IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 04, Issue 08 (August. 2014), ||V2|| PP 01-04

Fusion of Iris and Fingerprint Images for Multimodal Biometrics Identification

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Abstract: - Basically biometric system used for identification purpose in this we have two types of attributes physical and biological. The physical attributes are classified as fingerprint, face recognition, palm, voice and biological attributes gait, keystroke etc.In biometric system is that whatever changes the intruder has done with the template it should not be accepted by the biometric system. This paper outlines about the approach based on multimodal biometric (E g. Fingerprint and Iris) which fused together for recognition. This multimodal biometric system is composed of three modules 1) Feature Extraction 2) Fusion of Multimodal biometric template creation 3) Cryptographic key creation. Firstly features like minutia points from fingerprint and texture from iris are extracted. These features fused together to construct a single multi-biometric template. Template protection gives privacy which offers security.

Keywords: - *Fingerprint,Iris,Multimodal,Security,Templates*

I. INTRODUCTION

Now a days we are surrounded by such a globalize environment that our data can be accessible by everyone. So there is a possibility that the template can be hacked by intruder. Our data cannot be accessed by intruder for that purpose we need Security for the biometrics template. Biometrics systems basically used for uniquely recognizing person. There are two types of biometric systems Unimodal and Multimodal biometric systems. Unimodal Biometric Systems face several problems in person identification in case of noisy data, spoof attacks and unacceptable error rates. Multimodal Biometric System uses a combination of two or more biometric trait for identification. In a multimodal biometric system that uses different biometric for identification. In a multimodal biometric system that uses different biometric templates, fusion can be done at four different levels. The four different levels of fusion are given below: Raw data detector level, Feature level, score level.

I. PROPOSED APPROACH FOR CRYPTOGRAPHIC KEY GENERATION FROM MULTIMODAL BIOMETRICS

Multimodal biometrics was aimed for security-conscious customers. Multimodal biometric system has some good advantages such as 1) Improved accuracy 2) Verification Or Identification in case sufficient data is not extracted from given biometric template 3) Ability to protect the confidential data from spoof attack. Several steps involved in proposing the multimodal based approach for cryptographic key generation are :

1) Feature extraction from fingerprint.
2) Feature extraction from iris.
3) Fusion of fingerprint and iris features.
4) Generation of cryptographic key from fused features.

BLOCK DIAGRAM

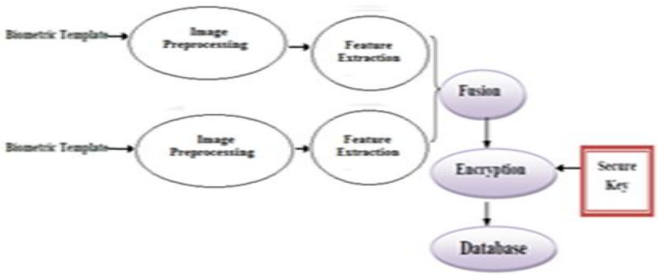


FIG.1: IMPLEMENTATION OF MULTIMODAL BIOMETRICS SYSTEM WITH CRYPTOGRAPHY KEY

The above figure shows the implementation of our multimodal biometric system. Firstly, the image acquisitions of two biometric templates were done. The next step involves the feature extraction from the biometric traits. The extracted features of both the modules stored in the database. After that template have to be compared with one of the existing template stored in the database. Result is obtained as a matching score of that template.

1. **MINUTIAE POINTS EXTRACTION FROM FINGERPRINTS**

Fingerprint recognition is done by several features such as minutia points (Bifurcation & ridges). The overall process can be divided into following operations:

1. Load the image
2. Binarization
3. Thinning
4. Minutia Extraction
5. Output image

Minutia Extraction is done by using mask operation

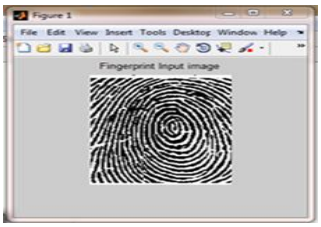
a) BIFURCATION

0	1	0
0	1	0
1	0	1

b) RIDGES

0	1	0
0	1	0
0	0	0

1.1 IMPLEMENTATION OF FINGERPRINT RECOGNIZATION SYSTEM:



Original Image

Thinned Image

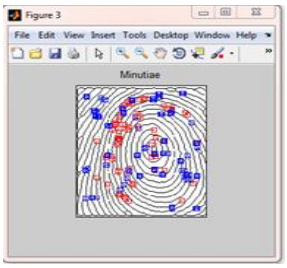


FIG.2 FINGERPRINT FEATURE EXTRACTION WITH MINUTIA POINTS

1. FEATURE EXTRACTION OF IRIS:

Iris recognition is an effective means for user authentication. iris has several important characteristics like 1) Iris has highly distinguishing texture 2) Right eye differs from left eye 3) Twins have different iris texture. The various steps involved in feature extraction of iris are as follows:

1. Load the image
2. Segmentation
3. Normalisation
4. Canny edge Detection
5. Dauman's Rubber Sheet Model

Iris feature extraction is obtained through of a Gabor filter. The overall procedure is load the eye image into the system extraction of feature in the texture format which uses the Gabor filter that feature is represented in the iris code.

Hough transform used to determine geometric entities such as line, circles. Circular Hough transform is used to detect the radius and center coordinates of pupil and iris.
The Equation for detecting the circles as follows: k, l are the x and y coordinates ,g is the radius of circle.

$$k2+l2=g2 \qquad \text{(Eq.1)}$$

For detecting the edges of eye canny edge detection is used. It only recognizes the edges from the eye image. Now we have localized the iris region. For constant dimension we are using the daugman's rubber sheet model.

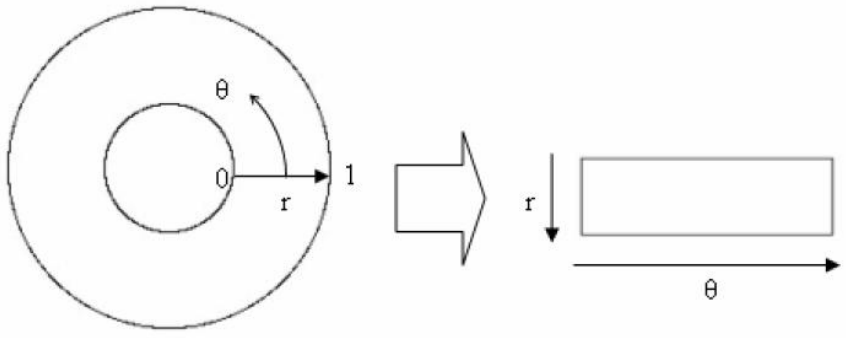
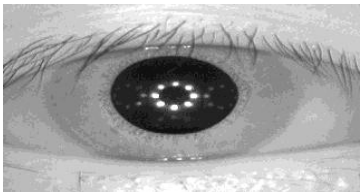


FIG3. DAUGMAN'S RUBBER SHEET

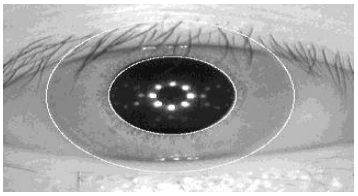
Daugman's remap the each point of iris region to a polar coordinates(r,) where r is in the range of [0, 1] and $\boldsymbol{\theta}$ is of range [0,2pi].
The remapping of coordinates are done from circle's x and y coordinates it converts the co-ordinates into the polar coordinates .The equation is as follows:

$$R= ag \pm ag2 - a - r2 \qquad \text{where a } = \boldsymbol{\sigma}x^2 + \boldsymbol{\sigma}y^2$$
$$g= \cos (pi - \tanh - 1\sigma x2/\sigma y2) \qquad \text{(Eq.2)}$$

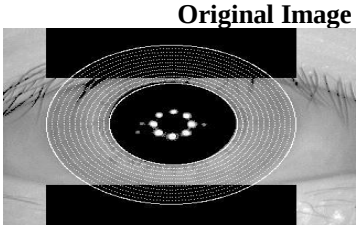
The $\boldsymbol{\sigma}$x, $\boldsymbol{\sigma}$y determines the distance of center of the iris and center of pupil. We get the result in the format of rectangular portion.



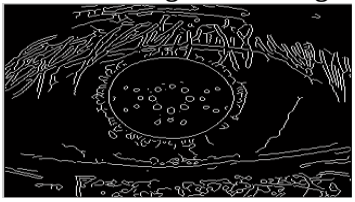
Original Image



Segmented Image



Normalized Image



Edge Detection

Extracted Feature of Iris

2. FUSION OF FINGERPRINT AND IRIS FEATURES

The next step is to fuse the two sets of features to obtain a multimodal biometric template for authentication.
The Fused Image is shown below:

Fused Features of Two Templates (Fingerprint & Iris)

CONCLUSION

We have proposed a cryptosystem based feature level fusion framework for the design of multibiometric system that simultaneously protects the multiple templates of a user using a single secure sketch. In our project, we have been using two modalities such as Fingerprint fusion of two modalities using principal component analysis method. Here, we got the fused biometric that fused biometric template used for encryption using selective encryption method. Basically now a day's selective encryption method is used for encryption because it gives helpful results for multimedia data and it is will use for further applications such as compression of encrypted images on web. So, multimodal biometrics gives accuracy in providing results as compared to unimodal system. By experimental results it shows that accuracy in system of multimodal system is efficient than unimodal system. Here we have tested the database for 800 subjects and the level of accuracy increase and the biometric template is wrapped by the encryption technique which is tricky to reform the same template as our system is providing security to the Multimodal biometric system.

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