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Curvelet transform based palm print recognition for biometric authentication.

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***Abstract**: An efficient Palm print recognition technique is being proposed here, the system uses the Curvelet Transform (CT) for the process of feature extraction. The CT differs from Discrete Wavelet Transform in a way that the levels used for feature extraction is made to vary. With the help of PCA and RBF neural network we can recognize the authentication by using Curvelet transform to increase the accuracy. Curvelet transform mainly used for predicting several principal lines especially most sparse lines on palm prints. This paper utilizes the Curvelet transform to extract the feature information of palm print images on different scales, deals with the information by dimension reduction of PCA(Principal Component Analysis), then provides the information for RBF network to study and make decisions. Here we are going to increase the speed of computational process to reduce the response time*.

Keywords: *Curvelet Transform (CT), Radial Basis Function (RBF), Primitive Component Analysis (PCA), Recognition Rate(RR),Compression Rate(CR).*

1. INTRODUCTION

A biometric system is essentially a pattern recognition system which makes a personal identification by determining the authenticity of a specific physiological or behavioural characteristic possessed by the user. Biometrics has gained much attention in the security world recently. Various biometric methods are available for authentication purpose. Palm print recognition is considered to be one among the best due to the easy capturing of images at various illuminations and gestures which could be processed later. An efficient Palm print recognition technique is being proposed here, the system uses the Curvelet Transform (CT) for the process of feature extraction. The CT differs from Discrete Wavelet Transform in a way that the levels used for feature extraction is made to vary. With the help of PCA and RBF neural network we can recognize the authentication by using curvelet transform to increase the accuracy. The Curvelet transform is a multi scale method of representation of several curves especially sparse curve functioning of in it. The Curvelet transform can extract the feature information of palm print images in different scales and angles. With the help of PCA we can get the data of palm print images(different angles and scales). After that the scales are to be transmitted to the RBF neural network, the network can extract the images of palm print in three different layers. In that, there are different dimensions and angles of scales of palm prints are available because distance between lines are must same when compares to original image.

In this paper we have to increase the speed of computational process of the Curvelet transform for reducing the high response time.

2. PROPOSED SYSTEM

A. Curvelet transform

The first generation Curvelet transform has the result 96.53% accuracy with high response time. In order to reduce the response time of first generation Curvelet transform we go for second generation curvelet transform. The second generation Curvelet transform mainly used for increasing the accuracy up to 98% but the response time is high when we go to get high accuracy. Here we have to reduce the response time of second generation with the same accuracy because accuracy is high in second generation Curvelet transform. here the computational complexity is low and reduce the response time.

B. Block Diagram

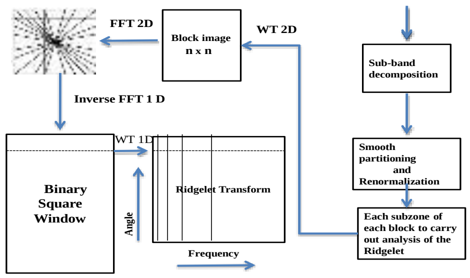

Fig 1: Basic Curvelet Transform

The above block diagram describes the operation of the proposed system. Here it combines the binary square window and ridgelet transform for the proposed system

A. Primitive component analysis(PCA)

In this PCA mainly used for taking different dimensions and scales of palm print images. In taking the scales of palm print the distance between the curves must same then only we get the proper image of original. Have the features of PCA we can easily take the measures of palm print and the scales are to be transmitted to the RBF neural network.

B. Radial basis function(RBF)

RBF neural network consists of three layers: The first is input layer, which consists of signal source nodes; the second is hidden layer. Number of hidden unit is determined by the problem and hidden unit transform function is center radial symmetry, non negative and non-linear; the third is output layer, which responses to input. Here we receive the measures of palm print images, by the measurement we move for the treatment of eigen vector for the representation of sparse curves. Here we reduce the time in that responsible coding, second generation reducing the time level may not affect the accuracy and computational process. The treatment of eigen vector following the three functions mainly.

C. Extracting eigen vector first layer on rough scale

From the measurement of PCA we can extract the rough scale for the dimensions of palm print images. for the palm print image size if 128*128 it will Carry out Curvelet transform to get the 1st layer's coefficients, make32*32 coefficients transformed as feature information and do them in a series connection from left to right as shown in figure 2.

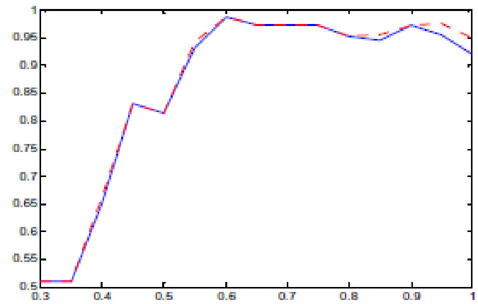

Figure 2: RC of 1st layer.

Figure 2 shows the Relationship Curve (RC) between recognition rate of each layer and compression rate. Here the RC plotted between on RR and CR as a rough scale of dimensions from PCA.

D. Extracting the 2nd layer eigenvector in curvelet domain.

It will perform the pixels of the character figure series connections from left t right and treat them as the Eigen vector (size of 16384).It will finally send them to the RBF network for classifier training or recognition as shown in figure 3.

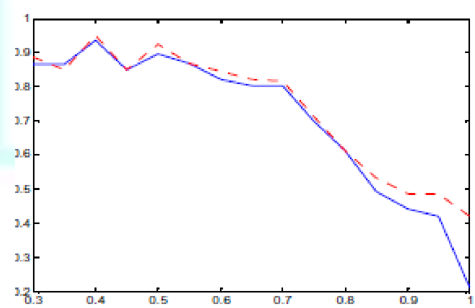

Figure 3:RC of 2nd layer.

E. Extracting the 3rd layer eigenvector in curvelet domain.

First it will reduce the noise and get character image after reverse transform and carry out binarization processing (size of 128*128)and divide the image into 4*4 of be adjacent to but not overlapping .Statistic pixels' sum of each block .Then extract eigenvector by series connection from left to right (size of 1024)and finally carry out dimension reduction by PCA. Finally, send them to RBF network for classifier training or recognition as shown in figure[4]

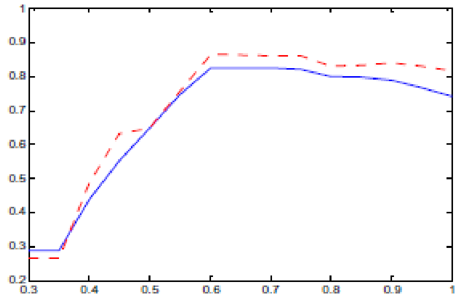

Figure 4: RC of 3rd layer.

F. performance of Curvelab tool box

Curve Lab is a collection of Matlab and C++ programs for the Fast Discrete Curvelet Transform in two and three dimensions. With the help of this tool box the calculation process of scales and dimensions are greatly reduced For this Curvelet transform we can get the desired output by the following Matlab code, first it loads the responsible palm image and use the parameters of curvelet transform and also execute it for the three functions of RBF neural network.

Parameters for the curvelet transform.

```
options.null = 0;
options.finest = 1;
options.nbscales = 4;
options.nbangles_coarse = 16;
options.is_real = 1;
options.n = n;
```

Perform the transform.

```
MW = perform_curvelet_transform(M, options);
```

Display the transform.

```
clf;
plot_curvelet(MW, options);
```

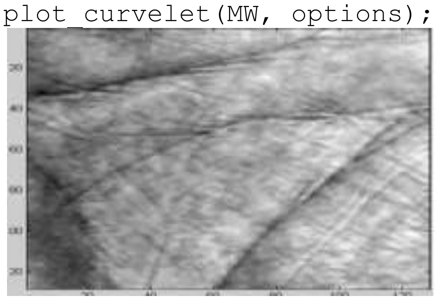

Figure 5: Original image.

Figure 5 is a original image which is used as an input image for the curvelet transform. From this input image PCA can get the dimensions of the image. Here it consists of several curves and sparse curves also.

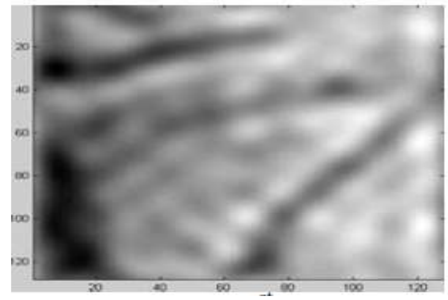

Figure 6: First layer.

Figure 6 shows the rough scale treatment of eigen vector. From the rough scales of eigen vector it gives the first layer output. features of RBF can create the first layer i.e called as a hidden layer.

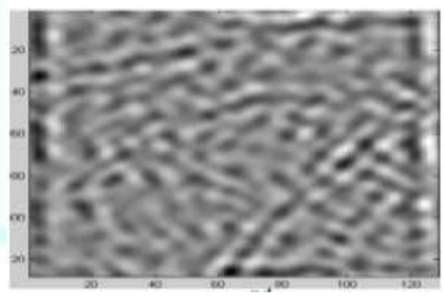

Figure 7: Second layer.

The second layer output shows the high recognition rate of sparse and several curves. For the exact identification it takes the particular area of image and enhance it. With the help of curve lab toolbox we can get it.

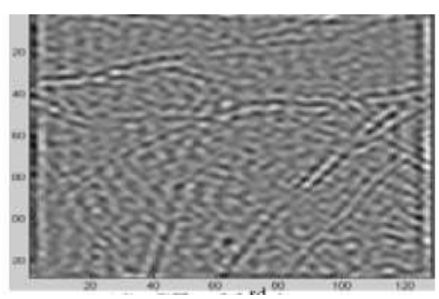

Figure 8:Third layer.

The third layer shows the output of input image with sparse curves. Here it shows high accuracy of recognition with high speed computational time. For reduce the response time, we use the curve lab toolbox. Here the time plot between RR and CR is reduced for quick response time.

3. CONCLUSION

In this output we get the sparse lines and principle lines of the palm print image with low response time and high accuracy than the first generation curvelet transform and other transforms. In future work we will create a fourth layer for accuracy high and multi-spectral of palm print image to capture sensitive image under illumination, including Red, Green, Blue and Infrared by using competitive coding scheme for matching algorithm. The multi-texture image segmentation would carry out the particular sparse lines with high accuracy.

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