PALM PRINT DETECTION CLASSIFICATION WITH CORRELATION FILTERS

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ABSTRACT - *Biometric tools is becoming broadly used in individual recognition method substituting existing predictable methods such as secret code and authorization. This paper presents a individual recognition method based on one of the biometric tools which is palm print identification. An approach based on the purpose of unconstrained bare minimum average correlation force (UMACF) filter is planned for palm print characteristic withdrawal and demonstration. We future a computerized palm prints identification method, via digital scanner as a picture acquirement mechanism. The tentative outcome demonstrate the possibility of the future structure*

Index terms *– correlation filters, palm print recognition.*

1. INTRODUCTION

Palm print has a number of advantages over other biometric features such as fingerprint, iris, face and tone. The advantages contain low-quality imaging, low-cost taking machine and constant procession features. Palm print is able to give many features for identification as it is shaped by superior skin region than the fingerprint does most important appearance, wrinkles, ridges, details points, and particular points that stay alive on palm print, are very useful for identification reason. In accumulation, each person being has dissimilar palm print templates.

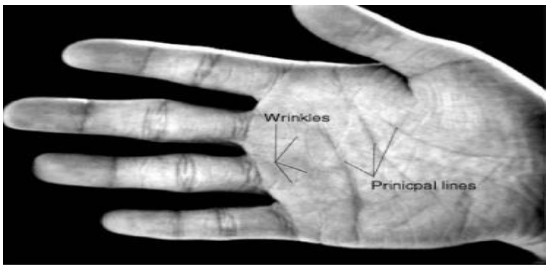


Fig. 1: Palm print image containing principal lines and wrinkles. [Adopted from Zhang *et al*[1]]

Zhang *et al*. [1] proposed a concurrent palm print recognition method that used 2D Gabor segment programming format to take out and correspond to palm print individuality. In the study planned by Qian *et al*. [2] line characteristic vector

(LCV) is used to characterize palm position. The vector is come by based on the enormity and direction of the pitch of the points forming the palm position. LCV furnish formational acquired facts about the lines and also the acquired facts about the thickness of the dissimilar palm lines. In the identical point, a correlation coefficient is used to calculate the relationship linking training image's LCV and experiment image's LCV. They proved that LCV is robust to some degree in revolution and transformation of palm print images.

Correlation filters were introduced in 1980, when Hester and Casasent [3] introduced the synthetic discriminate function (SDF) approach. SDF is a linear arrangement of coordinated spatial filters. The weights of SDF are selected so that the correlation outputs of the training descriptions will present corresponding correlation climax value at the source. It has two drawbacks. The first one is it has no alter invariance ability and the second one; it does not have the facility to accept considerable input sound.

In 1996, Vijaya Kumar *et. al*. [4] introduced the distance-classifier correlation filter (DCCF) which incorporates the compensation of minimum variation synthetic discriminate function (MVSDF) and minimum average connection power (MACE). Later, Vijaya Kumar created a new DCCF filter which was named minimax space change association (MSCA) filter.

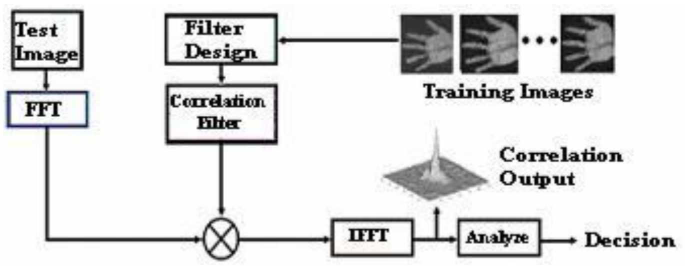


Fig. 2 Schematic of a correlation filter.

The use of most favorable trade-off synthetic discriminate functions (MFTSDF) filter in palm print identification was investigated by Henning's and Vijaya Kumar [5]. In this method, classifier for every palm print set is deliberate using the MFTSDF filter. The filter utilized palm print feel particulars with principle lines in the palm print image, and it is forceful to illumination deformation and small synthetic deformation.

Palm print images are coordinated by correlating the images in occurrence area and from the correlation force production plane, mountain to correlation force part is planned to conclude the comparison connecting the images. Their outcome showed that this technique can realize lofty charge of accurateness.

We planned a computerized palm print identification structure based on unconstrained bare minimum average correlation force (UMACF) filter. Fig. 2 shows the representation of a correlation filter. The palm print is acquired using a digital scanner as the image acquirement machine. To lessen pre-processing steps, two pegs are located on the scanner to ally the center finger as shown in Fig. 3 so that rotating error will be minimized.

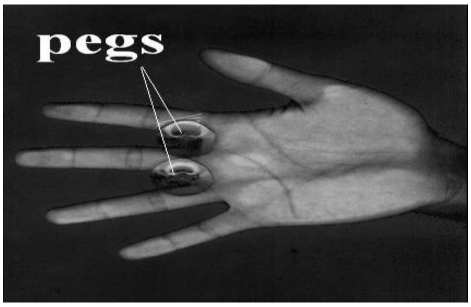


Fig. 3 **Position of the two pegs on the scanner**

2. METHODOLOGY

Assume that there are N training images, and the size of each image is d = d1 × d2 pixels. The 2-D Fourier Transform (FT) of i^{th} training image is lexicographically scanned to form a column vector xi containing d1 × d2 elements. The 2-D filter in the frequency domain is represented by the column vector h. The MACE filter constrains the correlation peak value at the origin, given by [6]:

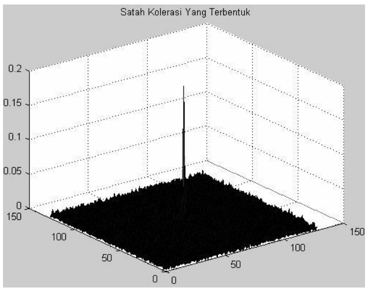
Xi+ h = ui, where Xi = | x1……. xN | is a matrix with size of d × N (+denotes conjugate transpose), while ui = [u1……….. uN]T is a column vector containing the peak value for the train image, and its size is N × 1. In the MACE filter, all points except the origin are reduced nearly to zero by minimizing the average correlation energy (ACE), given by [6]:

ACE = h+Dh

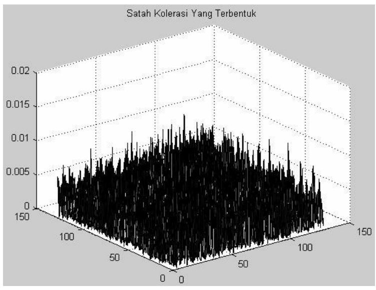
Where D is the average of the d × d diagonal matrices with the spectral density of the ith training image on the diagonal [6], given by (* denotes conjugate): N D =1/N Xi*Xi The MACE filter is: h = D-1X(X+D-1X)-1u. UMACE filter is a MACE filter variant but instead of constraining the peak value at the origin of the correlation output plane, UMACE filter is designed such that the peak value is free to increase according to the input data. UMACE filter is given by:

h = D-1m, (5)

Where m is a column vector which contains the average of training images' 2-D Fourier transform. Fig. 4 shows the correlation output plane for the authentic and impostor cases.



(a)



(b)

Fig. 4 Correlation outputs for (a) authentic person. (b) An impostor

The UMACE methodology determines a different filter for each palm print of authentic class. However, UMACE filter output only a complete correlation plane. If the intensity of the same test image differs when recognition process is done at a

Different time, the image's correlation peak value on the plane will change. Thus, Kumar *et al* [6] has suggested the Peak to Side lobe Ratio (PSR) to evaluate the similarity of correlation planes as it cannot be affected by image intensity. PSR is given by: PSR = mean (5 × 5 central mask) – mean (side lobe) standard deviation (side lobe) where side lobe region is defined as a 20 × 20 pixel rectangular region centered at the correlation peak and excluding the 5 × 5 central mask

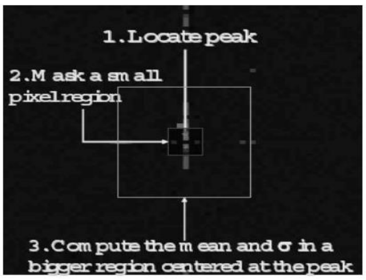


Fig. 5 Calculating PSR from correlation output plane.

The mean and standard deviation of the side lobe are then calculated from the region and the mean value of the 5 × 5 central mask is also determined to compute the PSR as shown in Fig. 5.

3. EXPERIMENTAL RESULTS

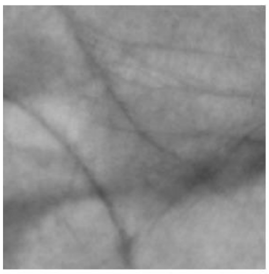
The whole scanned image is considered for the UMAAF filter as well as a cropped middle palm print image. The objectives of image cropping are to remove the region of importance (ROI) from the palm print image and to velocity up the dispensation point by dropping image's size. In this paper, ROI is defined as the middle part of the palm print which is of size 128 × 128 pixels.

Our experiments used palm print images obtained from 10 persons. 6 images were taken from each person's right hand using a digital scanner. Two pegs were located on the scanner to make parallel the middle finger throughout image acquirement. The images were scanned at 300 dpi declaration and stored as grayscale image using bitmap layout.

Experiments were conducted using Mat lab 7.0.4 SP2 on an Intel Pentium 4 1.8 GHz personal computer. The intention of the first experiment is to probe the algorithm presentation when images are cropped to the ROI and when the entire palm print as well as fingers is used. For the entire palm print, the scanned images were cropped to 523×523 pixels.

Examples of the palm print images used in the experiment are shown in Fig. 6. 5 images were arbitrarily elected from each person for training. The take it easy were used for testing. In this experiment, genuine examination image was used as key in, for every rest of exercise images. Two aspects were used to estimate the algorithms performances, the PSR value and processing time. Table 1 shows the results

(a) Whole palm print (523 × 523 pixels).



(b) Central area of the palm print

Fig. 6: Examples of the palm print images used in the experiment

TABLE 1: **PSR VALUES OBTAINED WHEN THE TEST IMAGE IS FROM AUTHENTIC INDIVIDUAL (GREY CELLS) AND WHEN THE TEST IMAGE IS FROM IMPOSTOR (WHITE CELLS)**

Person		Sets of Training Images				
		6	7	8	9	10
Test Image	1	5.9841	5.8278	5.8999	6.7806	6.5383
	2	4.7947	5.0569	5.4938	4.6528	6.0484
	3	5.8277	5.6015	8.3497	4.4346	5.8697
	4	5.1690	5.7174	6.4898	5.5386	5.9101
	5	6.4030	6.4719	8.8885	5.3912	6.6844
	6	82.7284	5.1185	5.3492	5.6428	5.5265
	7	4.7047	67.8974	5.2246	5.8192	7.4782
	8	4.3667	5.8558	98.6460	4.6226	8.7422
	9	5.1434	4.9300	6.7851	87.7346	6.8205
	10	6.9746	4.7052	7.9524	9.8652	55.0787

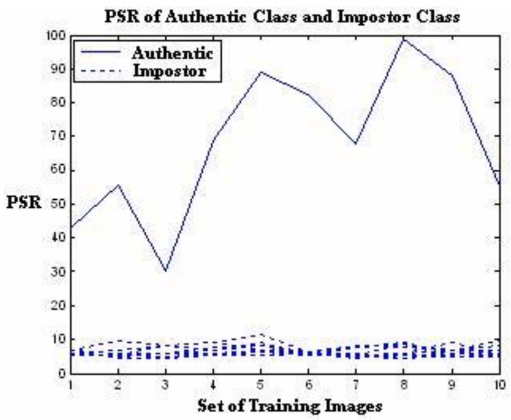


Fig. 7: Comparison between PSR of authentic class and impostor class

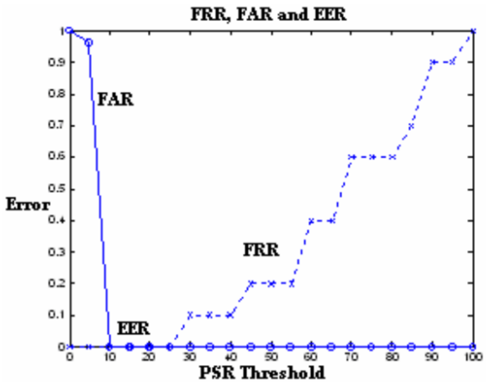


Fig. 8: FRR, FAR and EER

Person		Sets of Training Images				
		1	2	3	4	5
Test Image	1	43.0411	5.2483	6.7938	6.5352	5.6119
	2	5.0017	55.3920	9.9111	5.6610	6.9101
	3	4.8774	5.8100	29.9715	5.7227	8.4325
	4	6.0625	7.3384	8.8057	68.5998	8.9542
	5	6.2777	8.2183	11.6689	8.4657	88.7855
	6	5.6438	5.5066	6.1712	6.3323	6.2060
	7	4.4439	5.2007	8.3743	5.3896	7.5868
	8	5.6944	8.5390	7.5558	5.4378	9.1604
	9	8.7755	4.9083	7.0121	4.9218	6.1117
	10	5.1035	5.2108	4.7446	5.7790	5.0395

From Fig. 7, we can see the dissimilarity border connecting genuine class and charlatan is relatively large. Based on the Fig. 8, the algorithm will attain zero EER if the PSR entrance value is set between 10 to 25. These explanations explain that the algorithm has the aptitude to recognize genuine class and refuse charlatan class with high-quality accurateness.

4. CONCLUSION

This paper has exposed a palm print identification structure based on UMAAF correlation filters. A scanner is used to confine the palm print while two pegs are used to manage the position of the palm. even though the complete palm print images with pegs can be used for identification giving advanced PSR values, cropped images give enhanced presentation in conditions of rate The UMAAF filter is able to distinguish connecting genuine and charlatan images with good accuracy.

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