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Authentication System for IRIS Biometric Recognition Using Texture Analysis

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Abstract- A biometric system provides automatic identification of an individual based on a unique feature possessed by the individual. Iris recognition has emerged as one of the most preferred biometric modalities for automated personal identification. Iris is an internally protected organ whose texture is stable from birth to death, as its texture is unique in each individual, so it is reliable and accurate method of biometric technology. Our new approach for iris recognition has 4 stages: image preprocessing, pupil detection, hybrid feature extraction and classification. In feature extraction, texture analysis is done, which refers to the characterization of regions in an image by their texture content. It attempts to quantify intuitive qualities described by terms such as rough, smooth, silky, or bumpy as a function of the spatial variation in pixel intensities. In classification, template will be compared to a stored template in a database and then it will determine authenticated user.

Keywords- Biometric, Iris, hybrid feature extraction, classification.

I. INTRODUCTION

Biometrics is a combination of "Bio" means life and "metrics" means measure. Biometrics is defined as the science and technology of measuring and analyzing biological aspects of human being. Biometric authentication is highly reliable as physical human characteristics are more difficult to forge than security codes, passwords, and other security system. Biometric systems work by first capturing a sample of the feature, such as recording a digital sound signal for voice recognition, or taking a digital color image for face recognition, thenthis sample is transformed using some mathematical function into a biometric template. The biometric template provides a normalized, efficient and highly discriminating representation of the feature, which can then be objectively compared with other templates in order to determine identity. A biometric which uses a feature that is highly unique is a good biometric. This decreases the chances of any two people having the same characteristics. Based on fingerprints, facial features, voice, hand geometry, handwriting and iris biometric systems have been developed. Among all of the biometric identification systems Iris is taking too much attention because of its reliability and secure identification measures. Other significant qualities of the iris are uniqueness, universality, longevity, collectability, and anti tampering, which all ensure accurate identification of the individual[1]. Existence of the iris characteristics in each person refers to the Universality, whereas uniqueness refers to the ability to distinctly identify individual from his or her iris characteristics. The subtle textures shaping the iris have completely distinctive patterns that differentiate each person from another, far more than most of the other biometrics [1]. This means that no two people in the world would have the same iris eye print, even the left and right eyes of an individual and those between twins are different [2]. To make artificial copy of the iris is impossible because of its distinct properties. As the iris is closely connected to the human brain, it is the first part of the body to degenerate after death, and

therefore, it is next to impossible to use an artificial iris or to use a dead person's iris to fraudulently bypass a security system [3].

1.1 Aim

The aim is to design an effective and secure technique for personal authentication using iris recognition and also evaluate the performance of the designed framework by comparing the performance of existing iris recognition system.

1.2 Objectives

- To study structure of iris.
- To identify the techniques of iris recognition system.
- To evaluate the performance of existing system.
- To develop algorithm to make the iris recognition accurate and fast.
- To analyze the system performance with respect to the parameters FAR,FRR

1.3 Organization

The organization of this paper is as Section 2 contains proposed system. Section 3 consists of result analysis. Section 4 contains Conclusion and Future Scope.

II. PROPOSED SYSTEM

2.1 Basic Idea

The patterns of the iris contain many minute and fine edges which need to be extracted carefully in order to improve the recognition. These patterns are nothing but the features which may be neglected or not properly isolated which may reduce the recognition or give a false recognition rate. If all the features are selected then the increased number of features will increase the time for computation. To reduce the computation time we propose a hybrid feature extraction stage which will not only extract all the features but will also optimize the number of features.

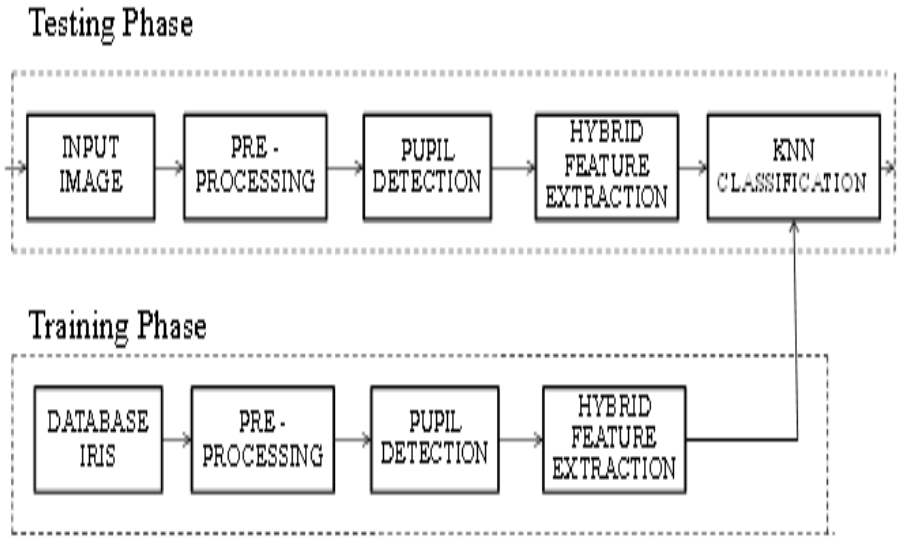

Fig 1 : Block diagram of proposed system

2.2 Proposed DFD

The proposed iris recognition system consist of 4 stages: image preprocessing, pupil detection, hybrid feature extraction and classification. Below figure shows the block diagram for the proposed system.

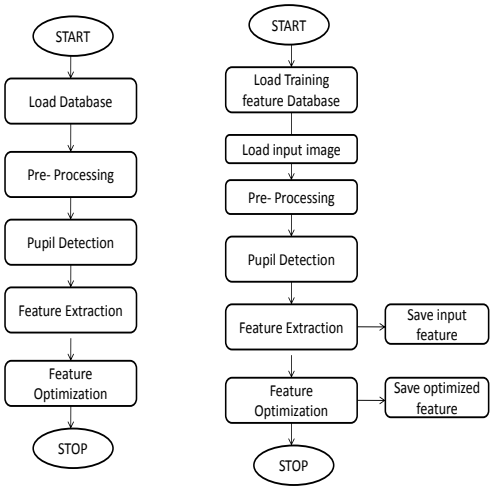

Fig 2 : DFD for Training and Testing Phase

The first stage comprises of preprocessing which includes number of sub stages. Following is the block diagram for the preprocessing stage.

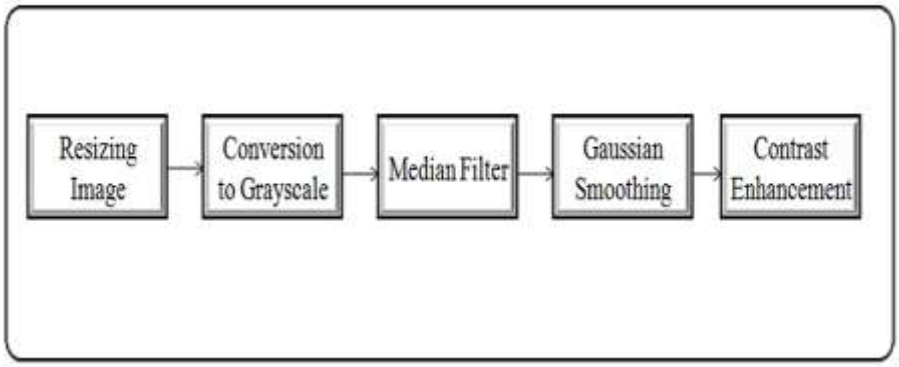

Fig 3: Block diagram of Preprocessing stage

The first sub stage is image resizing, in this stage the input image is resized to accelerate the computation and make the image appropriate for further processing. The next sub stage is RGB to grayscale conversion, in this stage the resized image is converted into grayscale only if the image is in the RGB format and then this image is passed to the next stage i.e median filter. In this stage, the median filter is used to reduce noise in an image. While reducing the noise from the image median filter takes care of preserving useful detail in the image. This class of filter belongs to the class of edge preserving smoothing filters which are non-linear filters. The next stage in IRIS recognition system is pupil detection. Pupil Detection consists of localization and normalization. The purpose of iris localization is to localize the eye image that corresponds to an iris. One is in the iris/sclera boundary that can be called the outer boundary and the other is sometimes called the iris/pupil boundary. The upper part of the iris area is mostly occluded by the eyelashes and eyelids. The normalization converts the segmented iris image from Cartesian image coordinates to polar image coordinates. The next stage is the hybrid feature extraction. In this stage the features of the IRIS are extracted. As said earlier IRIS is different for each person contain i.e no two person contain the same pattern so this is the crucial stage on which recognition rate of the system depends. The use of Gabor filters is proposed to significantly discriminate and isolate the fine textures in the image which may otherwise be neglected. Gabor filter used with suitable orientations and specific number of channels gives a good feature representation and lays the foundation for a better feature extraction. As the large number of features are extracted using the Gabor filter then it will take more time for the computation. So to reduce the time of computation we propose

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additional component with the gabor filter. This component is used to optimize the features. Now as the number of features extracted will be optimized then it will automatically take less time for the computation, so this stage is called as hybrid feature extraction as it not only extracts the features but also optimizes the number of features extracted.

Proposed algorithm :

Step 1: Pre – Allocate the cell array
Step 2: If there are odd nos of datapoints, then throw away the last one
Step 3: Initialize the filter wavelength
Step 4: For each scale construct the filter and calculate the radial filter component
Step 5: Calculate Centre frequency of filter.
Step 6: Normalized radius from centre of frequency plane
Step 7: For each row of the input image, do the convolution
Step 8: Save the output for each scale
Step 9: Finally calculate Wavelength of next filter
Step 10: Organize the dataset.
Step 11: Calculate empirical mean.
Step 12: Calculate deviations from the mean
Step 13: Find the covariance matrix.
Step 14: Find eigenvectors & eigenvalues of the co variance matrix

The last stage is the classification stage. For the classification we are using KNN classifier. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common among its *k* nearest neighbors.

III. RESULT ANALYSIS

Performance measurement in general makes four possible decisions; the authorized person is accepted, the authorized person is rejected, the unauthorized person (impostor) is accepted and the unauthorized person (impostor) is rejected.

Table No. 02 : Comparison table for performance parameters

I/p image	MSE	PSNR	Correlation	SNR
Input_1 Denoised_1	14.98	36.38	0.9902	11.37
Input_11 Denoised_11	11.37	37.81	0.9951	12.54
Input_111 Denoised_111	0.0159	66.1253	1.0000	48.4085
Input_1111 Denoised_1111	6.4009	40.068	0.9978	15.616

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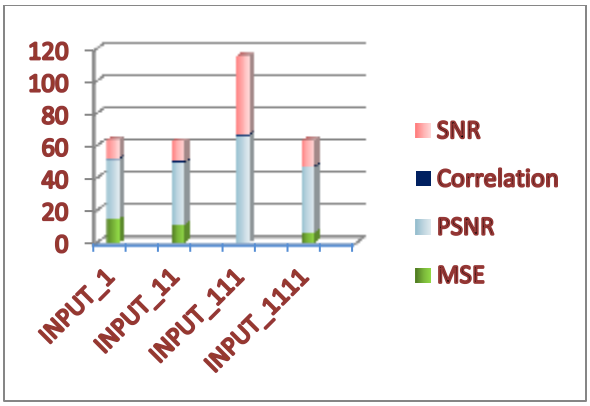

Fig 1 : Performance parameter

The experiments have been performed on IIT Delhi database and all experimental results have been tabulated as shown in the following table and also the chart for the same is shown below. In the database the size of each image is 320×240, and the images are resized to 80x80. The preprocessed images are given as input to the pupil detection stage where pupil is located using localization and then it is normalized i.e Cartesian coordinates and converted to the polar coordinates. Then this image is given to the extraction stage. In this stage optimized gabor filter is applied to the images. This reduces the execution time of the system also improves the accuracy of the system which is tabulated in the following table and also shown in the form of graph.

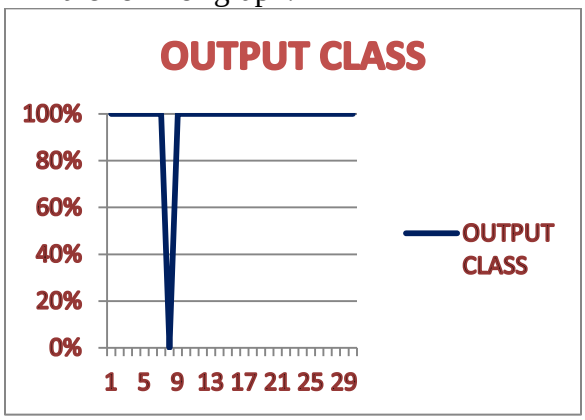

Fig 2 : Accuracy of the proposed system

Table 03 : Comparison table for the existing systems and proposed system

Sr No.	Method	Accuracy
1	Edge Detection + DCT	95.17%
2	LBP	58.75%
3	NBP	76.25%
4	Proposed technique	96.7%

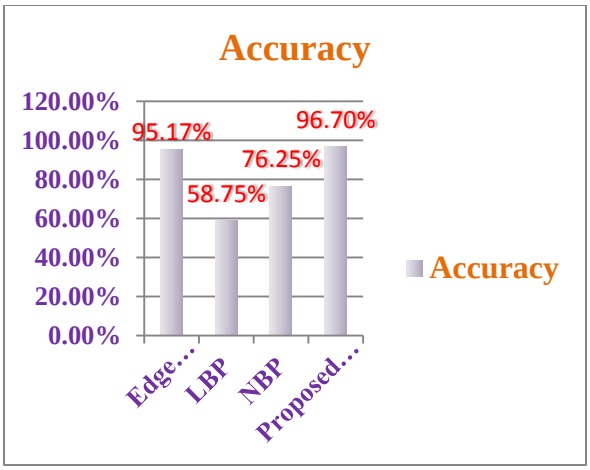

Fig 3 : Comparison for the existing systems and proposed system

IV. CONCLUSION

A novel approach for an Iris Recognition system is proposed which improves the recognition rate and reduces the number of features considered by performing texture analysis. The significance of this method is that it is independent of the database and ensures the reduction in the number of features selected irrespective of the database.

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