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Performance & Analysis of Effective Iris Recognition System Using Independent Component Analysis

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ABSTRACT

To remove artifacts, two post processing techniques that carry out optimization in the Fourier domain are developed. Decompressed iris images obtained from two public iris image databases are evaluated by visual comparison, two objective image quality assessment metrics, and eight iris recognition methods. To improve the efficiency, sensitivity and reduce the complexity. In existing system use the Principal component analysis will work with different parameters in the image in sequence manner and independent component analysis will work with different parameters in the image in same time, but the output is not reliable for a large set of images, in neural network, for each and every time, the large set of feature for image database get loaded for training process, it will increase the time complexity of the whole system. In this proposed system we use the ICA (Independent Component analysis) and Gabor filter to improve the sensitivity, specificity and reducing time complexity in the existing system. The concept of Gabor filter will analysis the input image in several phases and pick a better one through 500 iterations. A new approach for personal identification based on iris recognition is presented in this paper. The core of this paper details the steps of iris recognition, including image processing, feature extraction and classifier design. This paper is implemented using MATLAB

KEY WORDS: iris code, gabour filter, biometrics, feature extraction.

1. INTRODUCTION

The iris is the annular region of the eye bounded by the pupil and the sclera (white of the eye) on either side. The visual texture of the iris is formed during fetal development and stabilizes during the first two years of life. The complex iris texture carries very distinctive information useful for personal recognition. The accuracy and speed of currently deployed iris-based recognition systems is promising and point to the feasibility of large-scale identification systems based on iris information. Each iris is distinctive and, like fingerprints, even the irises of identical twins are different. It is extremely difficult to surgically tamper the texture of the iris. Further, it is rather easy to detect artificial irises (e.g., designer contact lenses). Although, the early iris-based recognition systems required considerable user participation and were expensive, the newer systems have become more user-friendly and cost-effective.

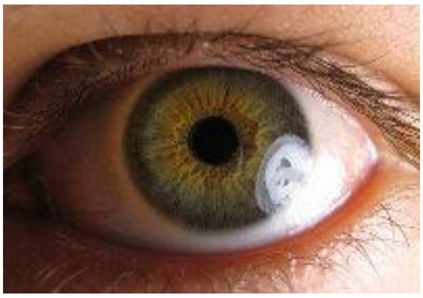


Figure.1.Iris Image

Figure 1 shows the image of iris image. The iris is colored, thin, circular structure in the eye. The iris is responsible for controlling the diameter and size of the pupil. The iris is a muscle within the eye, which regulates the size of the pupil and thus controlling the amount of light that enters the eye. The iris is the colored part of the eye. A biometric system is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database. Biometrics is the science and technology of measuring and analyzing biological data. In information technology, biometrics refers to technologies that measure and analyze human body characteristics, such as DNA, fingerprints, eye retinas and irises, voice patterns, facial patterns and hand measurements, for authentication purposes. The iris is the elastic, pigmented, connective tissue that controls the pupil. Once fully formed, the texture is stable throughout life. It is the only internal human organ visible from the outside and is protected by the cornea. The iris of the eye has a unique pattern, from eye to eye and person to person. An iris scan will analyze over 200 points of the iris, such as rings, furrows, freckles, and the corona and will compare it a previously recorded template. Glasses, contact lenses, and even eye surgery does not change the characteristics of the iris. To prevent an image /

photo of the iris from being used instead of a real "live" eye, iris scanning systems will vary the light and check that the pupil dilates or contracts.

Existing System: Principal component analysis is the simplest of the true eigenvector-based multivariate analyses. PCA is closely related to factor analysis (Adams, 2012). CCA is the Once region boundaries have been detected, it is often useful to extract regions which are not separated by a boundary (Daugman, 2007). Any set of pixels which is not separated by a boundary is call connected. Each maximal region of connected pixels is called a connected component. The set of connected components partition an image into Segments. Image segmentation is a useful operation in many image processing applications (Shad and Ross, 2006). A neural network consists of an interconnected group of artificial neurons, and it processes information using a connectionist approach to computation. In most cases a neural network is an adaptive system that changes its structure during a learning phase. Neural networks are used to model complex relationships between inputs and outputs or to find patterns in data (Z. Sun, 2005).

Proposed System: In our proposed system we use the ICA (Independent component analysis) and Gabor filter to improve the sensitivity, specificity and reducing the time complexity in the existing system. The concept of Gabor filter will analyze the input image in several phases and pick a better one through 500 iterations. The number of iterations is our wish, according to the image size and image quality parameters. (500 iterations are recommended for natural images and 850 iterations are recommended for medical images). Independent component analysis is used to process the different parameters in the image in parallel manner

Data Flow Diagram: A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. Often they are a preliminary step used to create an overview of the system which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).

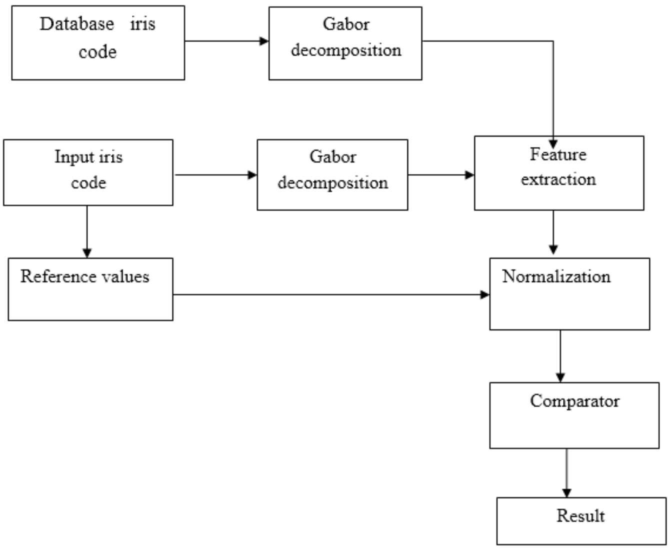


Figure.2.Schematic diagram of the decompression scheme

Figure 2 shows the schematic diagram of the decompression scheme. The black arrows indicate, respectively, the information flow of the decompression process and the information flow of the preparation of training images.
Module1: Module diagrams are used to show the allocation of classes and objects to modules in the physical design of a system, that is module diagrams indicate the partitioning of the system architecture.

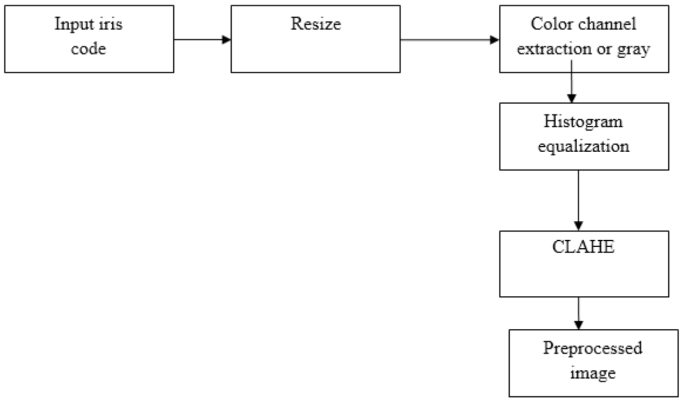


Figure.3.Schematic diagram of the preprocessing scheme

Figure 3 shows the schematic diagram of the preprocessing scheme. The black arrows indicate, respectively, the information flow of the preprocessing process and the information flow of the preparation of training images.

Input Design: The iris is a muscle within the eye, which regulates the size of the pupil and thus controlling the amount of light that enters the eye. The iris is the colored part of the eye.

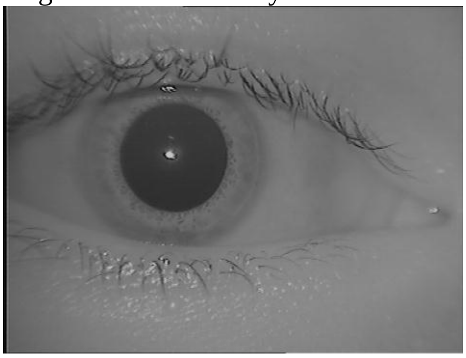


Figure.4.IrisImage

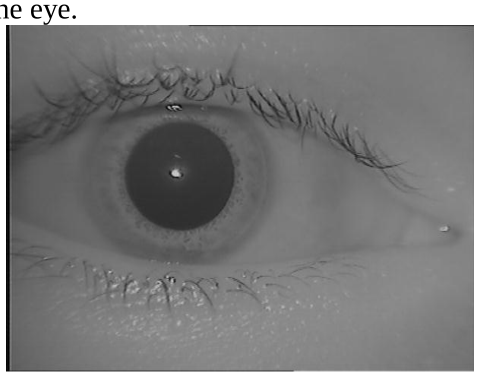


Figure.5.Input Iris Code

The Figure 4 shows the iris image of input image. Iris recognition refers to the automated method of identifying or confirming the identity of a subject by analyzing the random pattern of the iris. Iris recognition is relatively young, being only commercially developed the last decade mostly due to previous patent limitations.

System Implementation: In our proposed system we use the ICA (Independent component analysis) and Gabor filter to improve the sensitivity, specificity and reducing the time complexity in the existing system. The concept of Gabor filter will analyze the input image in several phases and pick a better one through 500 iterations. The number of iterations is our wish, according to the image size and image quality parameters.(500 iterations are recommended for natural images and 850 iterations are recommended for medical images).

Input Iris Code: The Figure 5 shows the input image. The input iris image is a gray image. It is of default size 576*768. For our convenience, the input iris image is resized to 512*512.

Gabor Decomposition: Gabor filter will analyze the input image in several phases and pick a better one through 500 iterations. The number of iterations is our wish, according to the image size and image quality parameters. (500 iterations are recommended for natural images and 850 iterations are recommended for medical images).

Data Base: A database is a collection of information that is organized so that it can easily be accessed, managed, and updated. In one view, databases can be classified according to types of content: full-text, numeric, and images. The data are typically organized to model relevant aspects of reality in a way that supports processes requiring this information (for example, finding a hotel with vacancies).

Feature Extraction: In this feature extraction methods find out the Mean, Variance, Energy, skewness and Kurtosis. Mean**:** Average or mean value of array. Variance**:** Compute variance of input or sequence of inputs. Skewness**:** Skewness is a measure of the asymmetry of the data around the sample mean. If skewness is negative, the data are spread out more to the left of the mean than to the right. If skewness is positive, the data are spread out more to the right. The skewness of the normal distribution (or any perfectly symmetric distribution) is zero. The skewness of a distribution is defined as

$K = E(x-\mu)3 \;/\; \sigma 3$ .... (1)

Where μ is the mean of x, σ is the standard deviation of x, and E(t) represents the expected value of the quantity t. skewness computes a sample version of this population value.

Kurtosis; Kurtosis is a measure of how outlier-prone a distribution is. The kurtosis of the normal distribution is 3. Distributions that are more outlier-prone than the normal distribution have kurtosis greater than 3; distributions that are less outlier-prone have kurtosis less than 3. The kurtosis of a distribution is defined as

$K = E(x-\mu)^4 / \sigma^4$...................... (2)

Where μ is the mean of x, σ is the standard deviation of x, and E(t) represents the expected value of the quantity t. kurtosis computes a sample version of this population value.

2. RESULTS

The input iris image is a gray image. It is of default size 576*768. For our convenience, the input iris image is resized to 512*512.

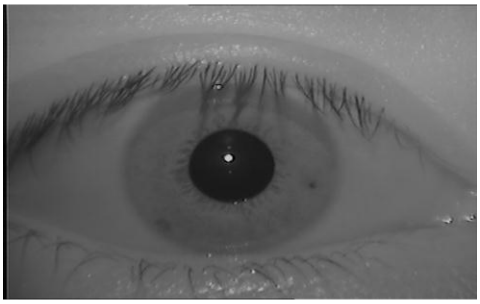


Figure.6.Input Image of the Iris

The Figure 6 shows the input image. Iris recognition refers to the automated method of identifying or confirming the identity of a subject by analyzing the random pattern of the iris.Pre-processing methods use a small neighbourhood of a pixel in an input image to get a new brightness value in the output image. Such pre-processing operations are also called filtration.

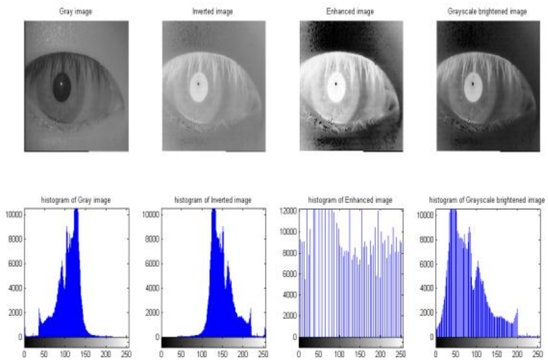


Figure.7.Preprocessing Output

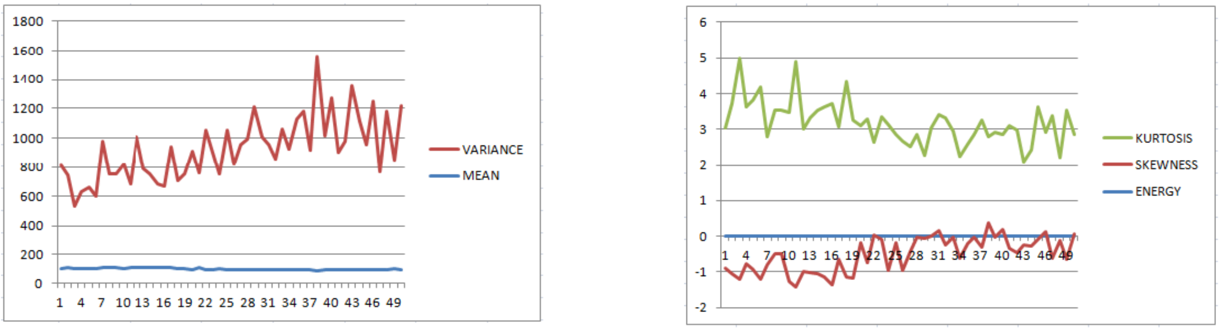
The Figure 7 shows the preprocessing output. The gray image is converted into integrated image after enhances the image and taken each image have histogram values. The iris is a muscle within the eye, which regulates the size of the pupil and thus controlling the amount of light that enters the eye.

Figure.8.Left Eye Output

The Figure 8 shows that left eye resized image, CLAHE, Gabor filter and feature extraction values of Mean, Variance, Energy, Skewness and Kurtosis.The iris is a muscle within the eye, which regulates the size of the pupil and thus controlling the amount of light that enters the eye.

Figure.9.Right Eye Output

The Figure 9 shows that Right eye resized image, CLAHE, Gabor filter and feature extraction values of Mean, Variance, Energy, Skewness and Kurtosis. The iris is a muscle within the eye, which regulates the size of the pupil and thus controlling the amount of light that enters the eye.



A B

Fig.10.Left Eye Feature Extraction

The Figure 10(A) shows the Left eye Feature Extraction values. In this only found mean and variance. The Figure.10(B) shows the Left eye Feature Extraction values. In this only found Energy, skewness and kurtosis.

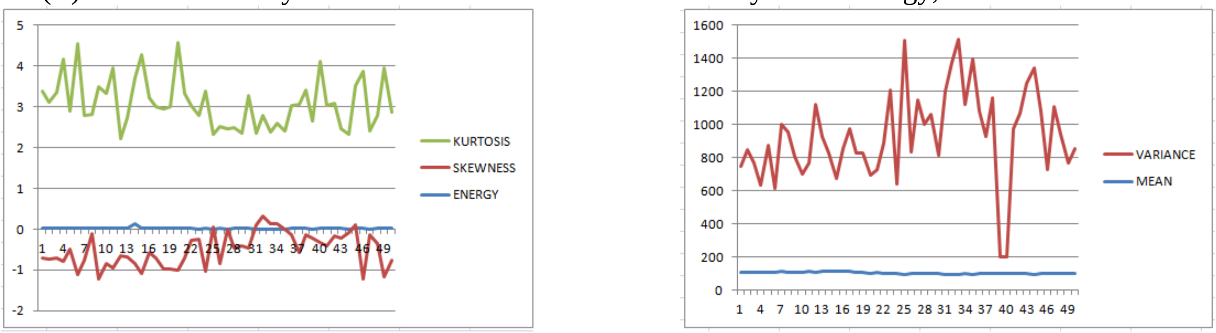
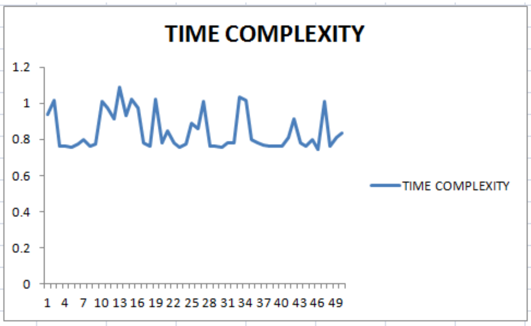


Figure.11.Right Eye Feature Extractions



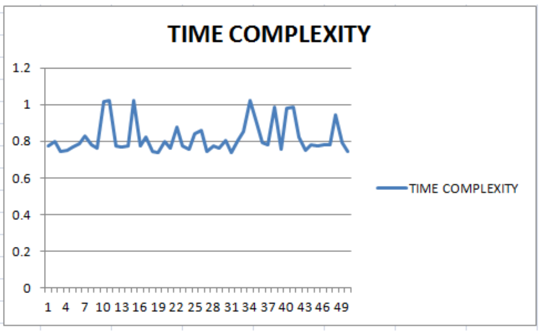


Figure.12.Left Eye Time Complexity **Figure.13.Right Eye Time Complexity**

The Figure 11 shows the Right eye Feature Extraction values. In this only found mean and variance. The Figure 12 shows the Left eye Feature Extraction values. In this found reduce the time complexity values. The Figure 13 shows the Right eye Feature Extraction values. In this found reduce the time complexity values.

3. CONCLUSION

We proposed a method to reduce time complexity in iris Recognization. The concept of Gabor filter has analyzed the input image in several phases and picks a better one through 500 iterations. The number of iterations is designer wish, according to the image size and image quality parameters. (In base paper 500 iterations are recommended for natural images and 850 iterations are recommended for medical images).The proposed algorithm uses a bank of Gabor filters to capture both local and global iris characteristics to form a fixed length feature vector. In this method found the feature extraction values that are mean, variance, energy, skewness and kurtosis.In future, the performance values, efficiency and sensitivity of the iris Recognization will be increased. The performance is compared to the biometrics techniques.

REFERENCES

Adams Wai-Kin Kong, Iris code Decompression Based on the Dependence between Its Bit Pairs, IEEE Transactions on Pattern Analysis and Machine Intelligence, 34(3), 2012.

Bea .K, Noh .S, and Kim .J, Iris Feature Extraction Using Independent Component Analysis, Proc. Int'l Conf. Audio- and Video-Based Biometric Person Authentication, 838-844, 2003.

Daugman J, The Importance of Being Random: Statistical Principles of Iris Recognition, Pattern Recognition, 36, 2003, 279-291.

Daugman, J. New Methods in Iris Recognition," IEEE Trans. System, Man, and Cybernetics Part B, 37(5), 2007, 1167-1175.

J.Daugman, How Iris Recognition Works, IEEE Trans. Circuits and Systems for Video Technology, 14(1), 2004, 21-30.

Kong. A, Zhang. D and Kamel. M, Palm print Identification Using Feature-Level Fusion, Pattern Recognition, 39, 2006, 478-487.

Kong. A.W.K. and Zhang .D, Competitive Coding Scheme for Palm print Verification, Proc. Int'l Conf. Pattern Recognition, 1, 2004, 520-523.

Krichen .E, Mellakh. M.A, Garcia-Salicetti. S, and Dorizzi .B, Iris Identification Using Wavelet Packets, Proc. Int'l Conf. Pattern Recognition, 4, 2004, 226-338.

Noh S.I, Bae. K, Park. Y, and Kim .J, A Novel Method to Extract Features for Iris Recognition System, Proc. Int'l Conf. Audio- and Video-Based Biometric Person Authentication, 862-868, 2003.

Shad S and Ross A, Generating Synthetic Irises by Feature Agglomeration, Proc. Int'l Conf. Image Processing, 317-320, 2006.

Sun .Z, Tan .T, and Wang .T, Iris Recognition Based on Non-Local Comparisons, Proc. Fifth Chinese Conf. Biometric Recognition,pp. 491-497, 2004.

Tan. L. Ma, T, Wang. Y, and Zhang.D, Efficient Iris Recognition by Characterizing Key Local Variations, IEEE Trans. Image Processing, 13(6), 2004, 739-750.

Valentian .T. Ea, A., Rossant .F, Amiel, and A. Amara .F, Algorithm Implementation for Iris Identification, Proc. 48th Midwest Symp. Circuits and Systems, 2005, 1207-1210.

Z. Sun, T. Tan, Y. Wang, and S.Z. Li, Ordinal Palm print Representation for Personal Identification, Proc. IEEE CS Conf.Computer Vision and Pattern Recognition, 1, 2005, 279-284.

Zhang .D, Kong. W.K, You .J, and Wong .M, On-Line Palm print Identification, IEEE Trans. Pattern Analysis and Machine Intelligence, 25(9), 2003, 1041-1050.

Zhang. P.F, Li. D.S, and Wang .Q, A Novel Iris Recognition Method Based on Feature Fusion, Proc. Third Int'l Conf. Machine Learning and Cybernetics, 2004, 26-29.