Enhanced Human Iris Recognition System based on Procedure of Authentication System

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ABSTRACT
Biometrics refers to the recognition or confirmation of an individual based on certain unique features or characteristics. Biometric identifiers are the characteristic and quantifiablefeatures that are used to label and describe individuals. Iris recognition and favour because of its high recognition rate, non-invasive and simple algorithm and other advantages, in a selection of biometric classification technology is very prominent. The iris texture feature extraction is the core of the iris acknowledgment algorithm. Fractal geometry theory provide new ideas and methods to express nonlinear image information, the fractal dimension is an imperativelimitation of fractal geometry, is a measure of complexity of irregular modify, covering envelop dimension can better replicate the graphics changes in different resolution characteristics; absent is the fractal dimension and autonomous statistics, is a supplement to the fractal dimension, overcome the different texture description may have the same fractal measurement of the problem. The biometric template is usually created using some sort of arithmetical operations. If a personality wants to be identified by the system, then first a digitized image of their eye is first shaped, and then a biometric pattern is created for their iris region. This biometric pattern is compared with all the other pre-existing templates in the database using certain matching algorithms in order to get the identification of the individual.In this paper, we describe the novel techniques that are developed to create an Irisappreciation System, A current survey of iris biometric research from its inception till now lists approximately 29publications. Research in iris biometrics has expanded so much that, although covering onlythese years and intentionally being discriminating about treatment, this new survey lists a larger number of references.

Keywords
Iris Recognition, Biometric authentication, fractal geometry theory and feature extraction process.

1. INTRODUCTION
Biometric identifiers are the characteristic and assessable features that is used to label and describe individuals [1]. There are two categories of biometric identifiers namely physiological and behavioral characteristics [2]. Iris, fingerprint, DNA, etc. belong to the previous kind of biometric identifiers but typing rhythm, gait, voice, etc. belong to the latter.

Biometric identification technology with its high accuracy by the academic circles and thebusiness community was carried more and more concentration. Iris is the body's interior organs, it hascomplex structure and rich texture of iris, the uniqueness and steadiness, such as compilationdescriptionmake it very suitable for identification. Compared with the knowledge of individuality recognition incontact with the palmprint recognition, fingerprint recognition, iris recognition has the type, nondestructive; compare with face recognition, speech acknowledgment and other non-invasivetechnology, iris recognition has higher correctness; and iris has the compensation of difficult tocounterfeit, difficult to change. According to figures, iris appreciation error rate is the least possibleamongst all biometric identification. It is because of these advantages, iris acknowledgment graduallyfrom the biometric detection technology of talent showing itself, become a hot research topicin the ground of biometric identification [3].

A biometric system usually functions by first capture a sample of the characteristic, such as capturing a digital color image of a face to be used in facial recognition or a recording a digitized sound indication to be used in accent recognition. The sample may then be refined so that the most discriminating facial appearance can be extracted and noises in the sample are reduced. The sample is then distorted into a biometric pattern using some sort of mathematical function [3]. The biometric template is a normalized and efficient representation of the example which can be used for comparison. Biometric systems usually have two modes of operation. An enrolment method is used for adding new templates into the database and the identification mode is used for compare a patternshaped for an individual, who wants to be verified, with all the existing templates in the database.A good biometrics is one which uses a feature that is highly unique. This reduces the chances of any two people have the same description to the minimal. The feature should also be stable so that it does not change over the period of time.

2. IRIS RECOGNITION
Iris recognition is a new biometric identification technology, because of its understandablecompensation, has gradually become a research hotspot in the field. This paper analyses the principle of the algorithm of iris recognition system configuration; from the image localization, iris image feature extraction and pattern matching variousdispensation steps to [4] carry on the research of iris recognition algorithm; and the algorithm is realize using Matlab7.0, CASIA.IrisV3.Interval iris image database finally, Chinese Academy of Sciences Institute of mechanization test on the presentation of the algorithm. The eye image is obtained by sampling equipment, including not only the eyelids, eyelashes; iris also includes the whites of the eyes, image demonising, positioning, segmentation, normalization and improvement. Pre-processing ofiris is the key step in iris recognition.

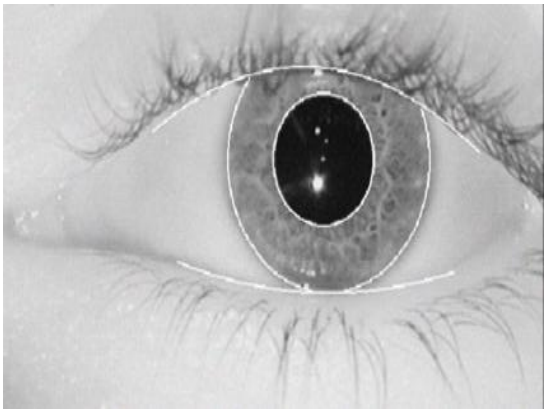

Fig 1: Iris recognition

The iris is a wellsheltered organ that is externally visible and whose epigenetic patterns are [6] very unique and remain stable throughout most of a person's life. Its high individuality and stability makes it a good biometrics that can be used for identifypersons. These unique patterns can be extracted using image processing techniques employed on a digitized image of the eye and then the marks can be encoded into a biometric template which can later be stored in a database for future comparison. The biometric pattern is usually created using a number of sort of numerical operations. If an entity wants to be recognized by the system, then first a digitized image of their eye is first produced, and then a biometric pattern is fashioned for their iris region. This biometric template is compared with all the other pre-existing template in the folder using certain matching algorithms in order to get the identification of the individual [5].

3. PROCESS OF IRIS RECOGNITION

Previous work on iris recognition, derived from the information found in the open literature, led us to suggest a few possible improvements.

3.1 Image acquisition

One of the major challenges of automated iris gratitude is to imprison a high-quality image of the iris while remaining non-invasive to the human operator. Given that the iris is a relatively small (typically about 1 cm in diameter), dark object and that human operators are very sensitive about their eyes, this matter requires careful engineering. Several points are of particular concern.

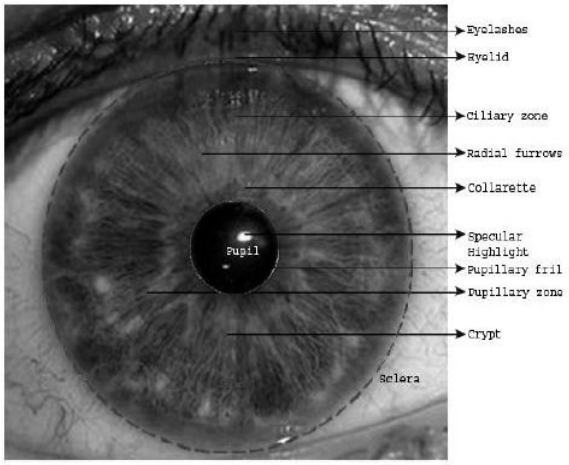

Fig 2: Iris image

3.2 Iris Localization

Without placing undue constraints on the human operator, image acquisition of the iris cannot be normal to yield a picture containing only[7] the iris. Rather, image acquisition will capture the iris asfraction of a larger picture that also contains data derived from the immediately surrounding eye region. Therefore, prior to the theatre iris pattern matching, it is important to localize that portion of the acquired image that corresponds to an iris.

Fig 3: Iris Localized image

3.3 Edge Detection

For edge detection we will use sobel operator in which gradient is designed. The gradient is purely the derivative of the local image values. An edge in the original image would communicate to a higher value in the slope image. Using a gradient image for the Hough transform decreases computation time drastically since only point that correspond to actual edges are used in the computation. The Sobel operator is often used to compute the gradient image as well. It has distinct advantages, although it is slightly more complex [8].

3.4 Iris Segmentation

Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also branded as superpixels). The ambition of segmentation is to simplify and/or change the representation of an image into somewhat that is more significant and easier to analyze. Image segmentation is typically used to locate objects and confines (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to each pixel in an image such that pixels with the identical label share certain characteristics.

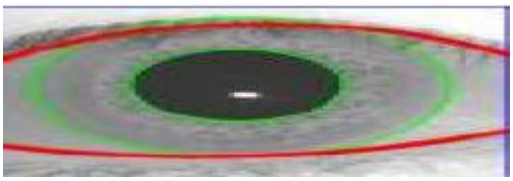

Fig 4: Iris Segmented Image

3.5 . Normalization

In order to obtain best features for Iris verification, polar transformed image is enhanced using contrast incomplete adaptive histogram equalization [9]. The results of image before and after enhancement are shown in Figure below.

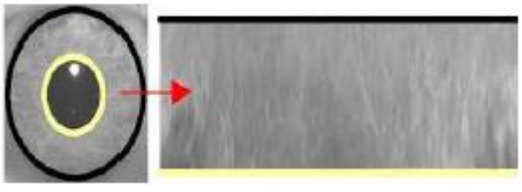

Fig 5: Normalization Iris Image

3.6 Features Extraction

Feature extraction is the most important step in Iris confirmation. Normalised image is used to extract the unique feature the iris image such as:

- Texture analysis
- Zero crossing
- Overlapped patches

3.7 Matching

Matching between the two Iris feature vectors is done using Hamming Distance. It is a calculate of how many bit are the same between two bit patterns. Using the Hamming Distance of two bit patterns, a result is made as to whether the two patterns were generated from different Irises or from the same one.

4. RELATED WORK

Tomask*et al.* [10],2014 presented the issues in recognition of iris in iris biometric system. In this currently available databases and image acquisition system has been shown. Then author concentrated on the various feature extraction methods. In result section, segmentation, normalization, feature encoding are presented. In the end DET plots get plotted for iris British database.**Haiqing*et al.*[11],2014** surveyed the summaries of the progress in iris image acquisition, segmentation, surfaceinvestigation, classification and cross-sensor recognition from 2008 to 2014. The main motivation of this study is to develop a biometric system that was highly flexible, reliable etc. **Kiran*et al.*[12],2015** proposed a new method of feature extraction in iris recognition named deep sparse filtering to get new robust features. In addition to this it also proposed a segmentation method based on radius. This method has been applied on publically available database. Iris image acquisition has been done through 2 modes name iphone 5S and Nokia 1020. From results evaluation value of EER = 1.62 % for VSSIRIS has been obtained. **Jia Zhen *et al.*[13],2015** proposed a method for iris recognition based on Gabor filters. In this Gabor filters has been used for feature extraction and 2 classifiers has been used for classification of iris templates. From result simulation it has been seen that FAR and FRR of good rates has been obtained. In addition to this the main advantage of this method is that it overcomes the problem of the eyelids. **Yongqiang*et al.*[14],2015** proposed a technique for iris pupil segmentation based on MMC and SPP. The proposed work utilised two techniques as mentioned above. The whole implementation has been done on CASIA 1 and CASIA 2 dataset. From result evaluation it has been seen that proposed method worked well with high speed. **Bhuiyan*et al.*[15],2010** proposed a BEMD method to decompose an image into various bi-dimensional intrinsic mode functions. Then after that an image decomposition based colours has been done using BEMD method. Then FBEMD method has been utilised to get lower and upper envelops. **PP. Sinha*et al.*[16],2013** presented an algorithm based on 1D EMD by using three surfaces named upper surface, lower surface and mean surface. Lower and upper surfaces correspond to local and global minima. To obtain the mean surface, application of lower surface and upper surface has been done. From result simulation it has been seen that lower 1-DBEMD is good. **Donghoh*et al.*[17],2012** investigated the shifting process of BEMD algorithm. Then on the basis of this modified BEMD has been recommended in which smoothing shifting process has been obtained with new function named 2D local extreme. From result simulation it has been seen that this method is working well.

5. APPLICATION

Iris recognition, like facial recognition, is most often used for security connected applications. Some countries haveimplement iris-recognition systems in airports, points of access or exit, and direction buildings. The technology hasalso been used to prevent unauthorized access of personal computer and mobile strategy. A[18] small, convenient iris-scanningdevice is available for consumer use, bypassing the need for awkward password entry. Iris acknowledgmentapplication is also available for the iPhone and other smart phones.

6. DATABASE

The data samples used in our experiments were taken from the Chinese academy of Sciences (CAS) [13]. Iris acknowledgment has been an active investigatetheme in recent years due to its high accuracy. There is not any public iris folder while there are numerous face and fingerprint database. Lack of iris data for algorithm testing is a main impediment to do research on iris recognition. To support the research, National Laboratory of Pattern Recognition (NLPR),[15]establishment of Automation (IA), Chinese Academy of Sciences(CAS) will provide iris database freely for iris recognition researches. CASIA Iris Image folder includes 756 iris images from 108 eyes (hence 108 classes). For each eye, 7 descriptions are capture in two sessions, where three samples are collected in the first session and four in the moment session. CASIA Iris Image Database (CASIA-Iris) developed by our research group has been released to the worldwide biometrics community and updated from CASIA-IrisV1 to CASIA-IrisV3 since 2002. CASIA-IrisV4 is an extension of CASIA-IrisV3 and contains six subsets. The three subsets from CASIA-IrisV3 are CASIA-Iris-Interval, CASIA-Iris-Lamp, and CASIA-Iris-Twins correspondingly. The three new subsets are CASIA-Iris-Distance, CASIA-Iris-Thousand, and CASIA-Iris-Syn.CASIA-IrisV4 contain a total of 54,601 iris images from more than 1,800 genuine subjects and 1,000 virtual subjects. All iris imageryare 8 bit gray-level JPEG files, composed under near infrared illumination or synthesized. The six data sets were composed or synthesize at dissimilar times and CASIA-Iris-Interval, CASIA-Iris-Lamp, CASIA-Iris-Distance, CASIA-Iris-Thousand may have a minute inter-subset overlap in subject. More than 3,000 users from 70 countries or regions have downloaded CASIA-Iris and much outstanding work on iris gratitude has been done based on these iris image databases. Although great progress of iris appreciation has been achieved since 1990s, the rapid growth of iris recognition applications has clearly tinted two challenges, i.e. usability and scalability. Most current iris recognition methods have been normallyevaluated on medium sized iris image databases with a few hundreds of subjects. However, more and more large-scale iris appreciation systems are deploying in real-world applications. Many new problems are met in organization and indexing of large-scale iris image database. So scalability is another challenging issue in iris recognition.

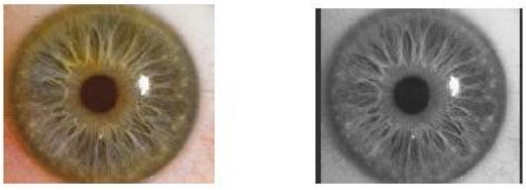

Fig 6: CASIA Iris dataset

7. PROBLEM FORMULATION

Substitute representations of identity such as passwords and ID cards are not sufficient for dependable identity willpower because they can be easily misplaced, shared, or stolen. Biometric recognition is the science of establish the individuality of a person using his/her anatomical and behavioral traits. Commonly used biometric character include fingerprint, face, iris, hand geometry, voice, palm print, handwritten signatures. Three facial appearances that subjective the augmentedinterest in the biometric is as follows:

1. Public acceptance;
2. New user-friendly detain devices with broad enhanced capabilities; and
3. A broadened range of applications.

But the main issue of all authentication systems is that it must have, high accuracy rate and low error rate. So it can only be achieved by using SIFT feature extraction for Iris, then for feature reduction genetic algorithm is applied and once features are reduced they are further classified by using neural network. That's why proposed algorithm is based on this algorithm along with some preprocessing on CASIA dataset. During feature extraction process, we employ feature extraction method to get feature vectors.

8. CLASSIFICATION OF IRIS RECOGNITION

8.1 Hamming Distance

This algorithm is the simplest method of finding the sum of dissimilaritybetween[16] the agreed and the stored templates based on XOR operation.

8.2 Local Binary Pattern

This is another familiar method to find the matching operation based on the histogram computed for each block of normalized iris [18].

8.3 Neural Network

It is mainly classified into two types - supervised and unsupervised. The supervised learning process of feed forward neural network was applied for classifying the authorized and unauthorized user [11].

9. CONCLUSION

This paper describes the whole process of iris recognition algorithm and implementation steps.Mainly includes the positioning of iris image, iris segmentation, normalization and enhancement,feature extraction and matching. In the classical learning algorithm of iris recognition at the sametime, also made some improvement, improve the efficiency of the algorithm, experiments showthe effectiveness of the proposed algorithm. Iris localization will directly affect the recognitioneffect. At the edge of the positioning, a positioning has bias conditions, using four pointcomparison mechanisms, which select the location result more reasonable. At the same time, theboundary detection template to improve, enhance the gray contrast, interference effectivelyrandom noise. Quality assessment of iris image using the subjective method and objective method to evaluate the iris image, removed some do not meet the requirements of the image, improve the recognition effect. The pupil center position according to the highlight point position reduces thesearch time complexity. Extraction of the outer edge of the pupil, and puts forward the method ofthe internal point threshold segmentation and empty. Locating the iris, application oftranscendental pupil and iris information, reduce unnecessary computation point, reduce the timecomplexity.

10. 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] HyungGu Lee, Seungin Noh, KwanghyukBae, 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] Xianzhao et.al, "Improved Empirical Mode Decomposition Algorithm of Processing Complex Signal for IoT Application", International Journal of Distributed Sensor Networks, Vol. 2015, 2015.

[6] Raedet.a;, "A Powerful yet Efficient Iris Recognition Based on Local Binary Quantization", Information Technology And Control, Vol. 43, 2014.

[7] Christopher, "A Fast Empirical Mode Decomposition Technique for Nonstationary Nonlinear Time Series", Elsevier, 2005.

[8] Wei Kin et.al, "Iris recognition based on bidimensional empirical mode decompositionand fractal dimension", Information Sciences, vol. 221, pp. 439–451, 2013.

[9] Azade et.al, "Iris Recognition based on Wavelet Transform and Probabilistic Neural Network", International Journal of Computer Trends and Technology (IJCTT, Vol. 14, 2014.

[10] Tomasq et.al, "Selection of parameters in iris recognition system", Multimedia tools and Applications, Vol. 68, Issue 1, pp 193-208, 2014.

[11] Haiqing et.al, "A Brief Survey on Recent Progress in Iris Recognition", Biometric Recognition, Vol. 8833, pp 288-300, 2014.

[12] Kiran B. Raja, R. Raghavendra, Vinay Krishna Vemuri, and Christoph Busch. 2015. Smartphone based visible iris recognition using deep sparse filtering. *Pattern Recogn. Lett.* 57, C (May 2015), 33-42.

[13] Jain Zhen, "Iris Recognition based on Block Theory and Self-adaptive Feature Selection", International Journal of Signal Processing, Image Processing and Pattern Recognition Vol. 8, No. 2, pp. 115-126, 2015.

[14] Yongqiang LI, "Iris Recognition Algorithm based on MMC-SPP", International Journal of Signal Processing,

Image Processing and Pattern Recognition Vol. 8, No. 2, pp. 1-10, 2015.

[15] Bhuiyan, S.M.A.; Khan, J.F.; Adhami, R.R., "A bidimensional empirical mode decomposition method for color image processing," in Signal Processing Systems (SIPS), 2010 IEEE Workshop on , vol., no., pp.272-277, 6-8 Oct. 2010.

[16] PP. Sinha et.al, "A Review on Bidimensional Empirical Mode Decomposition", International Journal of Science and Research (IJSR), Vol. 14, 2013.

[17] Donghoh Kim; Minjeong Park; Hee-Seok Oh, "Bidimensional Statistical Empirical Mode Decomposition," in Signal Processing Letters, IEEE , vol.19, no.4, pp.191-194, April 2012.

[18] 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.