed using MATLAB and is tested on two different databases CASIA (Chinese Academy of Sciences' Institute of Automation) iris image database and UBIRIS (Universidade da Beira Interior) iris database and the results are to be compared. The proposed modification is shown in figure 3.

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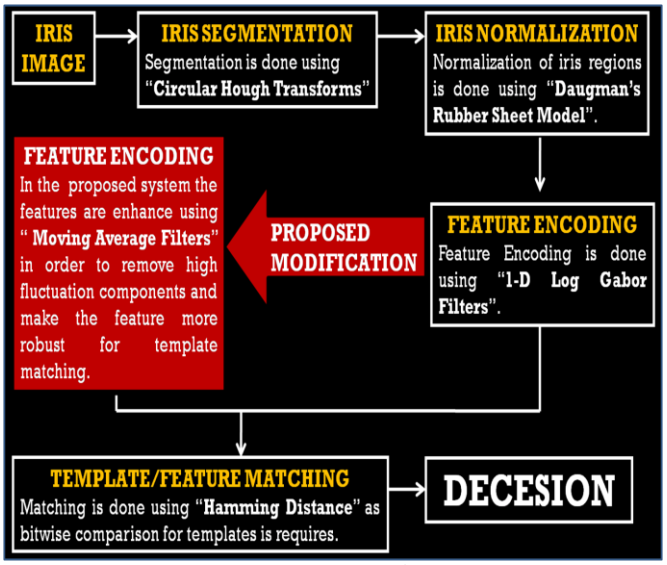


Fig. 3. Proposed modification.

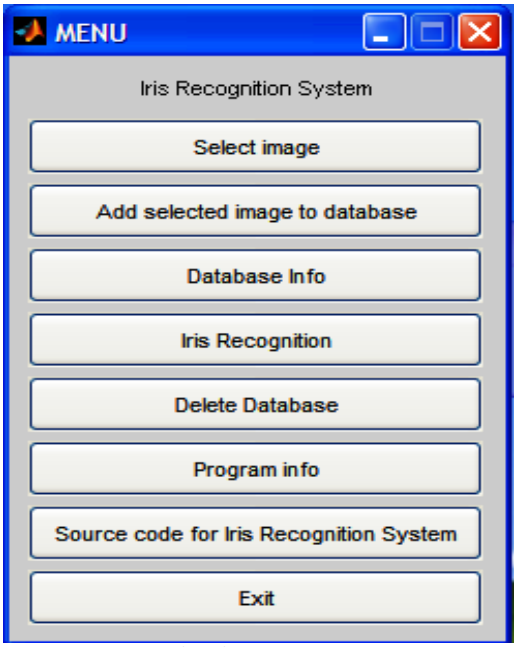


Fig. 4. User-Interface for iris recognition system.

III. RESULTS

The developed user-interface is shown in figure 4. Test Results for 10 images of CASIA database are tabulated as shown in figure 5. Test results for 10 images of UBIRIS database are tabulated as shown in figure 6.

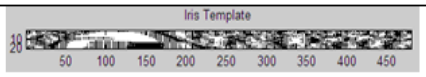
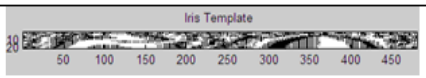
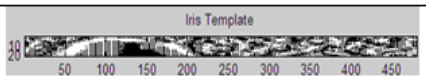
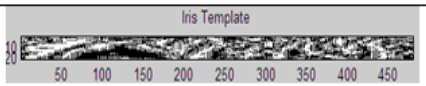
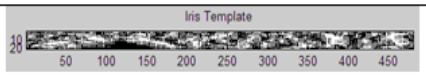
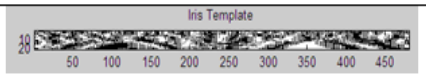
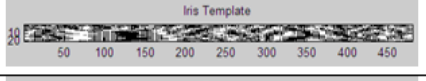
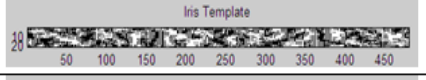
Test Number	Input Image (.bmp)	Iris Template Generated	Input Id	Recognized Id	Hamming Distance
1.	001_1_1		01	01	4.777964e-001
2.	002_1_2		02	02	4.648855e-001
3.	003_1_3		03	03	4.566337e-001
4.	004_2_1		04	04	5.008844e-001
5.	005_2_2		05	05	4.722335e-001
6.	006_2_3		06	06	4.514937e-001
7.	007_2_4		07	07	4.560754e-001
8.	008_1_1		08	08	4.705997e-001
9.	009_1_2		09	09	4.795295e-001
10.	0010_1_3		10	10	4.456456e-001

Fig. 5. Test results for CASIA database.

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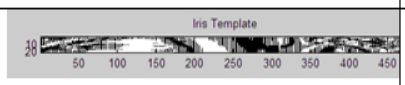
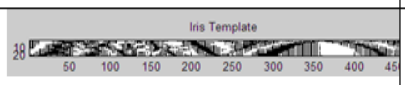
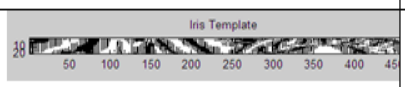
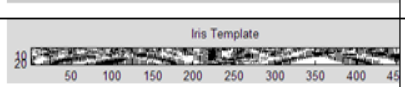
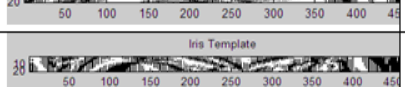
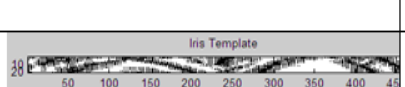
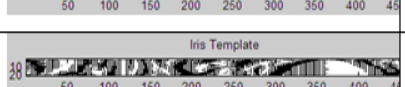
Test Number	Input Image (.bmp)	Iris Template Generated	Input Id	Recognized Id	Hamming Distance
1.	Img_1_1_1		01	01	4.608330e-001
2.	Img_2_1_2		02	02	4.763068e-001
3.	Img_3_1_3		03	03	4.656489e-001
4.	Img_4_1_4		04	04	4.203980e-001
5.	Img_5_1_5		05	05	3.701123e-001
6.	Img_6_1_1		06	06	-
7.	Img_7_1_2	-	07	ERROR	ERROR
8.	Img_8_1_3		08	08	4.400607e-001
9.	Img_9_1_4		09	09	4.597930e-001
10.	Img_10_1_5	-	10	ERROR	ERROR

Fig. 6. Test results for UBIRIS database.

The results analysis for 10 different images from each of the database i.e CASIA as well as UBIRIS are tested and compared. The system performed well for all 10 images from CASIA database but resulted in error outputs in two diffeent images of UBIRIS database.

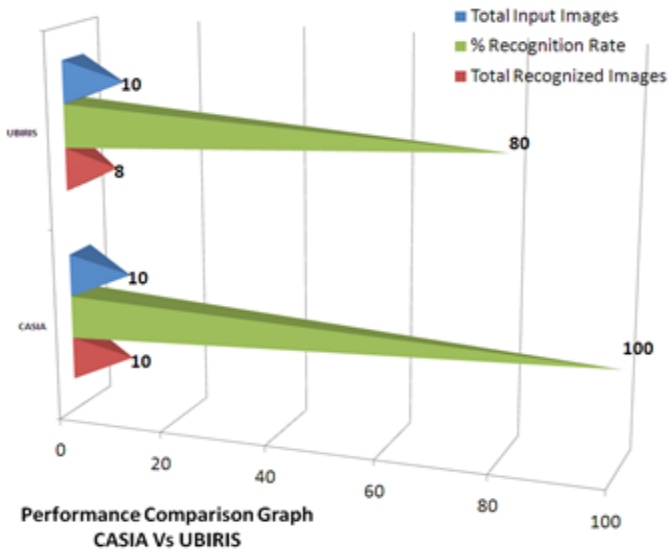


Fig. 7. Performance comparison CASIA vs UBIRIS.

The performance comparison of the developed iris recognition system on 10 different images from CASIA Database and UBIRIS database is graphically illustrated in the figure 7.

IV. Conclusion

The initial testing phase of the iris recognition system shows that system performed with 100 % accuracy on 10 input images from CASIA database and 80 % accuracy on 10 input images from UBIRIS databases. The further evaluation of the developed system is required to be done for more number of input images.

References

[1] http://www.disabled-world.com/artman/publish/eye-color.shtml.
[2] L. Masek, "Recognition of human iris patterns for biometric identification," The University of Western Australia, pp. 04-24, 2003.

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