ISSN: 2321-8169
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Multibiometrics For Avoiding Masquerading Identity And Alteration

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Abstract- Deployment of Automated Fingerprint Identification System is widespread in border control as well as law of enforcement applications that increases need of ensuring that these systems should not be compromised. There are several investigated issues in fingerprint system security which includes fake fingerprints as for masquerading identity as well as fingerprint alteration and many security related issues. For avoidance of masquerading identity and alteration the main contribution of the paper is to 1) Use multibiometrics so as to reduce the growing threat of person evading AFIS 2) Analyzing fingerprint based on orientation field as well minutiae distribution 3) Recognition of iris pattern using algorithm based on eye template of an individual. Experimental results will recognize the individual based on the output from both the techniques.

Keywords—*Fingerprints, Minutiae distribution, Orientation field, Iris recognition, Hough Transform, Hamming Distance*

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I INTRODUCTION

Law of enforcement agencies uses fingerprint recognition for identifying the criminal and suspects for almost 100 years. As fingerprints of individual are unique, which differentiate an individual from the other for lifetime. There are many cases were many criminals and suspects are identified with the help of fingerprint. Due to which criminals try for masquerading their identity by alteration, Figure 1 shows many cases of fingerprint alteration.

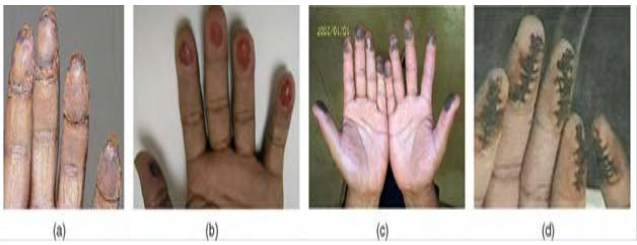

Fig.1. Photographs of altered fingerprints. (a) Transplanted friction ridge skin from sole. (b) Fingers that have been bitten. (c) Fingers burnt by acid. (d) Stitched fingers

Generally the altered fingerprint are divided into three types

1) Obliteration

2) Distortion

3) Imitation

1) Obliteration

It is one of the common form of alteration which means destroy, erase or remove. Obliteration means destroying the quality of the friction ridge pattern on the fingertips which can be performed by burning , incision, applying acids, scraping .

Type	Obliteration		Distortion		Imitation
	Scar	Mutila-tion	Z-cut	Trans-plantation	
Number of Images	1,457	2,480	297	148	51

Fig. 2. Fingerprint obliteration. 2) Distortion

It means reshaping of original patterns of friction ridge, which can be obtained by reorganizing or removing of skin from fingertips. Distorted fingerprint have high quality level i.e. they have very clear and visible friction ridge patterns on the whole fingerprint

Fig.3 Fingerprint distortion.

3) Imitation

The most advanced category of altered fingerprint are imitated fingerprints. It preserves both ridge properties as well as contain smooth orientation field patterns for its friction ridge pattern. It can be obtained by transplanting a large area of friction ridge skin for example removing a portion of friction ridge skin and then joining the remaining skin.

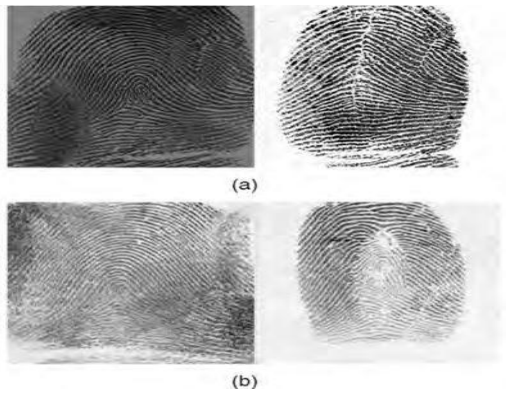

Fig. 4. Fingerprint imitation

II PROPOSED WORK

Unless the success of fingerprint recognition system, due to very minute differences in the normal fingerprints and altered fingerprints it has become a big challenge to detect the alteration for any fingerprint recognition system . So to avoid the masquerading identity and alteration problem, we propose to use multibiometrics so as to avoid or reduce the growing threat of person evading the AFIS.

Multi-Biometrics is an identification technology which uses more than one biometric technology such as Facial fingerprint, Fingerprint-Iris, Facial-Fingerprint-Iris etc. for matching. There are advantages of using Multi-Biometrics to increase the capabilities of each biometric technology for overcoming the limitations over single technology .This paper aims at defining optimum, accurate and fast process using multi-model biometrics to avoid masquerading identity problem. We propose to use Fingerprint- Iris Model for the identification of the individual

A. Fingerprint Detection

It is the oldest and reliable method for identification. Fingerprints are unique to every individual and can be considered as signature that certifys the person's identity. Fingerprints differ even for ten fingers of the same person. The fingerprints are different for twins also. There are many algorithm that are not suitable of detecting altered fingerprints, specially the distorted as well imitated types. In fact, the distortion and imitation in fingerprints are very hard to be detected by any fingerprint image quality assessment algorithm which is based on analyzing local image quality. so we consider the problem of automatic detection of alterations based on analyzing ridge orientation field and minutiae distribution.

B. Iris Recognition

Iris recognition is a highly mature technology with a proven track record in a number of application areas. Iris recognition systems used very effectively all over the world for identification and access control. This is based on analysis of the iris of the eye, which is the colored ring of tissue that surrounds the pupil of the eye. Based on visible features, i.e. rings, furrows, freckles and the corona, the features with their location information are extracted to form the Iris template, which is used for matching. Iris recognition is widely regarded as the most safe, accurate biometrics technology and capable of performing1-to-many matches at extraordinarily high speeds, without sacrificing accuracy.

Iris Recognition is the most powerful biometrically based technologies for an individual verification and identification that uses the iris patterns which exhibits unique for every individual. The proposed algorithm includes recognition through iris patterns based on eye template of an individual so as to improve the recognition accuracy and computational efficiency.

III PROPOSED MODEL

The proposed model Consist of Fingerprint- Iris Multibiometric model, where for avoiding masquerading both fingerprint and iris images are inputted for identification. After processing and applying various techniques on both images if the output of both system is true then only the individual is recognized else it is not the proper person. Due to which more security can be obtained and the problem of evading the AFIS can be avoided.

The proposed model basically consist of two sub models one for fingerprint detection and other for iris recognition. Fingerprint detection is based on orientation field estimation from which the discontinuity in orientation field is observed and given as input for feature level fusion and also minutiae is extracted and density map is obtained and inputted for feature level fusion so that it can be classified by using SVM model to obtain the result as whether the fingerprint is normal or altered.

The proposed submodel for iris recognition described below introduces a recognition technique where the iris

ISSN: 2321-8169
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patterns of eye template is used for better recognition and performance, as both the eyes carries distinguised features which signifies its uniqueness. The most distinctive feature of this model which makes it different from the existing model is that recognition doesn't rely purely on one eye. Therefore, if a person's one eye fails to match, there is another opportunity through which person can be recognized. Figure 5. Shows the proposed flowchart for the model

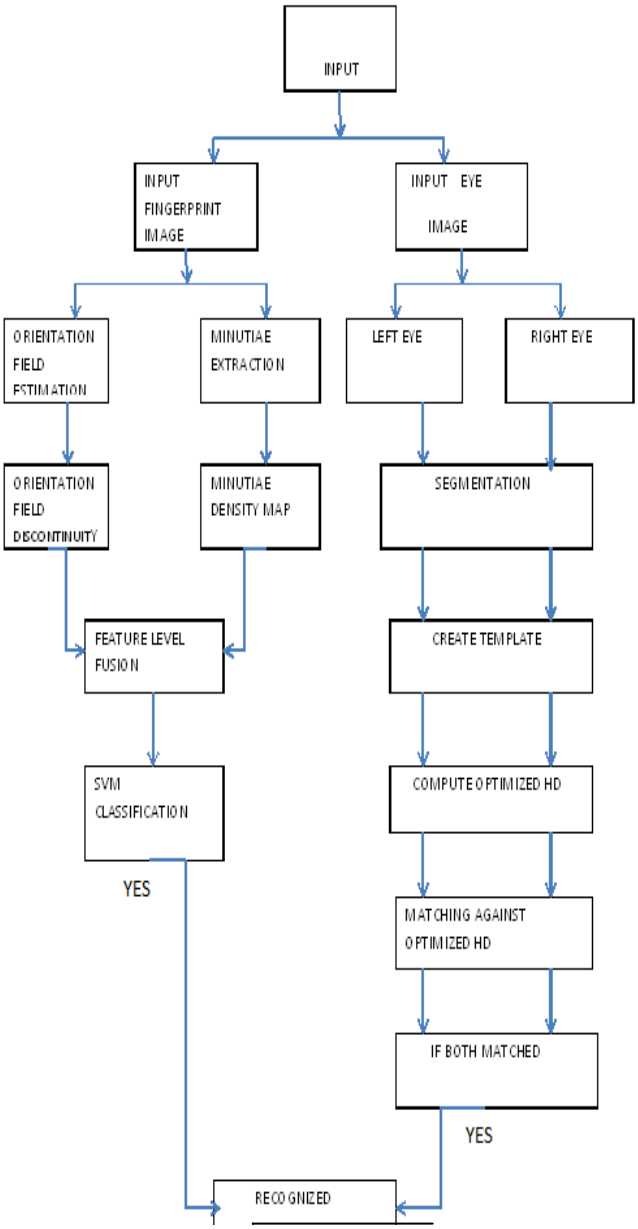

Fig.5. Shows Flowchart of Proposed Model

IV PROPOSED METHODOLOGY

A. Fingerprint Detection

The main steps in fingerprint detection are

1) Orientation Field Analysis

2) Analysis of Minutiae Distribution

Orientation Field analysis can be done in four step

- Normalization. Inputted image of fingerprint is normalized to 512 _ 480 pixels with the help of cropped rectangular region of the fingerprint, that is at the center of the fingerprint which is aligned along the longitudinal direction of the finger.

- Orientation field estimation. Gradient based method is used to compute the orientation field of the fingerprint, _ðx; yÞ,. Initial orientation field is smoothed by a 16 _ 16 averaging filter, followed by averaging the orientations in 8 _ 8 pixel blocks. A foreground mask is obtained by measuring the dynamic range of gray values of the fingerprint image in local blocks and morphological process for filling holes and removing isolated blocks is performed

- Orientation field approximation. The orientation field _ðx; yÞ is approximated by a polynomial model to obtain ^ð Þ.
  _ x; y
- Feature extraction. The error map, "ðx; yÞ, is computed as the absolute difference between _ðx; yÞ and ^ð Þ and used to construct the feature vector.
  _ x; y

Analysis of Minutiae Distribution. In fingerprint minutia indicates ridge characteristics such as ridge ending or ridge bifurcation. Almost in every fingerprint recognition systems minutiae are used for matching. Long with the abnormality observed in orientation field, we observed that minutiae distribution of altered fingerprints often differs from that of natural fingerprints.

On the basis of extracted minutiae from a fingerprint minutiae density map is constructed by using the Parzen window method with uniform kernel function which will include 1) Initial estimation 2) Low Pass Filtering 3) Normalization. After obtaining the feature level fusion from orientation field estimation and minutiae density map extracted feature are fed to Support Vector Machine for classification.

B. Iris Recognition

An Iris Recognition System consist mainly of five stages- (1) Pre-Processing (2) Segmentation (3) Normalization (4) Encoding (5) Matching. The processing done for both left and right eye is similar which will undergoes through same stages from 2 to 5.

1) Preprocessing

In this stage an eye image of an individual will be taken that must provide an explicit view of left and right eye. This can be obtained by cropping based on manual distance calculated from localized pupil Figure 6 shows sample picture of cropped eye image.

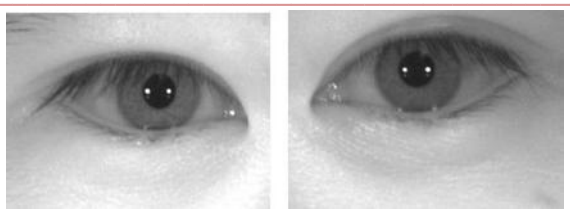

Figure 6 shows sample picture of cropped eye image.

2) Segmentation

Segmentation stage will detect the boundaries of pupil and limbus so as to isolate the iris region from an input eye iamge. It will also identify the region where eyelashes and eyelids interrupt limbus boundary's .It will be implemented by using circular Hough Transform.

3) Normalization

Normalization will be implemented by using Daugman's Rubber sheet model to transform iris texture from Cartesian to polar co-ordinates which remaps every point within the iris region to polar co-ordinates

4) Feature Encoding

Each Iris has distinct feature which makes it distinguishable from other.The template obtained during feature encoding process will be compared against metric matching which will be carried for Interclass and Intraclass.

5) Matching

Hamming Distance will be used for matching metric so as to compare two iris template.

V EXPERIMENTAL RESULT

The proposed work will recognize an individual on basis of output from both the submodels i.e. Fingerprint Detection and Iris Recognition if the output from fingerprint detection and iris recognition is true then and then the individual will be authenticated which will try to avoid the problem of masquerading identity in many application such as border control ,law of enforcement etc.

VI CONCLUSION

The proposed work will be tested to obtained better results using a database of fingerprint and iris . So the problem of masquerading identity and alteration can be avoided or reduced.

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