Paper ID:CSEIT23

IMAGE RECOGNITION THROUGH BIOMETRIC FUSION

Supriya S. Laykar
D.Y.Patil College of Engg and Technology, Kolhapur, Maharashtra
S. B. Patil
Assoc. Prof. D.Y. Patil College of Engg and Technology, Kolhapur, Maharashtra

Abstract-Biometric is the science and technology of measuring and analyzing biological data of human body, extracting a feature set from the acquired data and comparing this set against the template set in the database. In this paper, the fusion and recognition of face and iris image based on wavelet features and Kernel Fisher Discriminant Analysis (KFDA) is developed. Firstly, the dimension is reduced, the noise is eliminated, the storage space is saved and the efficiency is improved by Discrete Wavelet Transform (DWT) to face and iris image. Secondly, face and iris features are extracted and fusion by KFDA. Finally, Nearest Neighbor classifier is selected to perform recognition.

Key words: Face Recognition, Iris Recognition, Discrete Wavelet Transform, Kernel Fisher Discriminant Analysis, Feature Fusion

I. INTRODUCTION

Now a day, there is continuous development of science and technology; therefore traditional security technology can't meet the needs of people. Security becomes an issue for people. The increasing demand of enhanced security systems has led to an unprecedented interest in biometric based person authentication system.The term "Biometric" highlights the use of biological or physical or behavioral traits of a person to identify or verify his/her identity.

A biometric is defined as "life measure" and biometric technology uses images of human body parts, captured through cameras and scanning images. Biometrics is the science and technology of measuring and analyzing biological data of human body, extracting a feature set from the acquired data, and comparing this set against the template set in the database. Like other systems, biometric based security systems have vulnerabilities that attackers can exploit to gain unauthorized access. Various kinds of fusion biometrics or behavior features were used in identification, which improved the accuracy and the credibility of the identification system effectively.

Biometric systems based on single source of information are called Unimodal systems. Although some Unimodal systems have got considerable improvement in reliability and accuracy, they often suffer from enrollment problems due to non-universal biometrics traits, susceptibility to insufficient accuracy caused by noisy data. Hence, single biometric may not be able to achieve the desired performance requirement in real world application and standardize the design of the secure biometric systems .We have concentration on multimodal with the use of face and iris features of human body. Face recognition is the most natural and easiest acceptable method about identification, while iris recognition is a biometric feature with a higher accuracy than others. Both of them are very potential identification technologies. Feasibility and advantage of multimodal system over unimodal system is better performance, user friendly and more secure.

II. PREVIOUS WORK

[1].PCA BASED Image Fusion of Face And Iris Biometric Features(S. Anu H Nair, P. Aruna CES department Annamalai University) - In this paper author explain how to implement feature level fusion for the extracted images of the different biometric features. The biometric features used here are face and iris. Discrete Wavelet Transform (DWT) and Discrete Cosine Transform (DCT) are used for feature extraction of face and iris independently and compared. The features of face and iris are fused by PCA fusion technique. The feature extraction of face and iris are very complex and non linear. These images are first decomposed for feature extraction and later the extracted images are fused. The performance of DCT and DWT are evaluated using PSNR and DWT analysed as the best feature extraction technique. The fused image can be further used for watermarking and authentication purposes.

[2].Different Image Fusion Techniques- A Critical review (Mr. Deepak Kumar Sahu , (IJMER) VOL. 2)-

Author review on some of the image fusion techniques for image fusion like, primitive fusion (Averaging Method, Select Maximum, and Select Minimum), Discrete Wavelet transform based fusion, Principal component analysis (PCA) based fusion etc. Comparison of all the techniques concludes the better approach for its future research. Finally he, review that a image fusion algorithm based on combination of DWT and PCA with morphological processing will improve the image fusion quality and may be the future trend of research regarding image fusion.

[3]. Coding Gabor Feature for Multi-model Biometrics
(Li Bai, chinese conference on pattern reorganization)-

In this paper, author proposed to improve the accuracy of personal identification, when only single sample was registered as template, by integrating multiple hand-based biometrics, i.e. palm print and finger-knuckle-print. He has aim to improve the accuracy of personal identification, when only single sample was registered as template, by integrating multiple hand-based biometrics. To make fusion much easier, the same feature, called fusion code, and decision level fusion strategy were used. Two fusion cases face & palm print and FKP (Fingers -Knuckle-Print) & palm print were taken as examples to verify the effectiveness.

[4]. Research on Face and Iris Feature Recognition based on 2ddct and Kernel Fisher Discriminant Analysis-

In this paper, a new approach to the fusion and recognition of face and iris image based on wavelet features and Kernel Fisher Discriminate Analysis (KFDA) is developed. Firstly, the dimension is reduced, the noise is eliminated, the storage

space is saved and the efficiency is improved by Discrete Wavelet Transform (DWT) to face and iris image. Secondly, face and iris features are extracted and fusion by KFDA. Finally, Nearest Neighbor classifier is selected to perform recognition.

[5]. Robust Person Identification With Face and Iris by Modified PUM Method -

Author, invent new method that combines the iris and face features as a new feature for representing persons and then acts the modified method on the new features for recognition. It also improves the method to form a better strategy for combining the face and iris on reorganization. Generally, the iris features, however, is more reliable than the face features. Hence the iris feature should be given a higher weight. For this, this paper further improves the method to form a better strategy for combining the face and iris on recognition.

III.PROPOSED METHOD

Image fusion is nothing but a process of combining the relevant information from a set of images into a single Image , where the resultant fused image will be more informative than any of the input images. Image fusion Technique can improve the quality and also increase the application of data.

Fusions can be divided into two types:

1. Spatial domain fusion
2. Transform domain fusion

DWT provides higher compression ratio & also provide good localization than other fusion techniques. Basic fusion is explained by following diagram-

The block schematic of proposed work of face and iris feature model is shown in following figure,

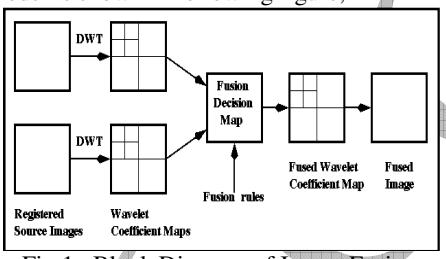
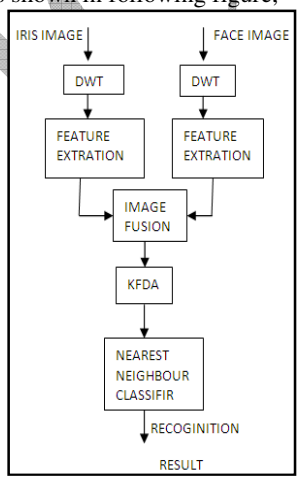


Fig.1 Block Diagram of Image Fusion

The block schematic of proposed work of face and iris feature model is shown in following figure,



PHASE I: PEOCESSING –

Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed. It can be in the form of DICOM, TIFF, JPG, PNG, GIF etc. One of the ultimate goals of image acquisition in image processing is to have a source of input. Once the image is inputted then it is been processed further.

PHASE II: FEATURE EXTRATION -

It is a mathematical tool to multi-level analysis function, known as the microscope of digital signal analysis. After wavelet transform, the wavelet coefficients can be used to describe the characteristics and reflect the nature of the original image information. Face feature extraction: For 2D discrete wavelet transform (DWT), an image is represented in terms of translations and dilations of a scaling function of a wavelet functions. As most of the image information is retained in the low-frequency component [LL], it is considered as the approximate amount of the original image. For each low-frequency component, LL can be done by DWT once again, and the dimension will be reduced further. The process of face extraction involves identifying the person based on facial features.

2. Iris feature extraction:

2.1. Iris image pre-processing: Iris is one of the most reliable and accurate biometric system. Image pre-processing part is performed before extracting iris features. It is processed to localize the inner and outer boundary of iris in the captured iris image

2.2. Canny edge detection and localization: Canny edge detection is used to create an edge map. The Canny method finds edges by looking for local maxima of the gradient of the iris image. In performing the preceding edge detection step, the derivatives of the horizontal direction will detect the eyelids, and the vertical direction will detect the outer circular boundary of the iris. The radius of the iris image is determined and provided to the Hough transform for better accuracy.

2.3. Hough Transform: Canny edge detection is used to build the edges in horizontal direction and then the Parabolic Hough transform is applied on it to detect the eyelids, approximating the upper and lower eyelids with parabolic arcs. If the maximum Hough space is below the threshold, it indicates the non occlusion of eyelids.

2.4. Normalization: Normalization module transforms the iris texture from Cartesian to polar coordinates.

2.5. Histogram equalization: Normalization makes iris texture less concentrated because it could have a non-uniform brightness in different parts due to applied light in image acquisition. The contrast enhancement of the image will be accomplished by histogram equalization.

2.6. Iris code generation and Feature extraction: Feature extraction is a key process where the two dimensional image is converted to a set of mathematical parameters. The iris contains important unique features, such as stripes, freckles, coronas, etc. These features are collectively referred to as the texture of the iris.

PHASE III: IMAGE FUSION-

Image fusion is the process of combining relevant information from two or more images into a single image. The resulting image will be more informative than any of the input images. The most important issue concerning image fusion is to determine how to combine the sensor images. Feature level methods are the next stage of processing where image fusion will take place. Fusion at the feature level requires extraction of features from the input images. The features involve the extraction of feature primitives like edges, regions, shape, size, length or image segments, and features with similar intensity in the images to be fused from different types of images of the same geographic area. These features are later combined with the similar features present in the other input images through a pre-determined selection process to form the final fused image. However, feature level fusion is difficult to achieve when the feature sets are derived from different algorithms and data sources. PCA (Principle Component Analysis) based image fusion will implemented from the extracted images of face and iris. It will used for dimensionality reduction, feature enhancement, and image fusion. PCA transforms or projects the features from the original domain to a new domain (known as PCA domain).Here the features are arranged in the order of their variance. Fusion process is achieved in the PCA domain by retaining only those features that contain a significant amount of information. The main idea behind PCA is to determine the features that explain as much of the total variation in the data as possible with as few of these features as possible.

PHASE IV. RECOGNITION-

Last step is nothing but recognition, where Kernel Fisher Discriminant Analysis (KFDA) & Nearest Neighbor classifier is used. The basic idea of KFDA is that the nonlinear original input space can be converted through a nonlinear map function into a linear high-dimensional feature space. As face and iris are highly complex and nonlinear, KFDA is chosen to extract contours and curves of the image with which the available nonlinear feature will be extracted. Nearest Neighbor classifier, is the one that assign the class of its closest neighbor in the feature space. The technique has been integrated into a fully developed recognition system.

IV. RESULTS & ANALYSIS

After all the algorithms are been performed the last & the final step is evaluation of the system. Image Quality Measurement (IQM) is vital in the development of image processing algorithms such as enhancement, de-blurring, de-noising etc. By the use of Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR) & Normalized Cross-Correlation (NCC) and Normalized Absolute Error (NAC) parameters , it reveal that multimodal biometrics system is more secure, reliable and also precise than single biometric approach .

V. CONCLUSION

Multimodal Biometric Systems are expected to be more reliable. Based on the study of multimodal biometric system, the features of face and iris are extracted separately using DWT. The feature extraction of face and iris are very complex and non linear. These images are first decomposed for feature extraction and later the extracted images are fused. The fused image can be further used for watermarking and authentication purposes. This fusion method not only overcome the "small sample" shortcoming, but also the higher correct identification rate than individual biometric face recognition or iris recognition.

VI. REFERENCES

[1]. Basavaraj Mirji, Manjesh R,"Image Fusion based on Face and Iris Feature vectors" in "IJRIT International Journal of Research in Information Technology", Volume 2, Issue 5, May 2014, Pg: 250-255.

[2]. S. Anu H Nair, P.Aruna&M.Vadivukarassi,''PCA BASED Image Fusion of Face And Iris Biometrics Feature'' ISSN(Print):2319-2526,Volume-1, Issue-2, 2013

[3]. Jun-Ying Gan, Jun-Feng Liu, "Fusion and Recognition of Face and Iris Feature based on Wavelet feature an d KFDA", Proceedings of the 2009 International conference on Wavelet analysis and pattern recognition, boarding, IEEE 12-15 July 2009.

[4]. Jun-Ying Gan,Jian-Hu Gao,Jun-Feng Liu,"Research on Face and Iris feature recognition based on 2DDCT and Kernel Fisher Discriminant Analysis" ,Proceedings of the 2008 International conference on Wavelet analysis and pattern recognition, Hong Kong,30-31 Aug 2008.

[5]. De-Song Wang,Jian-Ping Li,Yue-HaoYan,"A novel authentication scheme of the DRM system based on multimodal biometric verification and watermarking technique",IEEE,2008.

[6]. Nick Bartlow,Nathan Kalka,Bjan Cukic and Arun Ross,"Protecting Iris images Through Asymmetric Digital Watermarking",IEEE,2007.

[7]. Jie Lin,Jian-Ping Li,Hui Lin,Ji Ming,"Robust person identification with Face And Iris by modified PUM method,"IEEE,2009.

[8]. Linlinshen, zhen ji, yuwen li and li bai "Coding Gabor features for multi-modal biometrics" Chinese conference on pattern recognition, 2010 IEEE.

[9]. Deepak Kumar Sahu1, M.P.Parsai ,"Different Image Fusion Techniques –A Critical Review", International Journal of Modern Engineering Research (IJMER), Vol. 2, Issue. 5, Sep.-Oct. 2012 pp-4298-4301, ISSN: 2249-6645