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Ordinal Features Based Palmprint and Iris Recognition for Military Security

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ABSTRACT: Reliable authorization and athentication has become al part of our life for a number of routine applications.Majority of the authentication systems found today are not very flexible. Hence,biometric identification methods are quickly becoming commonplace in security and access control applications.This paper mainly focusses on providing higher and strict security in military environments for the access of nuclear weapons and their research sites by using the most accurate and reliable of the biometric technologies which is the palmprint recognition and iris recognition.The proposed work is to demonstrate an effective feature representation model for palmprint and iris recognition using the concept based on ordinal measures and it presents a palmprint and iris recognition using ordinal features.It is to provide all intra and interclass matching pairs well separated with a large margin. In order to obtain effective feature set for palm print recognition is done by firstly, segmenting the hand and then the palm print region is extracted. The tangent based approach is used for the segmentation. In the same manner, the effective feature set for iris recognition is obtained. The texture characteristics such as scale, orientation and salient texture primitives of iris patterns vary from region to region. Firstly, segmentation is done and exclusion of the occlusion regions in the iris images and labeling the regions using mask in iris matching. Ordinal features are then extracted and hamming distance based matching is performed. High efficiency is to be achieved even on a large-scale feature pool and training database.

KEYWORDS : Palm print recognition, Iris recognition, Gabor filter, Matlab, Ordinal measures.

I. INTRODUCTION

Most of the authentication systems which make use of cards, passwords etc are less secure and is prone to attacks or access to secured locations. Hence, biometric-based techniques have emerged as the most promising option and as a better alternative. The pattern of the human body is well suited to be applied for access control and provides security in biometric personal identification technique. This paper mainly focuses on to provide a higher as well as a strict security for military controlled access areas which require greater security for the access of nuclear weapons and restricted areas hence by using biometric techniques as the preferred solution because biometrics cannot be shared or borrowed. Hence, by using palm print and iris texture patterns which are the most accurate biometric modalities with successful applications for personal verification and identification.

The success of a texture biometric recognition system heavily depends on its feature analysis model, against which biometric images are encoded, compared and recognized by a computer. It is desirable to develop a feature analysis method which is ideally both discriminating and robust for palm print and iris biometrics [4]. On one hand, the biometric features should have enough discriminating power to distinguish interclass samples. On the other hand, intra-class variations of biometric patterns in uncontrolled conditions such as illumination changes, deformation, occlusions, pose/view changes, etc. should be minimized via robust feature analysis. Therefore it is a challenging problem to achieve a good balance between inter-class distinctiveness and intra-class robustness.

In our proposed work, palm print and iris recognition is carried out using the concept of ordinal measures. Ordinal measures [2] are considered as a very effective and efficient feature illustration model for palm print and iris recognition. However, ordinal measures are a general concept of image analysis and various variants which contain totally different parameter settings like location, scale, orientation, and so on, which can be derived to constitute a large feature area. The objective function of the proposed feature selection methodology comprises of two components, i.e., misclassification error of intra and interclass matching samples and weighted sparsely of ordinal feature descriptors and, the optimization

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subjects to a variety of linear inequality constraints, which requires that every intra and interclass matching pairs are well separated with a large margin.

II. ORIGINAL MEASURES FOR PALMPRINT AND IRIS RECOGNITION

Ordinal measures come from a simple and straightforward concept that we often use. The kind of qualitative measurement, which is related to the relative ordering of several quantities, is defined as ordinal measures (OM). For computer vision, the absolute intensity information associated with an object can vary because it can change under various illumination settings.

Fig. 1.Ordinal Measure of Relationship between Two Regions

From the above simple illustration of ordinal measures, we can notice the following:

Region A is darker than B, i.e. A < B
Region A is brighter than B, i.e. A > B

The symbols "<" or ">" denote the inequality between the average intensities of two image regions. The inequality represents an ordinal relationship between two regions and this yields a symbolic representation of the relations. For digital encoding of the ordinal relationship, only a single bit is enough, e.g. "1" denotes "A<B" and "0" denotes "A>B", and the equality case (a low possibility event) can be assigned to either.

III. METHODOLOGY

Ordinal feature selection for palm print and iris [4] is a method for a very secure computation of iris and palm print recognition. The system performs iris and palm print recognition which compares iris and palm print of subjects with a database of registered iris and palm print. The identification is done in a secure way which protects both the privacy of the subjects and the confidentiality of the database. The system runs a secure computation of iris and palm print recognition algorithm [4],which identifies if a image acquired by a client matches one of the suspects, but otherwise revels no information to neither of the parties.

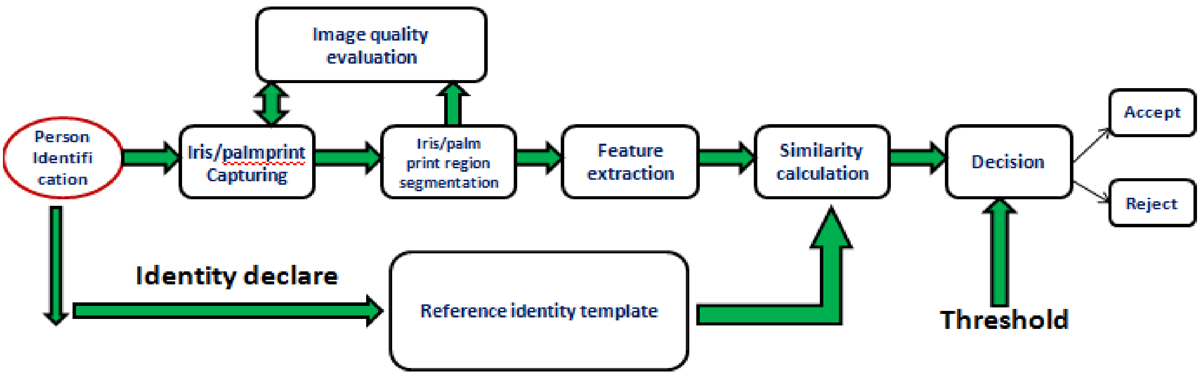

Fig 2 Block diagram of How Palm-Print and Iris Recognition is performed

The algorithm checks whether the captured image is stored in the database. Depending on that the captured image is accepted or rejected and is allowed access to the highly restricted areas.
The proposed system is designed with the four fundamental modules as explained below:

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A. Pre-*processing*:

There are various ways to capture palm print and iris images. Researchers utilize CCD-based scanners, digital scanners, video camera and tripod to collect palm print and iris images. Fig5.8 shows a CCD-based scanner developed by Hong Kong Polytechnic University. it captures high resolution images and aligns palms accurately because it has pegs for guiding the placement of hand.

Fig 3 CCD based scanner

For iris recognition, pre-processing module obtains an image of the eye.The system uses a dual-CCD camera to acquire a colour RGB image with one CCD and a near-infrared image with the other. The colour image is exploited to improve the reliability of the segmentation.

*B. Segmentation***:**

Segmentation is used to correct distortions, align different palm prints, and crop the region of interest for feature extraction by the following steps:

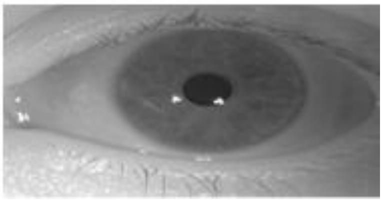

Fig 4 Capturing image of the eye

(a) Binarizing the palm images- Convert the original image into a binary form using the Formula shown below:

$$B(x, y)=1, \text{ if } O(x, y) * L(x, y) >= Tp$$
$$B(x, y)=0, \text{ if } O(x, y) * L(x, y) < Tp$$

Where B(x, y)and O(x, y)are the binary image and the original image, respectively; L(x, y)is a low pass filter, such as Gaussian, and "*" represents an operator of convolution.

(b) Extract the boundaries of the holes using boundary tracking algorithm. *(*Fixj, Fiyj),(i=1,2), between fingers using a Boundary-tracking algorithm. The start points, (Sxi, Syi), and end points, (Exi, Eyi), of the holes are then marked in the process.

(a) Identificación keypoints is used accomplished with the tangent based approach is preferred. This approach considers the edges of the 2 finger holes on the binary image to be traced. The common tangent of the two finger holes is considered to be the axis.Compute the center of gravity, (Cxi, Cyi), between the holes using the formula below:

$$Cx_i = \frac{\sum_{j=1}^{M(i)} Fixj}{M(i)}$$

where M(i) represents the number of boundary points in the hole

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(b) Establishing the co-ordination system- The key points for the coordination system are calculated as the midpoint of the two tangent points. Join the points using the formula below:

$$\mathbf{y = x\frac{(Cyi-Myi)}{(Cxi-Mxi)} + \frac{MyiCxi-MxiCyi}{Cxi-Mxi}}$$

(e) Construct perpendicular line to line drawn.

(f) Align co-ordinate system with different palm print.

For iris recognition, the localization/segmentation module localizes the iris's spatial extent in the eye image by isolating it from other structures in its vicinity such as the sclera, pupil, eyelids and eyelashes

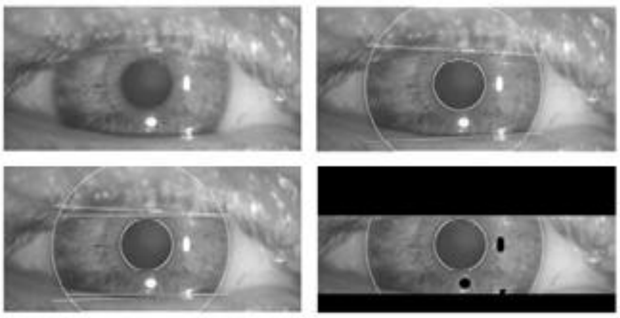

Fig 5 Segmentation of Iris Images

The area of interest by canny edge detection and houghman transform is cropped using the following formulas:.

Circular Hough Transform: Xc2+Yc2 = r2

Linear Hough Transform :(-(x-hj) sin+(y-kj) cosθj)2= (aj(x-hj)cos θj+(y-kj)sin θj)

C. Enhancement/normalization:

For iris recognition, the enhancement/normalization invokes a geometric normalization scheme to transform the segmented iris image from Cartesian coordinates to polar coordinates. Use the Daugman technique to transform the iris texture from cartesian to polar coordinates

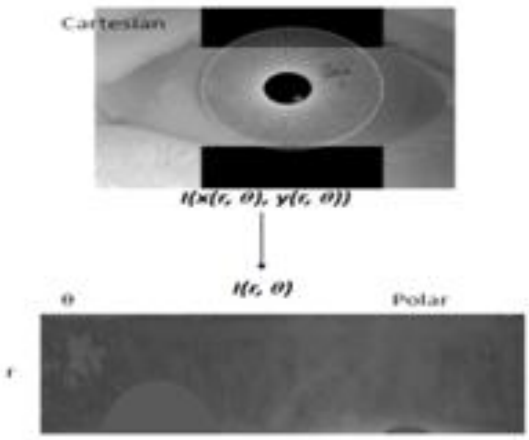

Fig 6.Transforming Cartesian into polar coordinates using rubber sheet model

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For palm print recognition, this process is not required.

D. Encoding:

Gabor filter, Gabor filter bank, Gabor transform and Gabor wavelet are widely applied to image processing, computer vision and pattern recognition. For iris recognition, the encoding module feature extraction routine to produce binary code.

E. Palm print Matching:

In order to describe clearly the matching process, each feature vector is considered as two 2-D feature matrices, real and imaginary. Palm print matching is based on a normalized hamming distance.

IV. RESULTS

Palm print image of the authorized user is scanned and is registered in the database to confirm the identity of the authentic user. The below figure depicts that the user stores his palm print image in the database to mark the confirmation of the user . Once the image has been registered and stored in the database, the confirmation is performed by using the process of segmentation which takes place in order to obtain the area of interest followed by the process of encoding and matching occurs.

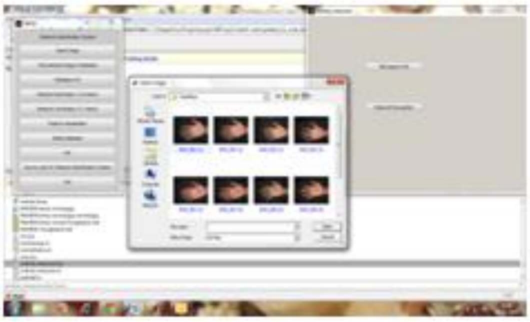

Fig 7.Image of palm print registration

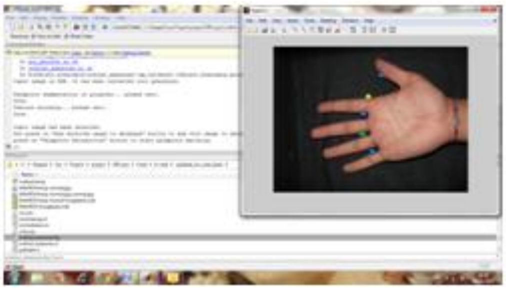

Fig 8.Segmentation of palmprint images

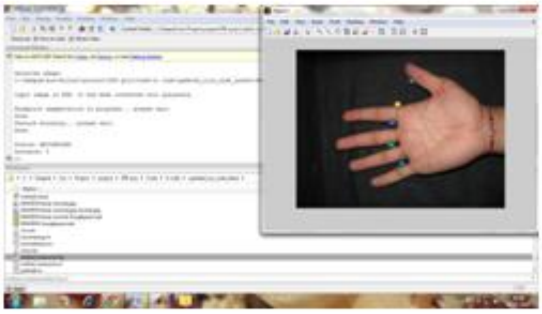

Fig 9.Match found

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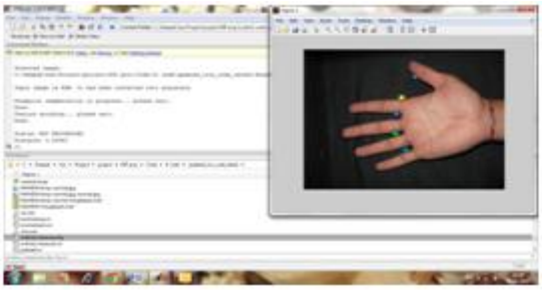

Fig 10.Match not found

Once the user details are registered, the confirmation is displayed through message. Iris image is captured and is stored in the cassia database to confirm the identity of the user. When the input image is inserted, pre-processing, segmentation, normalization, encoding and matching processes are performed in order to obtain either of the following two results.

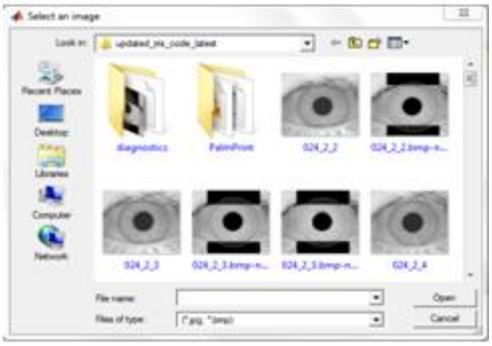

Fig 11.Casia database for iris

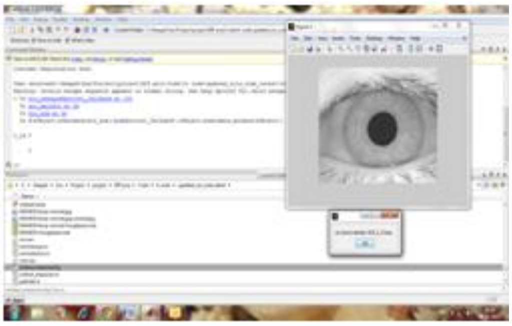

Fig 12.Match found

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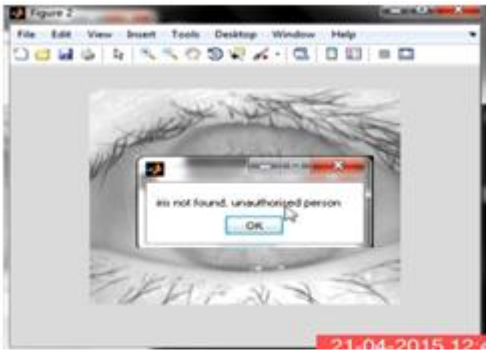

Fig 12.Match not found

IV.CONCLUSION

The ordinal measures have been considered as an effective feature representation model for palm print and iris recognition. Ordinal measures are very promising scheme for biometric pattern representation. Many best performing iris and palm print recognition algorithms can be interpreted based on ordinal measures. Some best performing algorithms can be made even better by using ordinal representation. Segmentation was achieved through the use of the circular Hough transform and the linear Hough transform. Thresholding was also employed for isolating eyelashes and reflections. Iris region was normalized; this was achieved by implementing Daugman's rubber sheet model. Features of the iris were encoded by convolving the normalized iris region with 1D Log-Gabor filters and phase quantizing the output in order to produce a bit-wise biometric template, hamming distance was chosen as a matching metric, which gave a measure of how many bits disagreed between two templates.

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