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An LBP based Iris Recognition System using Feed Forward Back Propagation Neural Network

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Abstract: An iris recognition system using LBP feature extraction technique with Feed Forward Back Propagation Neural Network is presented. For feature extraction from the eye images the iris localization and segmentation is very important task so in proposed work Hough circular transform (HCT) is used to segment the iris region from the eye mages. In this proposed work Local Binary Pattern (LBP) feature extraction technique is used to extract feature from the segmented iris region, then feed forward back propagation neural network is use as a classifier and in any classifier there to phases training and testing. The LBP feature extraction technique is a straightforward technique and every proficient feature operator which labels the pixels of an iris image by thresholding the neighbourhood of each pixel and considers the feature as a result in form of binary number. Due to its discriminative efficiency and computational simplicity the LBP feature extractor has become a popular approach in various recognition systems. This proposed method decreased the FAR as well as FRR, & has increases the system performance on the given dataset. The average accuracy of proposed iris recognition system is more than 97%.

Keywords: *Iris recognition, Pre-processing, Local Binary Pattern, Hough circular transform, Canny Edge Detector and Feed Forward Back Propagation Neural Network*

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I. Introduction

The iris is known as a thin circular anatomical structure inside the eye. The function of iris is the controlling of size and diameter of pupils and therefore it controls the light amount that progresses towards the retina. Front view of iris is depicted in Figure 1. For controlling the amount of entrance of light in the eye, the muscles connected by the iris that is sphincter and dilator, either contract or expand the iris centre aperture, identified as the pupil. The iris basically has two layers:

i. Pigmented front fibro vascular known as 'Stroma'.
ii. Pigmented epithelial cells.

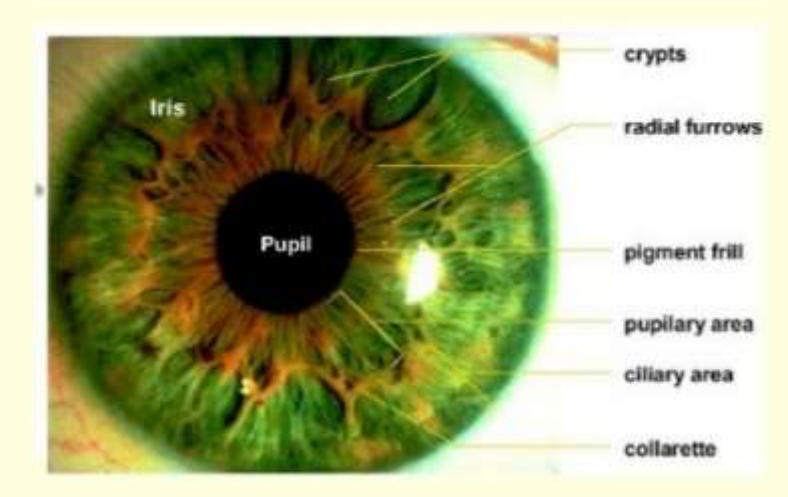

Figure 1: Frontal view of Human Iris

Biometric template is being compared by all another pre-existing templates exited in database by utilizing some matching algorithms for individual. It is the method for acquiring high definition images of iris images both from

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recollected images or iris scanner. The images shows the full eye mainly pupil and iris part. In the proposed work, Iris recognition system images using LBP feature as a simple but very effective texture operator, through its threshold processing for each pixel neighbourhood to mark the pixels of the image, and the result is regarded as a binary number with Feed Forward Back Propagation Neural Network as the simplest model consisting of layers like in BPNN. The first layer is connected as the input. Each subsequent layer has a front layer connection. The last layer generates network output. To learn in FFNN with backpropagation arise in the training phase that has every input pattern from the training set which is executed to the input layer and later propagates the forward is presented.

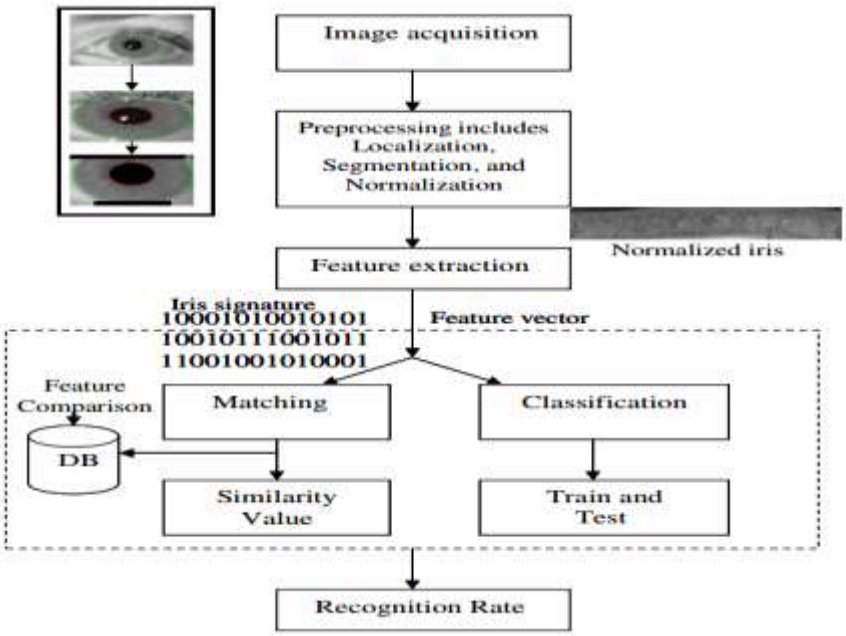

Figure 2: General architecture of IRIS recognition system

In the previous work, Iris recognition systems are proposed with different types of feature extraction with combination of different classifiers but proper detection and localization of appropriate iris area or iris segmenting is not possible, so, the accuracy of image recognition system is less. In iris recognition system, most suitable feature sets are not extracted without proper iris segmentation from the eye images.

II. Related Work

Lye Wi Liam et al has proposed a system consists of two parts, namely, Iris localization and recognition of Iris Patterns. The authors have utilized the digital camera for image capturing and the Iris is extracted from the image being captured. **Pan Lili et al has proposed** an algorithm of novel iris localization in which the authors has adopted some edge points for curve fitting and detecting. Later, the authors have set some integral iris image quality evaluation method which is essential for system of automatic iris recognition. **Hugo Proenca et al** has analyzed the relationship among captured iris image size with the accuracy of overall recognition. The authors have later identified the sampling rate threshold for the iris normalization system above for the error rates that are considerably increased. **Kefeng FAN et al** has shown an efficient technique for the acquisition of iris de-nosing, iris image acquisition, iris localization with the assessment of quality. The system of automatic focusing dependent on a decision function is being introduced in iris acquisition device for achieving the feedback control, that can capture high-resolution iris image by real-time. **Kazuyuki Miyazawa et al has developed an algorithm for** phase-based image matching. The usage of phase components in two-dimensional (2-D) discrete Fourier transforms for iris images that makes possible for achieving high robust iris recognition in some unified fashion by simple matching algorithm. **Hyung Gu Lee et al** has introduced invariant binary feature that is being defined as the iris key. The iris image variability is not necessary in the work. The iris key is being produced with the reference pattern and designed the iris image which is linked with the filter. In the filter, the Iris texture is being reflected as per the iris power spectrum magnitude in the frequency domain. **Eric Sung et al [2]**, has proposed modified Kolmogora complexity measure dependent on maximum Shannon entropy for wavelet packet reconstruction for quantifying the iris information. . The iris codes are established that contain approximately selective information. The correlation approach is coupled with the near neighbors classification with the degraded images.

III. Simulation Model

To verify the efficiency and accuracy of proposed work, iris recognition system using LBP feature with Feed Forward Back Propagation Neural Network, we

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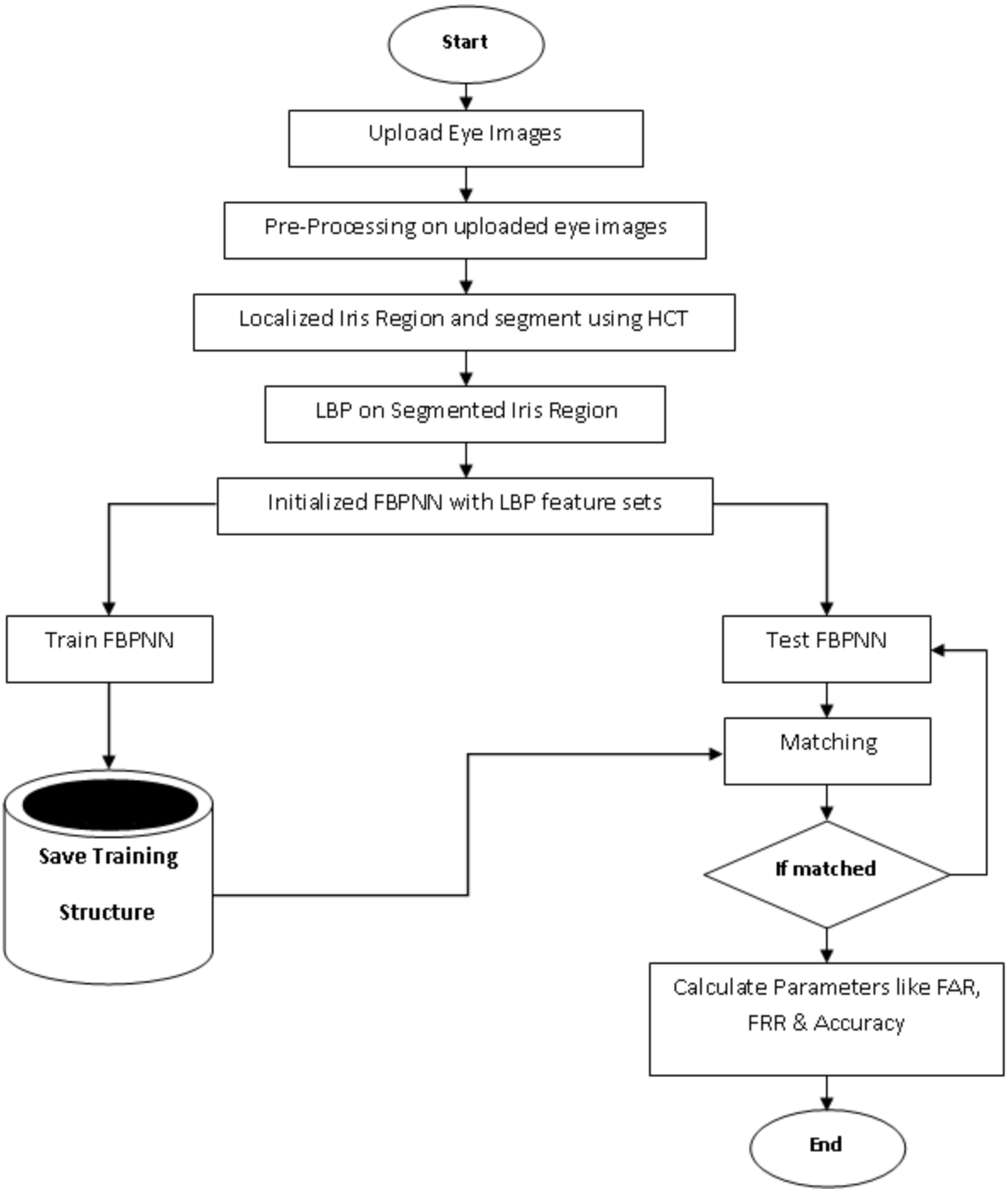

Figure 3: Proposed Methodology Framework

have performed several experiments with this procedure on several eye images. In the proposed work, several steps are used to detect and segment the iris region and extract the feature sets of images. The methodology of propose work is given below:

Step 1: Design and develop a proper GUI of propose iris recognition work.

Step 2: Develop a code to upload eye images from database for training and testing.

Step 3: Apply pre-processing on uploaded eye image.

Step 4: Develop a code for the iris localization and segmentation. For the iris region segmentation Hough Circular Transform (HCT) se used because for the circular area segmentation HCT give better segmentation results.

Step 5: After the 4th step develop the code for the local binary pattern feature extraction technique so we can train the proposed classifier with appropriate feature sets.

Step 6: Initialized feed forward back propagation neural network with feature sets of segmented iris region of eye image as an input of feed forward back propagation neural

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network. Train feed forward back propagation neural network with LBP feature sets.

Step 7: After the training of iris database we can simulate the proposed work with the test image and check their performance metrics.

Step 8: After the classification of test iris we compute the performance metrics like FAR, FRR and Accuracy.

IV. Simulation Results

This section explains the results obtained after the execution of the proposed work.

Figure 4: Main figure window

The above window is describing the main window for the proposed work that is an efficient iris recognition system using LBP technique with FBPNN. It is showing two buttons, namely start and exit.

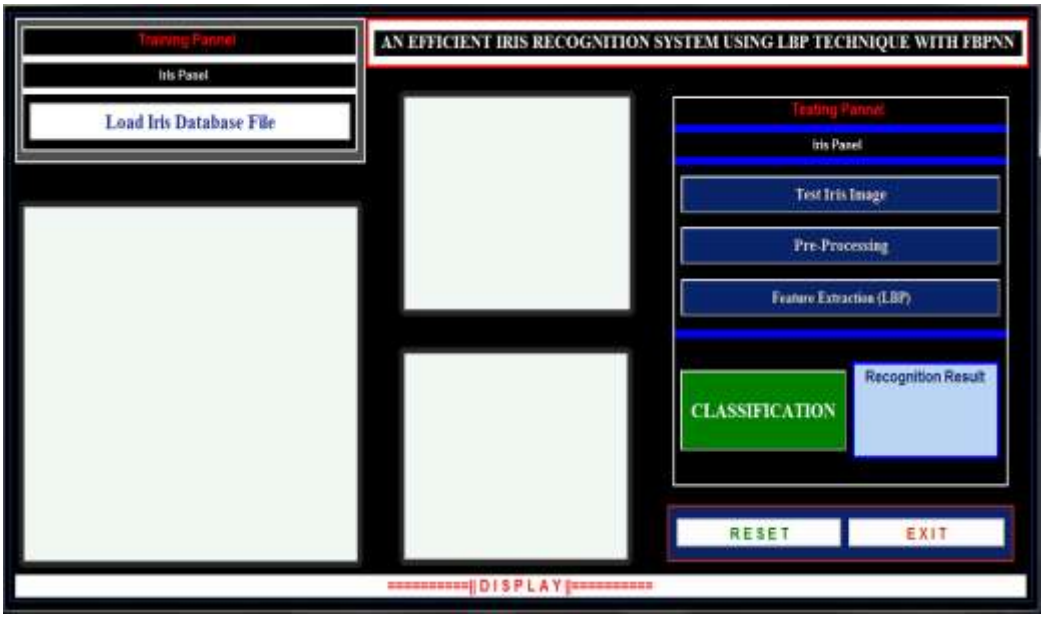

Figure 5: Running figure window

Above figure is for the training panel. The right side of the window is depicting iris panel, test iris image, pre-processing and feature extraction using LBP.

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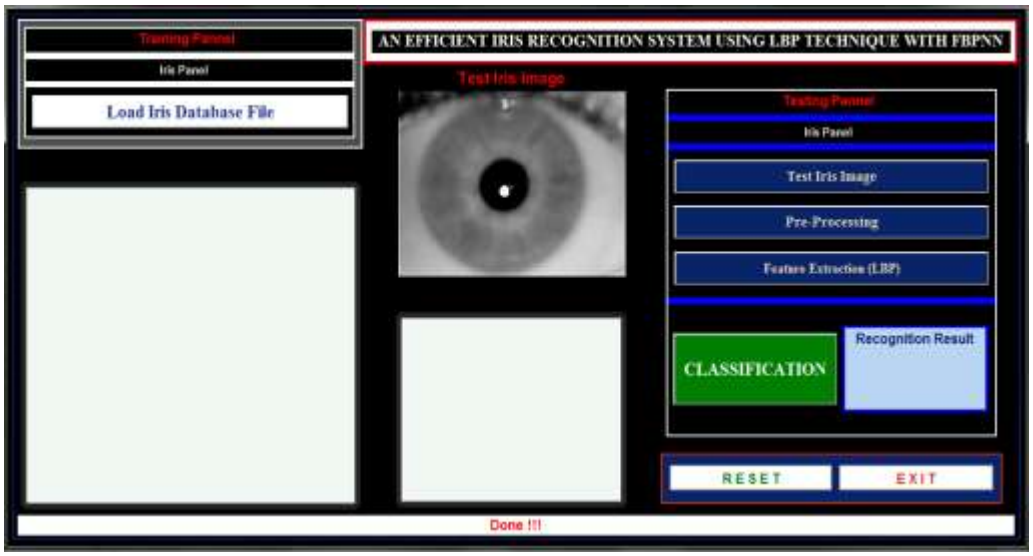

Figure 6: Upload test eye image

In the above figure, an eye is uploaded for training purpose to find the iris from the image. The extraction of the image is executed by the pre-processing step.

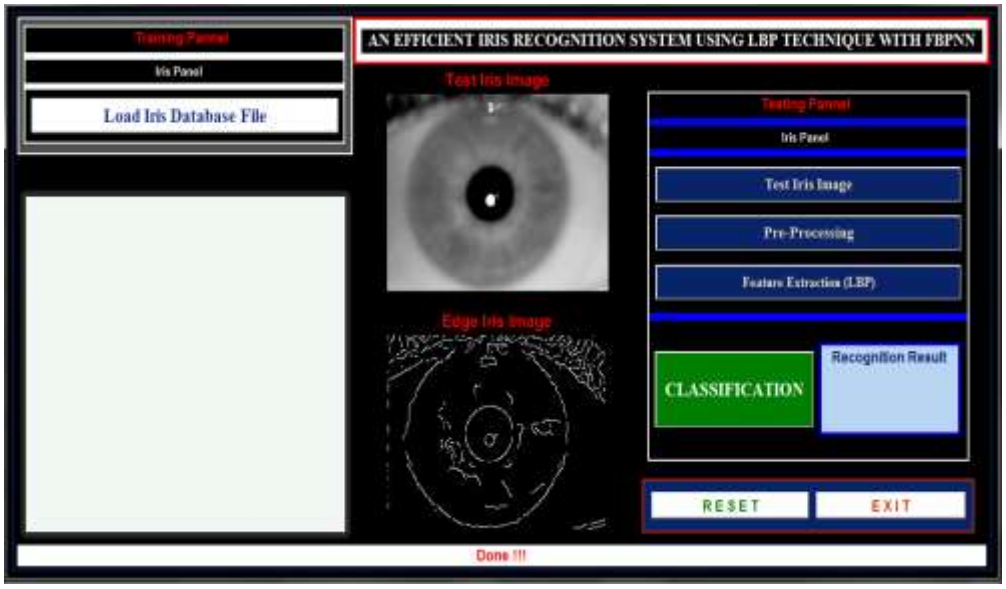

Figure 7: Pre-processing on eye image

The image is being tested in the above figure. Hough circular transform is used for circular objects to be extracted from an image, even if the circle is incomplete. The method works by transforming an image around in a circle

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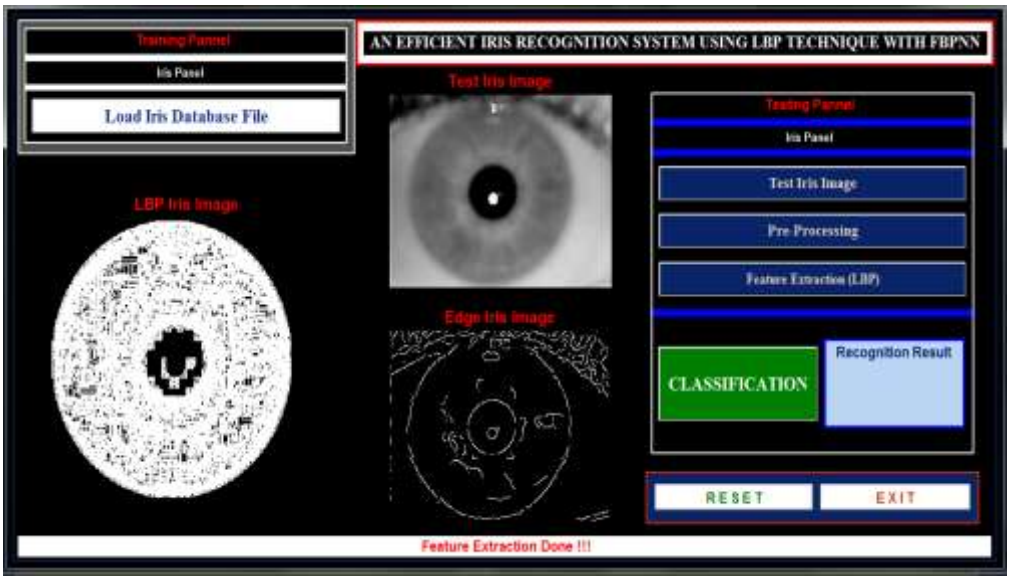

Figure 8: LBP feature extraction

The above figure is describing the local binary pattern operator as an image operator which transforms an image into an array or image of integer labels describing small-scale appearance of the image.

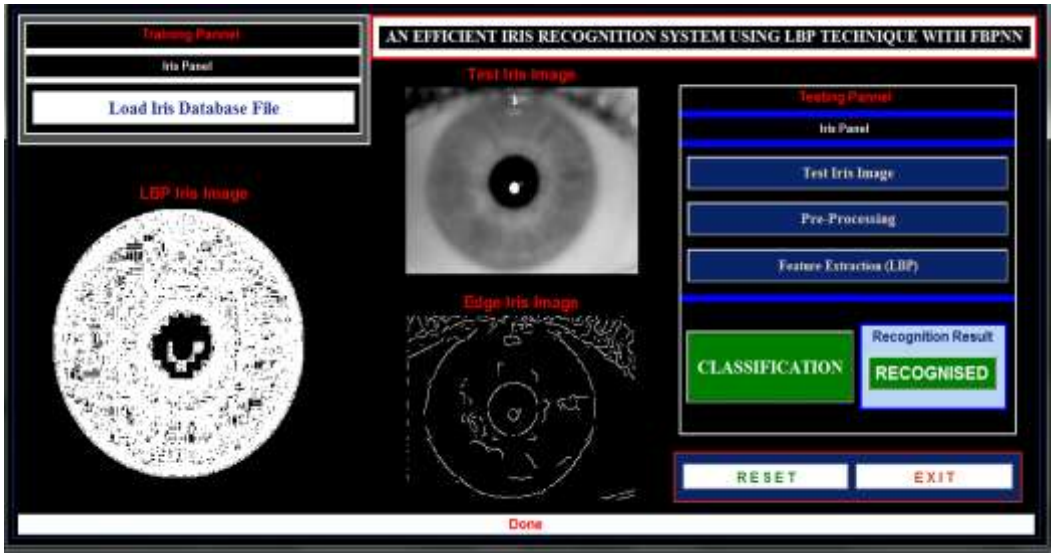

Figure 9: Recognition results

Above figure is describing the result obtained after the image being recognized. The results are calculated on the basis of parameters of FAR (False Acceptance Rate), FRR (False Rejection Rate) and Accuracy

Table 1: FAR, FRR and Accuracy

S. No.	FAR	FRR	ACCURACY
1	0.061397	0.934822	98.94
2	0.043875	0.983827	97.46
3	0.085639	0.83294	99.12
4	0.068382	0.84732	98.83
5	0.078412	0.97852l	98.68
6	0.064646	0.85566	97.36

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Table 1 is showing the values of FAR , FRR and accuracy. The average value of FAR is 0.067059, FRR is 0.890914 and accuracy is 98.39833

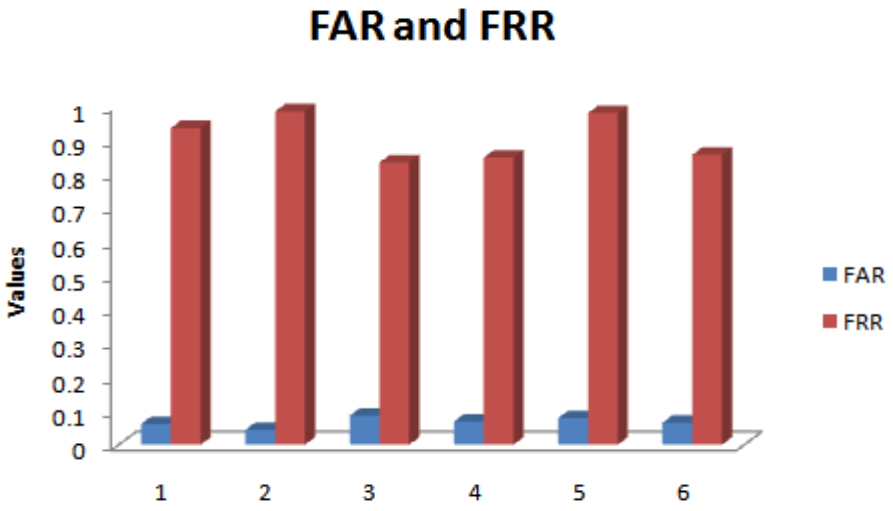

Figure 10: FAR and FRR

The graph of FAR and FRR is shown in the above figure. It is clear from the above figure that the value of FAR is less whereas the value of FRR is more. FAR measures and evaluates the efficiency and accuracy of a system by determining the rate at which unauthorized or illegitimate users are verified on a particular system. FRR is the instance of a security system failing to verify or identify an authorized person.

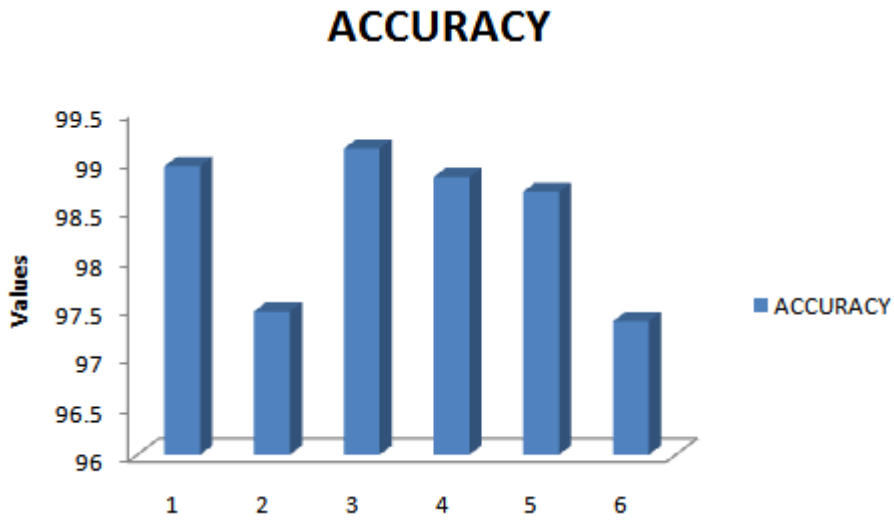

Figure 11: Accuracy

Above figure is showing the accuracy of the work being proposed. The average accuracy is 98.39833.Accuracy is considered as a term used for describe how accurate a biometric system performs. The accuracy is dependent on different verifying criteria's like FAR, FRR and identification rate etc.

V. Conclusion

In the proposed system a new technique is developed for iris recognition system using LBP feature extraction technique with Feed Forward Back Propagation Neural Network. At feature extraction level for feature extraction from the eye images we localized and segment the iris region from the eye images so the accuracy of iris recognition system is increases and the authentication systems will be stronger as compare to the previous existing work. In this proposed work Local Binary Pattern (LBP) feature extraction technique is used to extract feature from the segmented iris region, then feed forward back propagation neural network is use as a classifier. The LBP feature extraction technique is a straightforward technique and every proficient feature operator which labels the pixels of an iris image by thresholding the neighbourhood of each pixel and considers the feature as a result in form of binary number. Due to its discriminative efficiency and computational simplicity the LBP feature extractor has become a popular approach in various recognition systems. This proposed method

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decreased the FAR as well as FRR, & has increases the system performance on the given dataset. The average accuracy of proposed iris recognition system is more than 98%.

In future we can use the different types of feature optimisation technique with Local Binary Pattern feature extraction technique. For any recognition module the feature sets play very significant role so if we apply the feature optimization on extracted feature using LBP then we can find out the enhance feature set. After the feature optimization the accuracy will be increased up to more than 99%.

REFERENCES

[1] Lye Wi Liam, Ali Chekima, Liau Chung Fan and Jamal Ahmad Dargham, "Iris Recognition using Self-Organizing Neural Network", IEEE 2002 Student Conference on Research and Development Proceedings, Shah Alam, Malaysia, pp. 169-172.

[2] Eric Sung, Xilin Chen, Jie Zhu and Jie Yang, "Towards non-cooperative iris recognition systems", Seventh international Conference on Control, Automation, Robotics And Vision (ICARCV'02), Dec. 2002, Singapore, pp. 990-995.

[3] Jiali Cui, Yunhong Wang, JunZhou Huang, Tieniu Tan and Zhenan Sun, "An Iris Image Synthesis Method Based on PCA and Super-resolution", IEEE CS Proceedings of the 17th International Conference on Pattern Recognition (ICPR'04), 23-26 August 2004, Cambridge, UK, Vol. 4, pp. 471-474.

[4] Hyung Gu Lee, Seungin Noh, Kwanghyuk Bae, Kang-Ryoung Park and Jaihie Kim, "Invariant biometric code extraction", IEEE Intelligent Signal Processing and Communication Systems (ISPACS 2004), 18-19 November, 2004, Seoul, Korea, pp. 181-184.

[5] Zhenan Sun, Yunhong Wang, Tieniu Tan and Jiali Cui, "Improving Iris Recognition Accuracy via Cascaded Classifiers", IEEE Transactions on Systems, MAN, and CYBERNETICS - Part C: Applications and Reviews, Vol. 35, Issue 3, August 2005, pp. 435-441.

[6] Kazuyuki Miyazawa, Koichi Ito, Takafumi Aoki, Koji Kobayashi, Hiroshi Nakajima, "An Efficient Iris Recognition Algorithm Using Phase-Based Image Matching", IEEE Image Processing Conference, 2005 (ICIP 2005), 11-14 Sept. 2005, Vol. 2, pp. II- 49-52.

[7] Pan Lili, Xie Mei, "The Algorithm of Iris Image Preprocessing," Fourth IEEE Workshop on Automatic Identification Advanced Technologies (AutoID'05), 17-18 Oct. 2005, Buffalo, New York, USA, pp. 134-138.

[8] Wang Jian-ming and Ding Run-tao, "Iris Image Denoising Algorithm Based on Phase Preserving", Sixth IEEE International Conference on Parallel and Distributed Computing, Applications and Technologies, PDCAT 2005, 05-08 December, 2005, Dalian, China, pp. 832-835.

[9] Weiki Yuan, Zhonghua Lin and Lu Xu, "A Rapid Iris Location Method Based on the Structure of Human Eyes", 27th Annual Conference of the IEEE Engineering in Medicine and Biology Society, 1-4 September, 2005, Shanghai, China, pp. 3020-3023.

[10] Christopher Boyce, Arun Ross, Matthew Monaco, Lawrence Hornak and Xin Li, "Multispectral Iris Analysis: A Preliminary Study", Conference on Computer Vision and Pattern Recognition Workshop (CVPRW'06), 17-22 June, 2006, New York, USA, pp. 51-51.

[11] Proenca, H. and Alexandre, L.A., "Iris Recognition: An Analysis of the Aliasing Problem in the Iris Normalization Stage", 2006 IEEE International Conference on Computational Intelligence and Security, Volume: 2, 3-6 Nov. 2006, Guangzhou, China, pp. 1771-1774.

[12] Kefeng FAN, Qingqi Pei, Wei MO, Xinhua Zhao, and Qifeng Sun, "An Efficient Automatic Iris Image Acquisition and Preprocessing System", Proceedings of the 2006 IEEE International Conference on Mechatronics and Automation, June 25-28, 2006, Luoyang, China, pp. 1779-1784.

[13] Debnath Bhattacharyya, Samir Kumar Bandyopadhyay and Poulami Das, Handwritten Signature Verification System using Morphological Image Analysis", CATA-2007 International Conference, A publication of International Society for Computers and their Applications, Honolulu, Hawaii, USA, 28-30 March, 2007, pp. 112-117.

[14] MMU IRIS Recognition Homepage (IRIS Image Database), http://pesona.mmu.edu.my/~ccteo/

[15] http://mathbits.com/Mathbits/TISection/Statistics2/correlation.htm

[16] Ramy Ashraf Botros Youssef, Ahmed Salah EL-Din Mohamed, Mohamed Kamel Ahmed, "Reliable High Speed Iris Detection For Video Based Eye Tracking Systems", IMECS-2007, Hong Kong, March 21-23, 2007, pg. 1877-1882.

[17] J. A. Starzyk, Z. Zhu, Y. Li," Associative Learning in Hierarchical Self-Organizing Learning Arrays, "IEEE,vol. **17**, 2006 , pp. 1460 – 1470.

[18] K.S. Ravichandran, P. Thirunavukarasu, R.allaswamy, R. Babu," Estimation Of Return On Investment In Share Market Through Ann, " JATIT, 2007, pp. 44 – 54.

[19] J. A. Starzyk, H. He, " Anticipation-Based Temporal Sequences Learning in Hierarchical Structure, " IEEE, vol. **18**, 2007, pp. 344 –358.

[20] S. Shetty, K.K. Achary, "Audio Data Mining Using Multi-perceptron Artificial Neural Network," IJCSNS, **vol. 8**, 2008, pp. 224 –229.

[21] S. K. Mishra, G. Panda, S. Meher, "Chebyshev Functional Link Artificial Neural Networks for Denoising of Image Corrupted by Salt and Pepper Noise, " International Journal of Recent Trends in Engineering, vol. **1**, 2009, pp. 413 – 417.

[22] V.V. Thakare, P. Singhal," Neural network based CAD model for the design of rectangular patch antennas, " JETR,vol. **2(7)**, 2010,