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Review Article

Review on Fake Iris Detection Method using Image Quality Assessment

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Abstract

A biometric system is a computer system which is used to identify the person on their behavioral and physiological characteristic for example fingerprint, face, iris, key-stroke, signature, voice, etc. A typical biometric system consists of sensing, feature extraction, and matching modules. But now a day's these systems are attacked by using fake biometrics. 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: *Attacks, Biometrics, Countermeasures. Image Quality Assessment, Security.*

1. Introduction

Biometric recognition is a mature technology used in many government and civilian applications such as e-passports, ID cards, and border control. Examples include the US-Visit (United States Visitor and Immigrant Status Indicator Technology) fingerprint system, the Privium iris system at Schiphol airport, and the Smart Gate face system at Sydney Airport. However, during the past few years, biometric quality measurement has become an important concern. In recent years, the increasing interest in the evaluation of biometric systems security has led to the creation of numerous and very diverse initiatives that focus security measures as major field of research.

Among the different threats analyzed, the so-called 'direct or spoofing' attacks have motivated the biometric community to study the vulnerabilities against this type of fraudulent actions in modalities such as the iris, the fingerprint, the face , the signature, or even the gait and Multimodal approaches. In these attacks, the intruder uses some type of synthetically produced artifact (e.g. gummy finger, printed iris image or face mask), or tries to mimic the behavior of the genuine user (e.g., gait, signature), to fraudulently access the biometric system. As this type of attacks is performed in the analogy domain and the interaction with the device is done following the regular protocol, the usual digital protection mechanisms (e.g., encryption, digital signature or watermarking) are not effective. The aforementioned works and other analogue studies have clearly shown the necessity to propose and develop specific protection methods against this threat.

This way, researchers have focused on the design of specific countermeasures that enable biometric systems to detect fake samples and reject them, thus improving the robustness and security level of the systems. Besides other anti-spoofing approaches such as the use of multi biometrics or challenge-response methods, special attention has been paid by researchers and industry to the 'liveness detection' techniques, which use different physiological properties to distinguish between real and fake traits. Liveness assessment methods represent a challenging engineering problem as they have to satisfy certain demanding requirements. It is expected that, this technique should in no case be harmful for the individual or require an excessive contact with the user. People should not be reluctant to use it, fast, and also results must be produced in a very reduced interval as the user cannot be asked to interact with the sensor for a long period of time and at low cost. In addition to a good fake detection rate, the protection scheme should not degrade the recognition performance (i.e., false rejection) of the biometric system.

2. Literature Survey

In Paper Javier (Galbally Z.Wei, 2014), introduced a novel software-based multi-biometric and multi-attack protection method which targets to overcome part of

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limitations through the use of image quality assessment (IQA). It is not only capable of operating with a very good performance under different biometric systems and for diverse spoofing scenarios, but it also provides a very good level of protection against certain non-spoofing attacks (multi-attack).

Reliability corresponds to ideality of data. Iris biometric is reliable biometric in terms of performance. Hence, to process non-ideal data is reliable and segmentation of the iris pattern is important challenging. The paper (Jinyu Zuo Z.Wei, 2010), has proposed a robust segmentation methodology of non-ideal iris images. The non-ideal iris images are affected by such factors as specular reflection, blur, lighting variation, occlusion and off-angle images. And also explains to demonstrate the robustness segmentation methodology by evaluating ideal and non-deal iris images.

An image quality assessment is very important for the performance of biometric system containing iris images. The paper (U. M. Chaskar Z.Wei, 2012), 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.

Iris is an emerging and well-known biometric technology based on the physiological characteristics of human body. The paper (Kshamaraj Gulmire Z.Wei), 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.

The paper (Minakshi R. Rajput Z.Wei, 2013), reviewed literature for iris recognition and explains the need and significance of iris images. The proposed topic has discussed about the potentials of the contour let transform for iris texture representation and matching. The iris is localized first, then normalized to a fixed size 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.

The paper (Poonam Dabas Z.Wei, 2013), introduced objective methods for measuring the quality of images. Also with these objective methods, the proposed method focused on the various quality measures and an algorithm to model HVS (Human Visual System). HVS has properties: perceived brightness and frequency response. HVS is used to process input images.

The iris image quality determines the performance of iris recognition. The paper (Xingguang Li Z.Wei, 2011), has proposed the comprehensive assessment of iris image quality to assess the overall quality score of an iris image. The paper has contributed for three aspects: (i) Three approaches for estimating quality metrics. (ii) Proposed a fusion method to combine six quality factors of an iris image into a unified quality score. (iii) Proposed a statistical quantization method to classify the iris images in a database into a number of quality factors. The proposed paper demonstrates the robust quality score to predict the performance of the iris recognition.

Nowadays, biometric is the most important and trusted identification technique for an individual. Among biometrics, the iris recognition is more accurate and important identification technique. The paper (Sudipta Roy Z.Wei, 2011), proposed and implemented the iris recognition technique with Daughman. It is more reliable than traditional technique. This paper used novel technique to detect outer iris boundary. This new strategy worked successfully and helps security issues.

As the iris of a human eye is unique and reliable source for identification purpose. The paper (Karthik Raja Pitchai Z.Wei), proposed a system in which there is no co-operation of subject for iris recognition and if there is forged attempt, then error is flashed. This paper described the six parts of iris segmentation and normalized each segmented region followed by feature extraction and compared with database. It identifies the fake image and never demands for the co-operation from the subject.

For iris recognizition, the paper (J. Daugman Z.Wei, 2014) has proposed Daughman's algorithm method. First image has acquired with near infra-red camera then iris region has isolated. Then feature encoding has implemented by winding normalized iris pattern with 1D Log-gabor wavelet. The feature has extracted in codes of 0 and 1. Hamming distance matrix has chosen for template matching. Daughman's algorithm has used for segmentation. Two preprocess operations has used i.e. histogram equalization and binarization then optimized the algorithm. Sobel edge detection has applied to search the region and then normalization has done for feature extraction.

The paper (Z.Wei Z.Wei, 2005), first preprocessed the iris/pupil image. Then eyelids has isolated by linear hough transform, eyelashes by 1D Gabor filter and multiple eyelashes by variance of intensity. The iris image has normalized by using rubber sheet model. Then feature has extracted by contour let transform using multi-scale and directional filter banks. Feature selection has selected with several methods as gray level co-occurance matrix (GLCM), combination of local and global properties in an iris and vector of iris feature has created with the use of PCA and ICA and in the co-efficient domain. To classify iris images, SVM has used.

Conclusion

From above literature reviews, we can conclude that Daughman's algorithm is effective for segmentation. With Quality parameterization set, image quality is improved. For feature extraction, PCA and ICA methods are effective giving 85.3% and 89.5% recognition rate. Laplacian of Gaussian (LoG) operator is effective for evaluation of qualities of iris images than wavelet decomposition method. Contourlet transform will be more effective method for feature extraction which works for low quality iris images for recognition system. To detect Outer boundary, Circular Hough Transform is effective. Finally, Iris Recognition is more secured and reliable methodology for authentication preventing direct attacks.

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