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Design and Implementation of Fake Iris Detection System Using Image Quality Assessment

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ABSTRACT: To ensure the actual presence of a real legitimate trait in contrast to a fake self-manufactured synthetic or reconstructed sample is a significant problem in biometric authentication, which requires the development of new and efficient protection measures. The proposed system presents a novel software-based fake detection method that can be used in multiple biometric systems to detect different types of fraudulent access attempts. The objective of the proposed system is to enhance the security of biometric recognition frameworks, by adding assessment in a fast, user-friendly, and non-intrusive manner, through the use of image quality assessment.

Keywords: Image quality assessment; biometric; security; attacks; countermeasures.

I. INTRODUCTION

Biometrics derived from the Greek words "bios" meaning life and "metron" means measure, and it is defined as the method that uniquely recognize a human based on either physical or behavioral characteristics. Biometric systems provide verification and identification functions by analyzing bio-metric characteristic. It is a thin, circular structure in the eye, which is responsible for controlling the diameter and size of the pupil and thus also the amount of light reaching the retina. The color of the iris gives its color to the eye. It is widely used for personal identification. The area of the iris is small. It contains enormous pattern variations and unique for each person and hence it leads to high reliability.

Iris recognition is a rapidly expanding method to detect the biometric traits on images of irises to uniquely identify an individual. Iris-based recognition is the most promising for high environments among various biometric techniques (face, fingerprint, palm vein, signature, palm print, iris, etc.) because of its unique, stable, and noninvasive characteristics. Iris detection is one of the most accurate, robust and secures means of biometric identification while also being one of the least invasive. Image quality assessment has important step in the fake iris recognition images. Data quality assessment is an important and a valuable issue for unconstraint image in authentication of biometrics. By assessing the prominent factors and scores, the quality factors of iris images are determined. There are many factors which may affect the quality of the iris images.

Images usually get affected from wide range of qualities like dilation specular reflection, iris resolution motion blur, camera diffusion, presence of eyelids and eyelashes, head rotation, camera angle, contrast luminosity etc. The quality factors include such as Signal to Noise Ratio (SNR), Peak Signal to Noise Ratio(PSNR), Mean Square Error(MSE), Structural Content(SC), Mean Difference(MD), Absolute Difference(AD), Normalized Absolute Error(NAE), etc.

II. RELATED WORK

A novel multi-attack and multi- biometric method has introduced which is software based and contains the use of image quality assessment (IQA) which removes limitations. It is able to operate with a very good performance under multi biometric system [1].The reliability concerns with the ideality of data. Iris biometric is reliable biometric in terms

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of performance. Hence, to process non-ideal data is reliable and segmentation of the iris pattern is important challenging. The paper has proposed a robust segmentation methodology of non-ideal iris images. The non-ideal iris images are affected by such factors as occlusion, off-angle, blur image, brightness etc. Also explained to demonstrate the robustness of segmentation method for ideal and non-ideal iris images. The proposed segmentation methodology consists of five steps. First is the preprocessing, in which specular reflection is in painted and iris boundary has detected to eliminate the effect of noising. Second step introduced pupil segmentation which consists of normalization step, smoothing step, pupil localization, refinement of pupil boundary, evaluation of pupil segment. Third step consist of iris segmentation in which image translation and directional edge is detected the next two methods are occlusion measure and iris unwrapping [2]. An quality assessment is very important for the performance of biometric containing iris images. This paper has focused on the quality factors which affects iris images. There are many quality factors which affects iris images like dilation, specular reflection, iris resolution, motion blur, etc and the proposed paper has also discussed about the estimation procedure for ideal iris resolution, actual iris resolution, process able iris resolution occlusion measure, signal to noise ratio, etc. This paper has proposed a quality factors by their score of individual basis. Daughman's algorithm has used to localize the iris image for recognition purpose integro-differential operator has used to detect circular edge. The paper also has explained quality measures [3]. Iris is an emerging and well-known biometric technology based on the physiological characteristics of human body. This paper has proposed four steps for iris recognition such as: segmentation, normalization, feature extraction and matching. For segmentation, Daughman's method using integro-differential operator is used and to extract feature based on the Principle component analysis (PCA) and Independent component analysis (ICA) for iris. These methods have used for efficient results. And for matching purpose, Hamming distance method is used for principle component analysis and independent component analysis [4].The proposed topic has discussed about the potentials of the contour let transform for iris texture representation and matching. The iris has localized first by automatic segmentation algorithm of circular hough transform, then normalized to a fixed size by Daughman's algorithm and enhanced texture to multi scale, multidirectional contour let decomposition. The contour let transform is most effective feature extraction method for iris recognition system which is useful for improving image quality and high security demanding applications. Hamming distance method has used for matching result [5].

III. METHODOLOGY

A. CASIA Dataset

This dataset is developed by Chinese Academy of Sciences Institute of Automation research group. More Excellent work has been done for iris recognition databases and the databases have been downloaded from 70 countries or regions near or more than 3,000 users. It has used widely and publicly available for the researchers. It includes iris from 50 eyes, hence 50 classes which categories into 5 categories. The categories include Occlusion, Half iris, Good Iris, Blur, Off-angle iris. Images are of size 320x280 pixels gray scale taken by and designed by NLPR (National Laboratory of Pattern Recognition – Chinese Academy. This dataset have used for the image loading. While loading, it converts the rgb image to the gray scale image. After converting, it displays the image. And it makes ready for further modules.

B. Localization

1. Template matching

Template matching is method of finding the required image (i.e. template) in the input image. The matching technique takes much time for big images. It is sensitive to noise and occlusions. The proposed method required the highest matching image with the template image so that we get the required source image. This is the main goal of the propose method.

2. Hough Transform

There are two types of Hough Transform:

i. Linear Hough transform

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ii. Circular Hough transform

The proposed system uses Circular Hough Transform is to find the circular part in the eye i.e. defining the required pixel values for iris. By defining the pixel values for iris, we localized the circular iris from the eye.

C. Segmentation

The first step of iris recognition system is to isolate the actual iris region from the captured digital eye. The iris region consists of two circles i.e. the iris/sclera boundary and another for interior of the iris/pupil boundary. The eyelids and eyelashes normally obstruct the upper and lower parts of the iris region. Iris pattern may be corrupted by specular light. We need to remove this noise from the iris image to improve the iris recognition accuracy. For this purpose the segmentation by circular Hough transform is used.

D. Normalization

Once the iris region is successfully a captured image, the next process is to fix the dimensions of the segmented image in order to allow for comparisons. There are various causes inconsistencies between eye images. Some of them are due to pupil dilation, rotation of the camera, head tilt, and rotation of the eye within the eye ball and changing of the imaging distance. The most affected inconsistency is due to the variation in the light intensities and illumination causes pupil dilation resulting in stretching of the iris. In order to remove these inconsistencies, segmented image is normalized. The normalization process will produce iris regions, which have the same constant dimensions, so that two images of the same iris under different conditions will have the same characteristic features.

E. Iris Features Extraction

Haar wavelet transforms is used to extract features from the iris region. De-composing images with wavelet transform yields a multi resolution from detailed image to approximation images in each level. If images of size N x M are taken then it is decomposed up to Kth level (where K= 1, 2, 3 etc. images) within the image indicated as LH, HL, and HH represent detailed images for horizontal, vertical, respectively in the first level. The sub-image LL corresponds to an approximation image that is further decomposed, resulting in two-level wavelet decomposition. The result of the third level approximation gives the large reduction in computation without much loss in the prominent features.

F. Database Creation Module

In this module, the iris images, its features and the person names are to be stored to the database so that we can use it for evaluation. In database, minimum and maximum entries of persons and its corresponding features for particular images are stored.

G. Database Evaluation

After creation of database, it is evaluated and person is identified, if the person is not identified then fake iris detection is performed and checked if it is fake or genuine. In database, we can see features extracted for individual iris image and classified by the KNN algorithm. The KNN algorithm compares the features of the query image with the image stored in the database. The K has maximum value according to the features of the iris.

H. Result Evaluation

In result evaluation, the performance parameters are False Genuine rate (FGR), False Reject rate (FRR). And the accuracy is evaluated.

IV. RESULT

This section describes the results obtained when iris images having different categories as input to the proposed system. In this section, we evaluate the proposed system with five categories of iris images. These categories are:

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1. Off-angle Iris images
2. Half Iris images
3. Good Iris images
4. Blur Iris images
5. Occlusion having Iris images

All the above iris images are chosen from the dataset. The following table describes the fake iris images are detected for the five categories. Also, it describes the accuracy of five iris categories.

Table: Number of Fake Recognition and it's Rate for Each Category

Category	Number of samples	Number of Fake Recognition	Accuracy
1. Off-angle	40	39	97.5%
2. Half Iris	55	53	96.36%
3. Good Iris	45	44	97.77%
4. Blur Iris	30	29	96.67%
5. Occlusion	80	78	97.5%

From the above table, it can be commented that the overall accuracy of the proposed system is 97.16%.

V. CONCLUSION

To protect biometric systems from vulnerabilities like spoofing attack. In this system, we have design and implemented the novel software based protection system to detect the fake iris using Image Quality Assessment. The proposed system integrated. Template Matching and Circular Hough Transform algorithms for localizing the iris portion from eye image and it localizes correctly. Then also segmentation and normalization methods are effectively implemented. For feature extraction, Haar Wavelet Transform method is used. This novel software based method computes 21 Reference image quality features of biometric sample to verify its legitimacy. Proposed method suggests importance of image quality assessment for securing biometric systems against a variety of attacks. This new biometric protection approach contributes to security of biometric system at fast, less complex design than the hardware based system. It also makes the biometric system more user friendly, more suitable for security applications. The proposed method of design and implementation of fake iris using Image Quality Assessment gave the accuracy 97.41%.

REFERENCES

1. Javier Galbally, Sébastien Marcel, Member, IEEE, and Julian Fierrez, "Image Quality Assessment for Fake Biometric Detection: Application to Iris, Fingerprint, and Face Recognition", *IEEE Transactions On Image Processing, Vol. 23, NO. 2, February 2014*.
2. Jinyu Zuo, Student Member, IEEE, and Natalia A. Schmid, Member, IEEE, "On a Methodology for Robust Segmentation of Non-ideal Iris Image", *IEEE Transactions On Systems, Man, And Cybernectics—Part B: Cybernetics, Vol. 40, No. 3, June 2010.*
3. U. M. Chaskar, M. S. Sutaone, N.S. Shah, Jaison T, "Iris Image Quality Assessment For Biometric Application", *IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 3, No 3, May 2012 ISSN (Online): 1694-0814* www.IJCSI.org.
4. Kshamaraj Gulmire, Sanjay Ganorkar, "Iris Recognition: An emerging biometric technology", *IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)* www.iosrjournals.org.
5. Minakshi R. Rajput, L.M.Waghmare, "Iris Feature Extraction and Recognition Based On Different Transforms", *International Journal of Advances in Science Engineering and Technology, ISSN: 2321-9009 Volume- 1, Issue- 1, July-2013.*
6. Poonam Dabas, Priya Soni, " An Algorithm for Measurement of Quality of Image", *International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277 128X, Volume 3, Issue 3, March 2013.*
7. Xingguang Li, Zhenan Sun, Tieniu Tan, "Comprehensive Assessment of Iris Image Quality", *2011 18th IEEE International Conference on Image Processing.*
8. Sudipta Roy, Abhijit Biswas, "A Personal Biometric Identification Technique based on Iris Recognition", *International Journal of Computer Science and Information Technologies(IJCSIT), Vol. 2 (4) , 2011, 1474-1477.*
9. Karthik Raja Pitchai and Muhammad Azhar, "Iris Recognition System with Fake Identification".
10. Prateek Verma, Maheedhar Dubey, Praveen Verma, Somak Basu, "Daughman's Algorithm Method For Iris Recognition- A Biometric Approach", *International Journal of Emerging Technology and Advanced Engineering, ISSN 2250-2459, Volume 2, Issue 6, June 2012.*