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FACE RECOGNITION USING RADON & WAVELET TRANSFORM

Ms. Gayatri Bhole *, Mr. M. D. Jakhete

* Department of E&Tc. G. H. R. College of Engineering & Management, Jalgaon - India

ABSTRACT

This paper presents a new pattern recognition technique for face recognition based on the combination of Radon and wavelet transforms, which is variant to variations in facial expression, and illumination. It is very difficult to identify images or user at changing expressions. In this paper, designed of a system is used to identify the user having variant facial expression and illumination with the higher recognition rates and better accuracy. It is also robust to zero mean white noise. The technique computes Radon projections in different orientations and captures the directional features of face images. Further, the wavelet transform applied on Radon space provides multi resolution features of the facial images. Being the line integral, Radon transform improves the low-frequency components that are useful in face recognition. For classification, the nearest neighbor classifier has been used. Experimental results using ATT databases containing 50 images show the superiority of the proposed method with some of the existing popular algorithms.

KEYWORDS: Face recognition, Radon Transform, Wavelet transform, Radon space.

INTRODUCTION

Now a day in various security systems uses face recognition technique because of some characteristics like uniqueness. To control various data sequence produced in various data input various different formats are used. Human faces have variable expression according to the emotions or situation. If under such condition facial image is feed to the input of recognition system it may denies recognizing that person which may create the difficulty for that person to access his own system for which that security system is used. To avoid such difficulties, the system which work without failure & give appropriate results is required.

This paper elaborate the concept of such technique which work for variant facial expression & illumination.

Evolution in face recognition field

However, dimensions are get reduce using the LDA and the PCA is also computationally very costly when the original dimensionality is high and the number of training samples images is large. When the training database becomes spacious, the training time and Space of memory requirement will instantly increase. Also the systems based on the PCA or LDA should be retrained when some new data are added to obtain desired projection results which are required. Therefore, reduce the design complexity to its peak level desirably [3].

Now a day, discrete cosine transform (DCT) has been improve the rate of employment in face recognition for reduction of dimensions. The benefit of the DCT is that it is not depend on any data (i.e., the basis images are only dependent on one image instead of on the various sets of training images) and it can be designed using a fast algorithm. [3]

In many applications in today's life like identity verification security of information, human-machine interface, Face recognition has received largest attention. Various changes in face images such as viewpoint, brightness and different expressions on face become a great challenge in identification. Reduction of feature vector dimensions for face recognition can be done due to excellent energy compaction property of Discrete Cosine Transform (DCT) for highly correlated data.

PCA and LDA are used in DCT domain to find the characteristics of the facial images in reduced complexity of measurements. The combination of DCT characteristics, PCA and human visual system characteristics are used to design face recognition system [3].

By using nonlinear fractional power polynomial KPCA we can reduce the dimensionality of these features. To reduce dimensionality the conventional KPCA is used along with doubly nonlinear mapping in original feature space. Many face recognition algorithms use vector-based learning, where structural information about images is not saved.

Because of less number of training samples than dimension of feature space LDA suffers from under sample problem (USP). To preserve discriminative information in training tensor UPS tensor discriminant analysis is used as a pre-processing step for LDA.

Generalized support vector machine, minimax probability machine, Fisher discriminant analysis and the distance metric learning, to support tensor machine, tensor minimax probability machine, tensor Fisher discriminant analysis and multiple distance metric learning, respectively are used for Supervised tensor learning and its alternating projection optimization procedure is based[6].

Recursive cluster based linear discriminant (RCLD) is extracted from the total number of feature vectors. An inherent problem of conventional Fisher linear discriminant analysis can be overcome with the multimodal distributions along with RCLD. Illumination invariant face recognition using near infrared imaging system helps to produce face images of good condition with respect to visible light in the environment. Local binary pattern (LBP) features are used to derive an illumination invariant face representation. Statistical learning algorithms are used to extract the most discriminative features from a large pool of invariant LBP features for highly accurate face recognition. Most of the above-mentioned approaches have the limitations in number of features they can extract apart from their data dependent bases [7].

By using Radon transform we can derive more number of features from an image. The Radon transform helps in implementation of very effective detection algorithm, but does not provide sufficient information for recognition purpose. Visual system analyses images at several spatial resolution scales. In image representation, high frequencies carry detail information about image & low frequency carry coarse, information about shape which is useful in face recognition. An appropriate wavelet transform (WT) can result in robust face representation with respect to illumination and expression changes and is capable of capturing substantial facial features while keeping computational complexity low [4].

This paper presents a new technique for face recognition which is a combination of Radon and WTs, which is efficient, variant with variations in facial expressions and brightness. The approach is also robust to zero mean white noise and has data-independent bases scales.

PROPOSED SYSTEM

By using Radon transform we can derive more number of features from an image. The Radon transform helps in implementation of very effective detection algorithm, but does not provide sufficient information for recognition purpose. Visual system analyses images at several spatial resolution scales. In image representation, high frequencies carry detail information about image & low frequency carry coarse, information about shape which is useful in face recognition.

For proposed system processing algorithm can be given as [1]

Steps 1- In this step training images are normalized.

Step 2- During this step it computes most favourable outcome of radon projections. (Using $N_o = N_{smin}/3$)

Step 3- In this step using radon projections of an images are transformed into the Radon space .

Step 4- Three levels DWT of radon space is computed in this step.

Step 5:- To represent feature vector concatenate rows of LL part of decomposed radon space.

Step 6:- In this step feature vectors for all training images are calculated. These feature vectors represents the reference feature vector for training images & these are stored in database [1].

Figure:

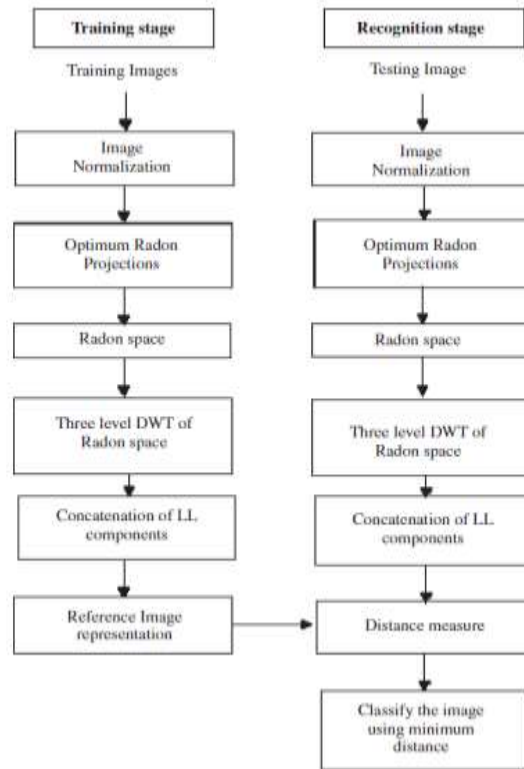


Fig.1 Block diagram of radon and wavelet transform based face recognition based system [1]

Operation

Step 1:

GUI for proposed system is shown below. It consists of one training image and 6 slots to give best mates with the training image provided by user. Also it provides the radon projection graph with required angle.

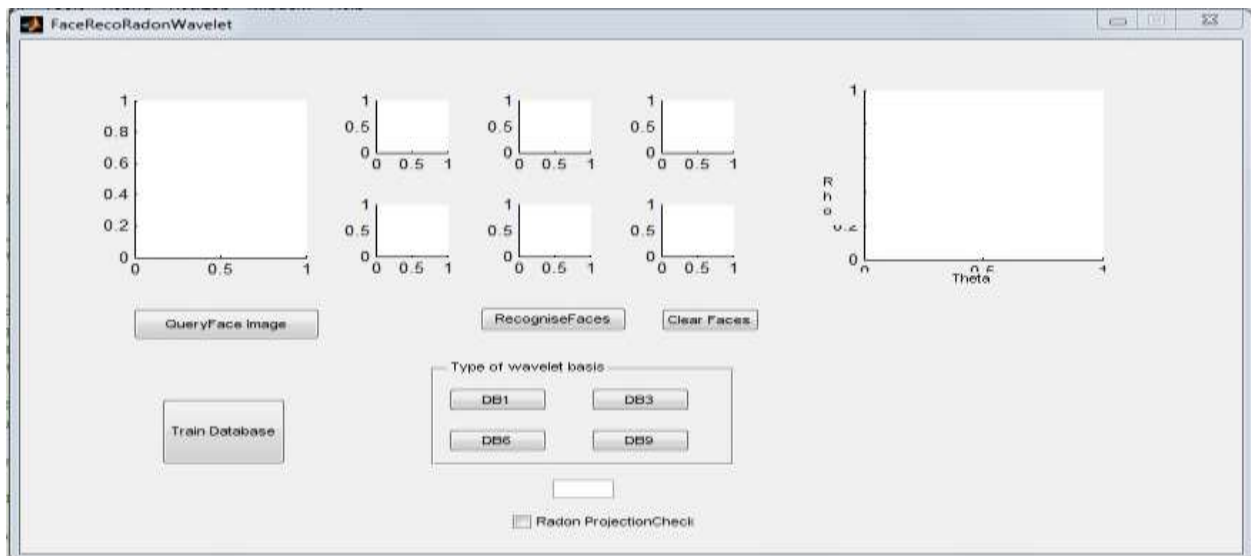


Fig. 2 step 1 output

Step 2:

Before giving an input image we have to train the database. When the database training is completed user is ready to give query image for which we have to find their identity. As we give query image to the input it shows radon projection graph for that images on right side.

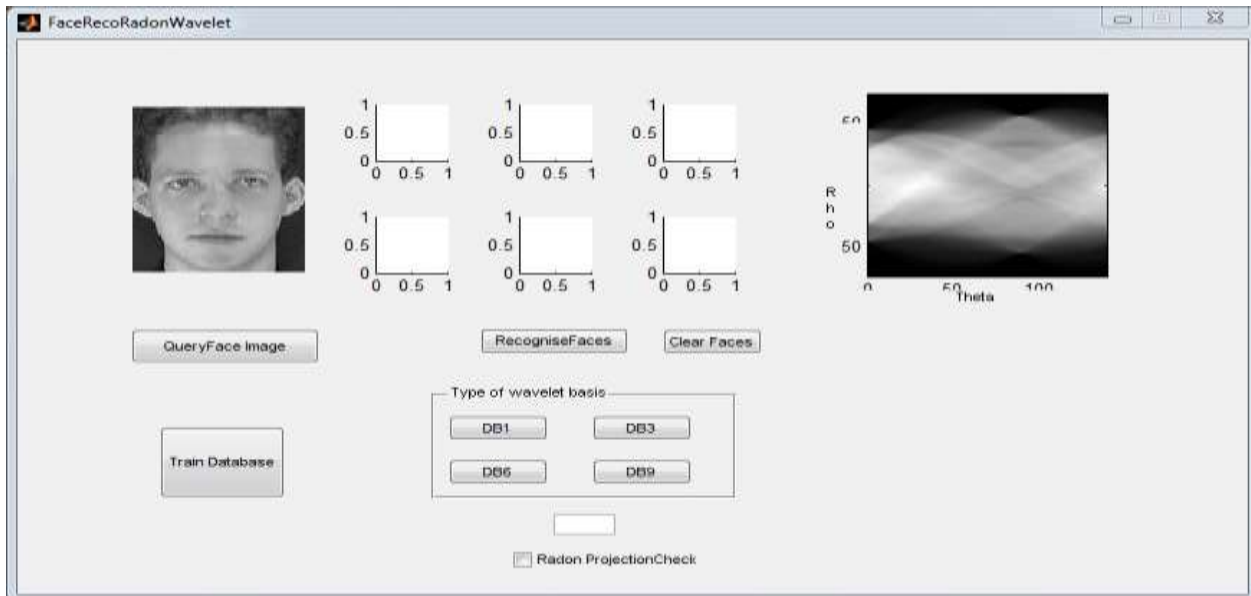


Fig. 3 step 2 output

Step 3:

After that click on recognize faces. Then it undergoes the radon projection to the wavelet transform. If image matches it provides message “person matched” as shown in fig. & if image doesn't matched with the database images it displays “person didn't match” as shown in fig.

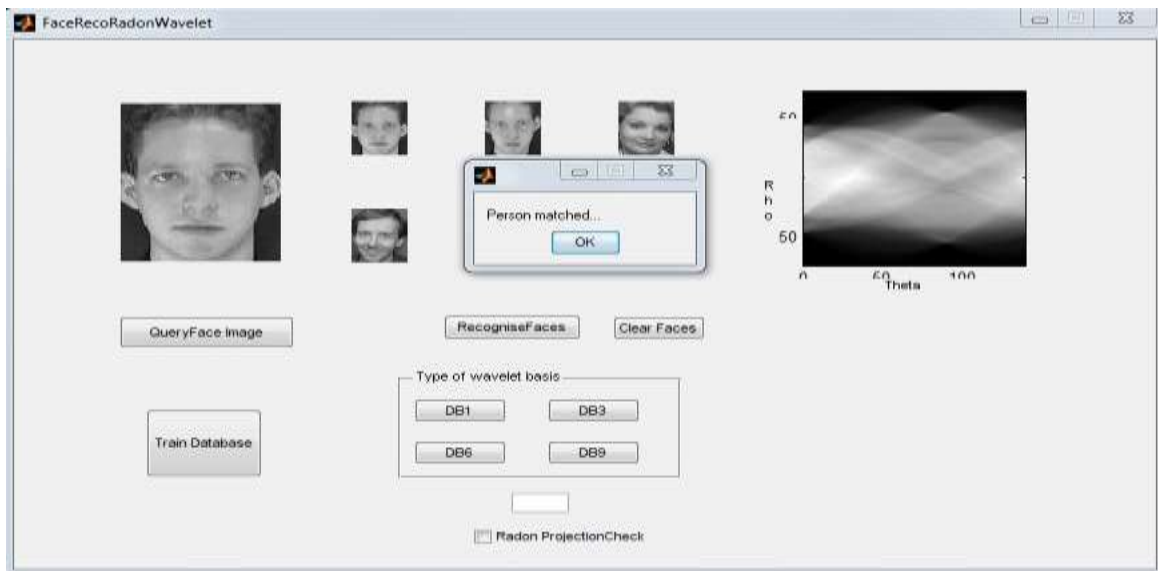


Fig 4 (a)

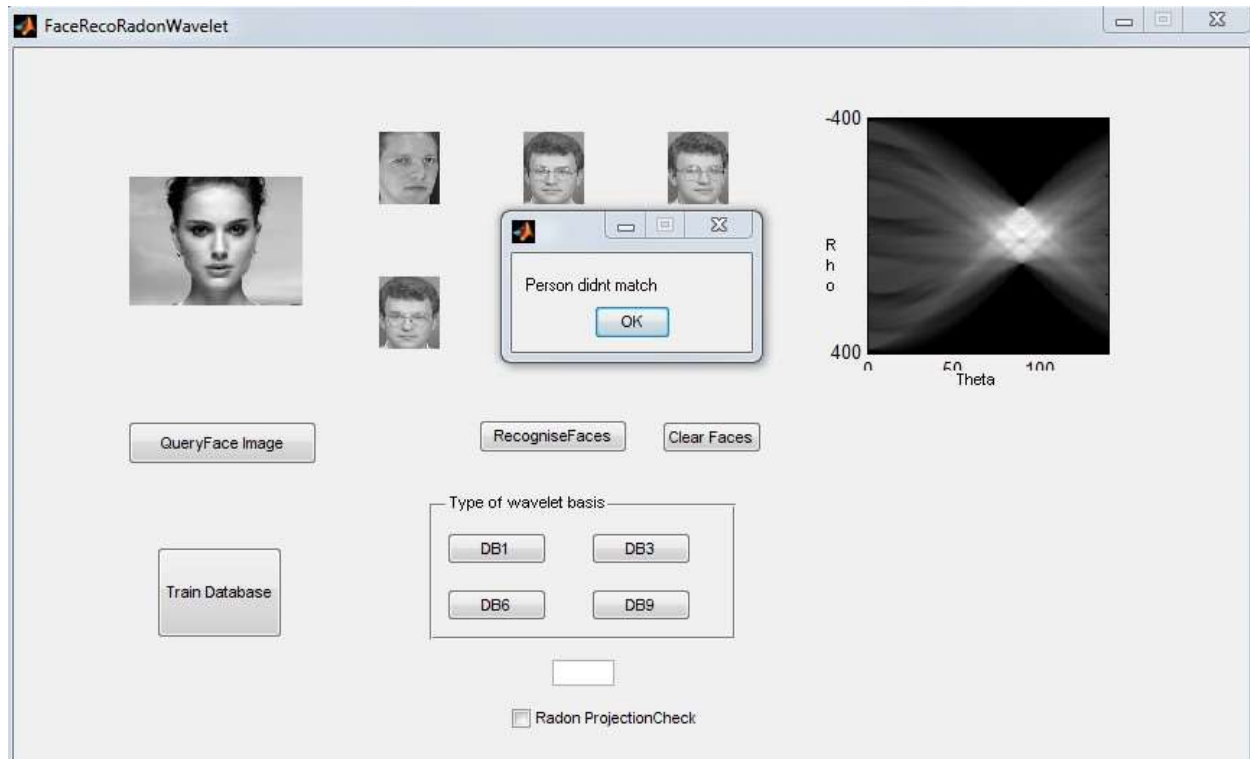


fig. 4(b)

fig 4(a) & 4(b) are output of stage 3

From these matching & not matching of training images helps to calculate recognition rate for that condition. We can calculate wavelet type also radon projection angle can be varied.

RESULT

From this method we used images in ATT database. At various radon projections almost 97% average recognition rate is obtained. Which is the very high recognition rate for faces with variable expressions. This shows that our system can work efficiently with the images with variable expressions & contrast.

CONCLUSION

This paper gives the information about new technique for face recognition using the combination of radon & wavelet transform. Firstly radon transform calculate directional features which helps in improvement of recognition rate. Wavelet transform helps to get the multiresolution features from the radon transform. For variable facial expressions, by using ATT database we get the 97% accuracy constaly on various radon projections.

In future we can work on this system to increase accuracy rate upto 100% on various angle of radon projectons. And also can be work to reduce work time of system.

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