Person Recognition using Multimodal Biometrics

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Abstract **--Biometric system is a recognition tool used to recognize individual. It uses biometric traits to identify and recognize patterns. This application requirement demands certain properties like acceptability, performance and distinctiveness. Unimodal biometric systems with a single modality biometric authentication may not fulfill the above demanding requirements. To overcome certain problems like noise, inter and intra – class variation in unimodal system; multimodal; biometric systems can be used. . Also unimodal systems have considerably high false acceptance rate (FAR) and false rejection rate (FRR), limited discrimination capability, upper bound in performance and lack of permanence. In this paper based on discrete wavelet transform analysis a multi modal biometric system for iris, face, signature and palm print recognizing is described. The iris, face, signature and palm print are the most unique phenotypic feature in human body. Combine these three modalities using feature level fusion enhance the recognition rate compared to unimodal biometrics. Initially the textures of iris, face and palm print are fused and encoded then we use discrete wavelet transform for feature extraction and KNN classifier algorithm for recognition, thus minimizing FAR and FRR. This is achieved by multimodal system which uses three modalities viz face, iris, signature and palm print.**

Keywords--- DWT, KNN classifier, FAR, GAR, FRR.

I.INTRODUCTION

Biometric is the technology used to identify the physiological and biological characteristics of an individual. These are unique features of an individual and will not be altered in a lifetime. These strong unique identifying features makes biometric as a promising recognizing system. Usually security access in a area can be made using password Which is a knowledge based security. The intruders can easily extract this information by breaching the doors of security. This problem arises in areas of high restricted information zone and in making monetary transactions. These problems can be overcome by using biometric traits. The biometric system makes personal identification by recognizing specific physiological characteristics possessed by the user. These biometric systems can be used as an automatic authentication system for identifying a person based on his physiological characteristics. Certain biometric traits which can be used as recognizing features are face, iris, palm print, etc.

Basically biometric systems are of (i) unimodal and (ii) multimodal biometric systems. The unimodal systems use a single authentication trait for identification. This system usually fails due to noise presented in collected data. In this case multimodal systems are used which uses more than one classifier to make the final decision. This concept of multimodal systems is proposed by Ross and Jain [7] in whom they presented various levels of integration. The reason to combine different modalities is to improve recognition rate. The multi biometrics is used to reduce one or more of the following: 1.False accept rate (FAR), 2.False reject rate (FRR). In this paper we present a novel combination of face, iris and palm print biometrics. Here we use Discrete Wavelet transform for feature extraction and then we use KNN classifier algorithm for recognition the patterns. There occurs a problem in iris image acquisition where a clear image has to be captured from user. Also in face recognization there occurs poor quality and low resolution which makes identification as tedious process.

II.RELATED WORKS

Various works are made recently proposed in biometric system. In literature [1] they propose a novel multi-resolution approach based on Wavelet Packet Transform (WPT) for texture analysis and recognition of iris and palm print. By using wavelet packets the size of the new pattern is compared against the stored pattern after computing the signature of new input pattern. Identification is performed by hamming distance. Symlets wavelet by combining the iris and palm print recognition scheme the accuracy of the recognition is improved**.**

Similarly for making face recognizing a method is proposed in [2], which states that each face image is decomposed as four sub bands using DWT. These four sub bands are approximation sub band (LL), horizontal detail sub band (LH), vertical detail sub band (HL), and diagonal detail sub band (HH). HH sub band is very fragile. HH sub band is useful to distinguish the images in the database. HH sub band is further processed using Principal Component Analysis (PCA). Feature vector is generated using DWT and PCA. Experiments are performed on YALE database. It gives better performance in terms of average recognized rate 3.25% improvement is observed at top ten matches and retrieval time compared to the existing methods. Most existing commercially available iris recognition system use algorithms originally developed in [3].

Also Histogram equalization is used on palm print [6] to enhance contrast of an image. The DWT is applied on Histogram equalized image to generate LL, LH, HL and HH bands. The LL band is converted into DCT coefficients using DCT. QPCA is applied on DCT coefficients to generate features. The test and database palm print features are compared using Euclidean Distance (ED). It is observed that the proposed method gives better performance compared to existing method.

III.PROPOSED SYSTEM

Biometric systems for today's high security applications must meet stringent performance requirements. The fusion of multiple biometrics helps to minimize the system error rates. Feature level fusion methods include processing biometric modalities sequentially until an acceptable match is obtained. In proposed approach, mainly using two concepts

1. Discrete Wavelet transform for feature extraction.

2. KNN classifier algorithm for recognition.

The proposed method uses the palm print, face and iris images of an individual, to generate a multimodal biometric images and then preprocessing is done and store in database. The multimodal biometric identifier can retain high threshold recognition settings by using more than one means of biometric identification. The system administrator decides the level of security he/she requires. In a high security site, it requires all three biometric identifiers to recognize lower security site.

A.Input Sets:

Input dataset used for this work contains Face, Iris and Palm print.

i.Face:

In face training, there are totally 20 images given a input, i.e., 2 images per person (total number of persons are 10).

In face testing, there are totally 40 images given a input, i.e., 4 images per person.

ii.Iris:

In iris training, there are totally 20 images given as input, i.e., 2 images per person. Out of these 4, 1 is left iris and 1 is right iris (total number of person are 10).

In iris testing, there are totally 40 images given as input, i.e., 4 images per person. Out of these 4, 2 are left iris and 2 are right iris.

iii.Palmprint:

In palm print training, there are totally 20 images given as input, i.e., 2 images per person (total number of persons are 10).

In palm print testing, there are totally 40 images given as input, i.e., 4 images per person.

iv.Signature;

In signature training, there are totally 20 images given as input, i.e., 2 images per person (total number of persons are 10).

In signature testing, there are totally 40 images given as input, i.e., 4 images per person.

B.*Preprocessing*

First step in image preprocessing is conversion of color image into gray level image. The different methods are followed to enhance the input images.

- For face and iris image preprocessing, histogram equalization technique is used.
- For palm print image enhancement median filter is used.
- For signature image enhancement edge detection is used

C.Feature Extraction

In this work we use 2D-DWT for feature extraction. The efficiently exploits the local spatial variations in image. The entire image is segmented into several small spatial modules and the effect of modularization in terms of the entropy content of the images has been investigated. In this process we use approximate coefficient. Approximate coefficient contains large set of information, remaining three coefficients contains low information rate.

2D DWT:

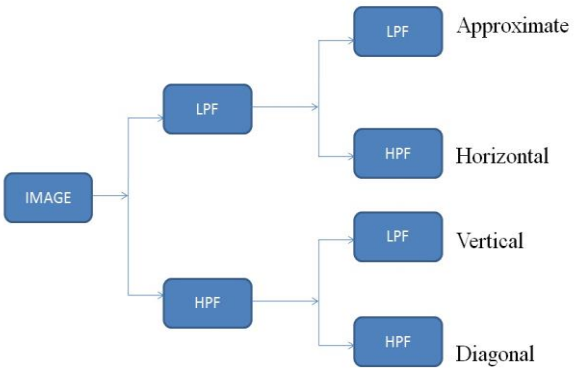

Fig 1: One level DWT

D.Feature Level Fusion

Features play a very important role for any pattern classification task. In feature level fusion, the feature sets originating from multiple biometric sources are consolidated into a single feature set by the applications of appropriate feature normalization, transformation, and reduction schemes. The primary benefit of feature level fusion is the detection of correlated feature values generated by different biometric algorithms thereby identifying a compact set of salient features that can improve recognition accuracy. In this paper we combine features of face, iris and palm print dwt features.

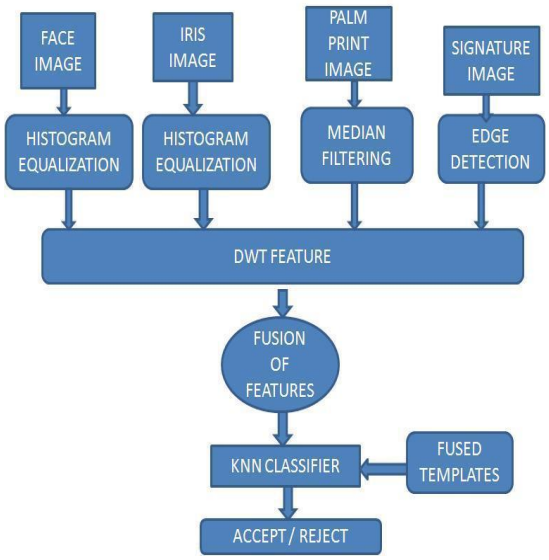

Fig 2: Feature level fusion

E.KNN Classifier:

After extracting features we use KNN classifier. KNN classification classifies instances based on their similarity to instances in the training data. Classification (generalization) using an instance-based classifier can be a simple matter of locating the nearest neighbor in instance space. The downside of this simple approach is the lack of robustness that characterizes the resulting classifiers. The high degree of local sensitivity makes nearest neighbor classifiers highly susceptible to noise in the training data.

IV.RESULTS

The flow chart for complete work is depicted below:

A.Analysis Of Face Database:

i.Histogram Equalization:

*F*igure 4.1 Histogram equalization of face

ii.DWT Feature Extraction:

Figure 4.2 DWT feature extraction of face

B.Iris Analysis:

i.Histogram Equalization:

Figure 4.3 Histogram equalization of iris

ii.Dwt Feature Extraction:

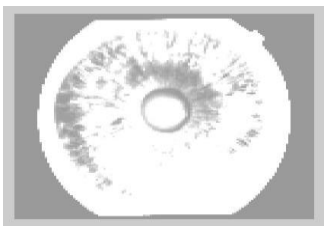

Figure 4.4 DWT feature extraction of iris

C.Palmprint Analysis:

i. Median Filter Output:

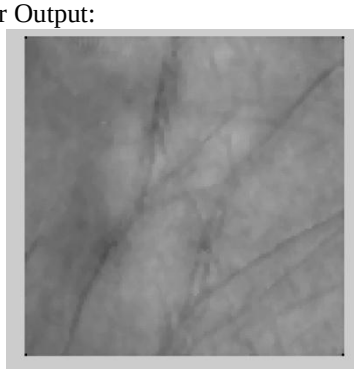

Figure 4.5 Median filter output of palmprint

ii.Dwt Feature Extraction:

Figure 4.6 DWT feature extraction of palmprint

D.Signature Analysis:

i.Edge Detection:

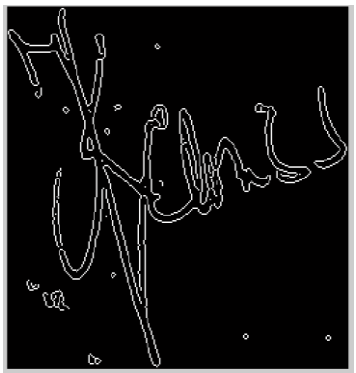

Figure 4.7 Edge detection of signature

ii.DWT Feature Extraction:

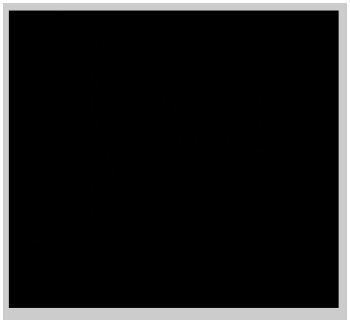

Figure 4.8 DWT feature extraction of signature

DATABASE	FAR(%)	FRR(%)	GAR(%)
FACE	0.83	7.5	92.5
IRIS	1.66	15	85
PALMPRINT	1.11	`10	90
SIGNATURE	6.66	40	60

Table 4.1 FAR,FRR & GAR rate for unimodal biometric

DATABASE	FAR(%)	FRR(%)	GAR(%)
FACE + IRIS + PALM + SIGN	0	2.5	97.5
FACE + IRIS + PALM	0	3.33	96.67
FACE + IRIS + SIGN	0	11.66	88.34\\
FACE + PALM + SIGN	0	15.83	84.17
IRIS + SIGN +PALM	0	15	85
FACE + IRIS	0	5	95
FACE + PALM	0	5	95
IRIS + PALM	0	6.25	93.75
FACE + SIGN	0	10	90
IRIS + SIGN	0	17.5	82.5
PALM + SIGN	0	5	95

Table 4.2 FAR,FRR & GAR rate for multimodal biometrics using feature level fusion

V.CONCLUSION

This paper presented the multimodal biometric systems. By combining multiple sources of information using feature level fusion, the improvement in the performance of biometric system is attained. Biometric products provide improved security over traditional electronic access control methods. Biometric systems are widely used to overcome the traditional methods of authentication. A biometric system may operate either in verification mode or identification mode. In this paper, GAR, FAR and FRR are used for analysis. To overcome existing problem i.e. time complexity and memory complexity we use DWT feature. Depending upon the accuracy of the qualitative analysis parameter of proposed implementation work, we extend our enhancement (score level fusion) by clubbing the every dataset with the remaining three dataset.

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