Novel Approach for Face Recognition System using Iris

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ABSTRACT: *The iris recognition is playing important role in human identification and efficiency pursuantly accuracy and processing time are most important for that systems. In the literature number of methods are described for iris recognition based on iris segmentation such as feature extraction and classification methods. In that number of drawbacks reported for such methods. In this Paper, we are design novel framework for iris recognition based robust iris segmentation method, hybrid feature extraction method and feed forward neural network (FFNN) classifier. The novel iris segmentation technique is presenting for non-ideal iris images. This technique is based on two methods for pupil segmentation, and then fusion of expanding and shrinking active contour is developed for the segmentation of iris by combining the novel pressure force to active contour model. For effectively unwrap the segmented iris proposing non-circular iris normalization method. After the efficient iris segmentation, we are applying the proposed feature extraction technique in which 2D-DWT (Discrete Wavelet Transform), texture features and geometric features of segmented iris image are used. The features extracted are combined together to from the hybrid feature vector. For recognition purpose we are using FFNN classifier.*

Keywords—component, FFNN, 2D-DWT

1. INTRODUCTION

In recent years, accurate automatic personal identification is becoming more and more significant to the operation of security system. Biometric employs physiological or behavioural characteristics to accurately identify each subject. A commonly used biometric feature includes face, fingerprints, voice, iris, retina, gait, palm print, hand geometry, dental radiograph, etc. of all these biometrics.

Iris recognition is a newly emergent approach to person identification in last decade. Iris segmentation is an essential module in an iris recognition system as the performance of the system is highly [2] dependent on this step and errors can lead to misclassification during authentication. This step involves isolating the iris structure from other parts in an eye image, including the pupil, sclera, eyelashes, [3] eyelids, and reflections.

For iris segmentation, several researchers assume that the inner and outer iris boundaries are circular. Electronic arena is witnessing rapid sophisticated, a large and important. Recognition systems have become a role of the large and effective, especially after the progress that has occurred in the area of Information Technology.

Iris is the main important part of the human eye; it consists of circular muscle and the other longitudinal control in the amount of light passing the retina through the human eye, with the increasing of requirements for higher security level, biometric systems have been widely used for many applications. Biometrics includes face, iris, fingerprints, voice, palms, hand geometry, retina, handwriting, gait etc. [3]. Recognition algorithms usually require a combination of various techniques, which span across all the three levels. At the lowest possible level are methods for localizing the region of concern in the image (background subtraction), detection and tracking of feature points, various morphological operations that may be needed in order to obtain a better quality of the input data, etc.

Many times the pupil boundary is not exactly a circle even in cooperative recognition. The Proenca and Alexander observed a significant degradation of iris recognition rates especially in the presence of chances of errors in the section of pupil border. The outer iris boundary appears to be non-circular and non-elliptical in non-ideal images such as off-axis iris images. Moreover, simple Shape assumptions for iris fragmentation are not efficient as the iris is partially deformed by eyelids, eyelashes, and reflections. The movement of direction of the useful contour is geared base on eyelid location. In summary, we contribute are as follows.

- A novel iris section technique aiming at improving the recognition performance for iris biometrics for visible light and near infrared (NIR) imaging.
- Segment iris accurately by shrinking and expanding active outline integrated with a pressure force.
- The system for discarding the images with an invalid iris and limiting the search region in the non-skin parts for iris captured with visible light.

A biometric technique provides automatic recognition of an individual on some sort of unique advantage or characteristic possessed by individual. Depend on finger prints, facial advantages, voice, hand geometry, handwriting, the retina and the one presented in this paper for the iris biometric systems have been developed. Biometric systems working on first capturing a [5] sample of the feature, such as record a digital sound signal for voice recognition and use a digital Color image for face recognition. The sample is transformed using some sort of mathematical cause into a biometric template. To determine identity the biometric template will provide a normalized and competent highly discreet representation of the feature, it can then be objectively compared with another template. Many [6] biometric systems are allow two modes of operation. The first one is enrolment mode for adding templates to a database and the second one is identification mode, where a template is created for an individual and then a match is searched for it in database for pre enrolled templates.

A very small biometric system is characterized by use of attributes that is highly specific so that the chances of any two persons having the same characteristic care reduced, so that attribute does not change over time, and can be easily detected to provide advantage to user, and prevent misrepresentation of its feature. Many iris segmentation algorithms have been proposed. These algorithms are broadly classified into three categories of iris segmentation:

- iris segmentation with classical circular approaches and their improvements;
- iris segmentation using non-circular approaches;
- Iris segmentation using active contour models.

To find this assumed circular boundaries of the iris several traditional iris section algorithms are suggested including the well-known algorithms proposed by Daugman[1] and Wildes [2]. Daugman [1] used the integral differential operator (IDO). On the other hand, to localize the iris, Wildes[2] applied an edge detector followed by a cirular Hough transform (CHT). Later, several others also proposed iris segmentation system based on the CHT. Other system based on the approximation of circular iris boundaries are implemented.

The most basic concept in any biometric system revolves around the basic processes of acquiring a high-resolution and feature-rich image, followed by detailed analysis of the desired part using image processing techniques and finally matching these details to a given input image. Iris Recognition systems use a very similar methodology.

The need for an exhaustive search circles over a large N3parameter space also makes the procedure time consuming. To solve this drawbacks of the previous traditional algorithms, some improved iris [8] segmentation algorithms are proposed. The Tan et al. Estimate a coarse location of the iris using a clustering algorithm then the iris is segmented with a modified IDO which has lower computation time. Sahmoud and Abuhaiba proposed an iris segmentation algorithm which starts by determining the expected region of the iris using the K-means clustering algorithm to minimize the search region, then the CHT is applied in order to estimate the iris radius and center. Radman et al. [9] adopted and improved IDO to segment the iris. To minimize search time and the approximate position of the pupil center is determined using the circular Gabor filter. Then, the iris circle and pupil circles are localized using the IDO. Wan et al. [10] presented circle-based iris segmentation wherein a Laplace pyramid is incorporated to save computation time.

2. LITERATURE SURVEY

In [2], author J. G. Daugman. are design the Algorithms for recognizing persons by their iris patterns have now been tested in many field and laboratory trials, producing no false matches in several million comparison tests.

In [3], author R. P. Wildes, the author designs automated iris recognition as a biometrically based technology for personal identification and verification.

In [4] Y. Zhu, T. Tan and Y. Wang are developing a new system for personal identification depend on iris patterns and it is presented in this paper. It is composed of iris image acquisition, image pre-processing, and feature extraction and classifier design. The algorithm for iris feature extraction is based on texture analysis using multi-channel Gabor filtering and wavelet transform.

In [5], Z. Z. Abidin, M. Manaf, and A. S. Shibghatullah are uses the Iris segmentation is foremost part of iris recognition system.

In [6], J. Huang, X. You, Y. Y. Tang, L. Du, and Y. Yuan are uses the segmentation accuracy, especially in non-ideal iris images for Iris Recognition System.

In [7], H. Proenca and L. A. Alexandre are analyzing the relationship between the accuracy of the segmentation algorithm and the error rates of typical iris recognition systems.

In [8], M. Li, Y. Wang, and T. Tan are providing biometric system to reliable and accurate identification of an individual is an iris recognition system.

In [9], L. Ma, T. Tan, Y. Wang, and D. Zhang are Unlike other biometrics such as fingerprints and face, the distinct aspect of iris comes from randomly distributed features. This leads to its high reliability for personal identification, and at the same time, the difficulty in effectively representing such details in an image.

3. PROPOSED APPROACH FRAMEWORK AND DESIGN

There are many traits used for human verification and recognition, iris pattern is one of them which is widely used for human recognition due to its reliability, non-invasive characteristics and accuracy. The computer vision methods, iris pattern based human identification is called as iris recognition system. Iris recognition system is mainly based on three important phases: iris segmentation, feature extraction and classification. Iris segmentation plays very important part for accurate human identification. As the performance of iris recognition system is highly depending on iris segmentation method, it becomes essential phase for system. Inaccurate iris segmentation may lead to misclassification while human authentication. This step involves isolating the iris structure from another components in an eye image, including the pupil, sclera, eyelashes, eyelids, and reflections. There are number of iris segmented methods proposed, but those are suffering from various challenges. To address such challenges active contour models were proposed. But there are number of drawbacks in the earlier active contour models which make them inefficient for precise iris segmentation. To address such limitations, recently new active contour model is proposed with claiming better segmentation accuracy and processing time. The research problem with this recent segmentation method is they are not focused on use of efficient feature extraction method as well as classification method.

4. PROPOSED SYSTEM ARCHITECTURE

We are contributing the existing IRIS method with proposed algorithm called Pupil Segmentation (name of proposed algorithm) in order to overcome the limitation of Image matching & Recognition method. The proposed approach will be used to remove the Eyelids and Eyelashes to recognize it. The IRIS is use the Noncircular normalization and 1-D-Gabor Filter Extraction to match the images.

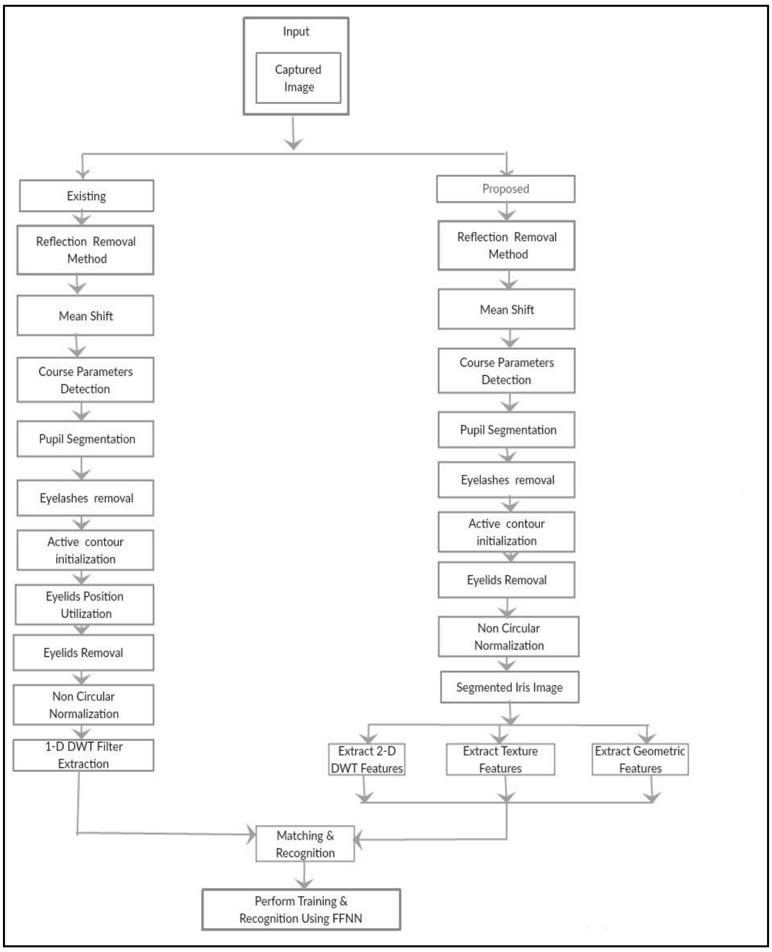

Figure.1. System Architecture

5. MATHEMATICAL MODULE

Active Contour Model

The snake is represented by a curve $v(s) = [x(s), y(s)]$ $s \in [0, 1]$, where s represents the length of the curve. The snake energy is defined as

$$E_{snake}=\int_0^1 E\text{int}\,(v(s))\,ds + \int_0^1 E_{exe}(v(s))\,ds$$

The terms $E\text{int}(v(s))$ and $E\text{ext}(v(s))$ represent, respectively, the internal and external energy of the snake. The internal energy is used to control the deformability of the snake, and is written as

$$E_{int}(v(s)) = \frac{1}{2}(\alpha(s)|v_s(s)|^2 + \beta(s)|v_{ss}(s)|^2)$$

where vs is the first spatial derivative which represents elasticity, or membrane-like behavior, while the second term vss is the second spatial derivative and represents rigidity or thin-plate behavior. The coefficients α and β are weighting parameters that control, respectively, the elasticity and rigidity of the contour.

Noncircular Normalization

$$R_i = \sqrt{(x_i - x_p)^2 + (y_i - y_p)^2}$$

xi, yi and xp, yp correspond to the iris and pupil contours, respectively. Experiments indicate that choosing 350 radial lines with 50 points in each gives the best result.

Algorithm1. Pupil Segmentation

- Input: i here i is Image File
- Step 1: i1=Pupil Image Captured in NIR Light (i)
- Step 2: i2 = Pass input to Reflection Removal (i1)
- Step 3: i3= Apply Mean Shift (i2)
- Step 4: i4= Parameters Detection (i3)
- Step 5: i5= Pupil Segmentation (i4)
- Step 6: Final Output (i5)
- Step 7: Stop

Algorithm2. Iris Segmentation and Recognition

- Input: ihere i is Image File used by previous Algo.
- Step 1: i1 = Apply Method of Eyelashes removal (i)
- Step 2: i2 = Active contour initialization (i1)
- Step 3: i3=Eyelid position utilization (i2)
- Step 4: i4=Apply Eyelids Removal Method (i3)
- Step 5: i5=Noncircular normalization (i4)
- Step 6: i6= 1-D-Gabor Filter Extraction (i5)
- Step 7: i7=Perform Recognition (i6).
- Step 8: Final Output (i7)
- Step 9: Stop

Algorithm3. Iris Hybrid Feature Extraction and Classification

- Input: I here i is Image File Input segmented iris image
- Step 1: i1 = Extract 2-D DWT Features (i)
- Step 2: i2 = Extract Texture Features (i1)

- Step 3: i3=Extract Geometric Features (i2)
- Step 4: i4= Matching and Recognition using FFNN (i3)
- Step 5: i5=Performance Measurement in terms of accuracy, errors and time (i4)
- Step 6: i6= Comparative graphs w.r.t. existing and proposed methods (i5)
- Step 7: Final Output (i6)
- Step 9: Stop

6. EXPECTED RESULT

6.1 Dataset Information

- CASIA-Iris-Lamp

CASIA-Iris-Lamp was collected using a hand-held iris sensor produced by OKI. A lamp was turned on/off close to the subject to introduce more intra-class variations when we collected CASIA-Iris-Lamp. Elastic deformation of iris texture (Fig.4) due to pupil expansion and contraction under different illumination conditions is one of the most common and challenging issues in iris recognition. So CASIA-Iris-Lamp is good for studying problems of non-linear iris normalization and robust iris feature representation.

- Multimedia University Iris Database Version-2(MMU2):

The MMU2 database is collected at Multimedia University. It contains 995 eye images from 100 persons.Five images are captured from each eye of a person. There are 5 left eye images whichare excluded from the database due to cataract disease. The images are captured using PanasonicBM-ET100US camera and with 320X238 resolution. The total number of unique subjects considered for this database is 199.

- UBIRIS.v1 –

This version of the database is composed of 1877 images collected from 241 eyes during September, 2004 in two distinct sessions. It simulates less constrained imaging conditions. It is public and free available.

- UBIRIS.v2 –

The second version of the UBIRIS database has over 11 000 images (and continuously growing) and more realistic noise factors. Images were actually captured at-a-distance and on-the-move.

The practical implementation of proposed work and existing works is done using Java on real time public research iris datasets such as CASIA V4.0 and MMU2. Below figures are showing the comparative graphs between existing and proposed iris recognition methods.

Precision Rate Graph

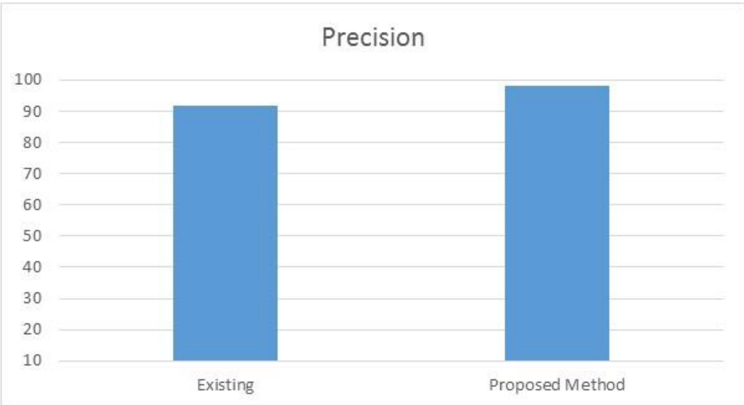

Figure 2: Precision Performance Evaluation

Accuracy Graph

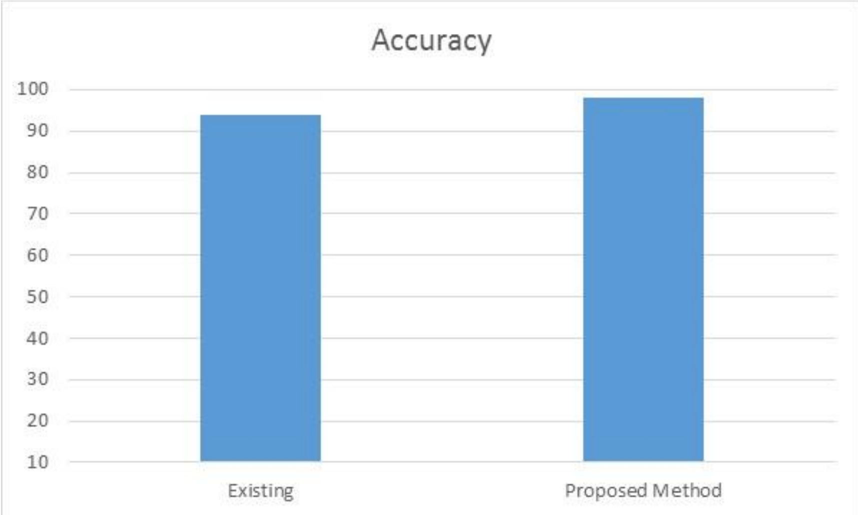

Figure 3: Accuracy Performance Evaluation

As showing in figures 2 and 3, the performance of accuracy is improved in proposed method, performance of processing time is decreased and also the recognition errors are minimized using proposed iris recognition system.

7. CONCLUSION AND FUTURE WORK

Iris recognition plays very significant role in under authentication process in many real time applications as security systems. In this paper we presented the study on recent iris recognition methods and also discussed the problems associated with it. For any iris recognition method accuracy and efficiency are two major concerns. In this paper we proposed efficient automatic framework for iris recognition using hybrid feature vector method and feed forward neural network classifier. The results showing are the expected results between existing and proposed method.

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