International Journal of Computer Science Trends and Technology (IJCST) – Volume 3 Issue 2, Mar-Apr 2015

RESEARCH ARTICLE OPEN ACCESS

Face Recognition Using Radon & Wavelet Transform

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ABSTRACT

This paper presents new technique for pattern recognition case for face recognition which uses combination of Radon and wavelet transforms. It is invariant with the variations in facial expression, and brightness. It is able to withstand with zero mean white noise. This technique helps to compute radon projections in different directions and captures the features of face images based on directions. After that, the wavelet transform applied on radon space provides multi-resolution features of the facial images. Low frequency components used in face recognition can be improved by taking radon projections. For classification of these projections the nearest neighbour classifier has been used.

Keywords:- Radon transforms, wavelet transform, face recognition.

I. INTRODUCTION

In last few year, because of attracted characteristics and shapes attention human face recognition has wide application area which includes face recognition, security systems etc. Various formats for face recognition used to control video sequence produced in various data inputs. Brightness conditions & facial expressions are responsible for image variation in a face recognition technique which needs to be robust. Principal component analysis (PCA) and linear discriminant analysis (LDA) have been mostly used for dimensionality reduction or characteristics extraction in pattern searching and recognition [4]. Some researchers are successfully employed in face recognition research pattern. In classification stage, for extraction of effective features & reduction of design complexity reduction of measurements of various dimensions necessary [3].

II. EVOLUTION IN FACE RECOGNITION

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, invariant with variations in facial expressions and brightness. The approach is also robust to zero mean white noise and has data-independent bases (the basis images are only dependent on one image instead of on the entire set of training images) scales.

This project is divided into following:-

- Computing Radon projections in different orientations
- The directional features of face images are captured.
- Applying, the wavelet transform applied on Radon space and computing multi-resolution features of the facial images.
- The nearest neighbour classifiers are used for classification of these feature vectors.

III. PROPOSED SYSTEM

Because of less number of training samples than dimension of feature space LDA suffers from under sample problem (USP). To reduce USP tensor discriminant analysis as a pre-processing step for LDA Which along with reducing USP also help in preserving discriminative information in the training tensors. To overcome the drawback of LDA, presented a general averaged divergence analysis [1]. 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[1].

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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].

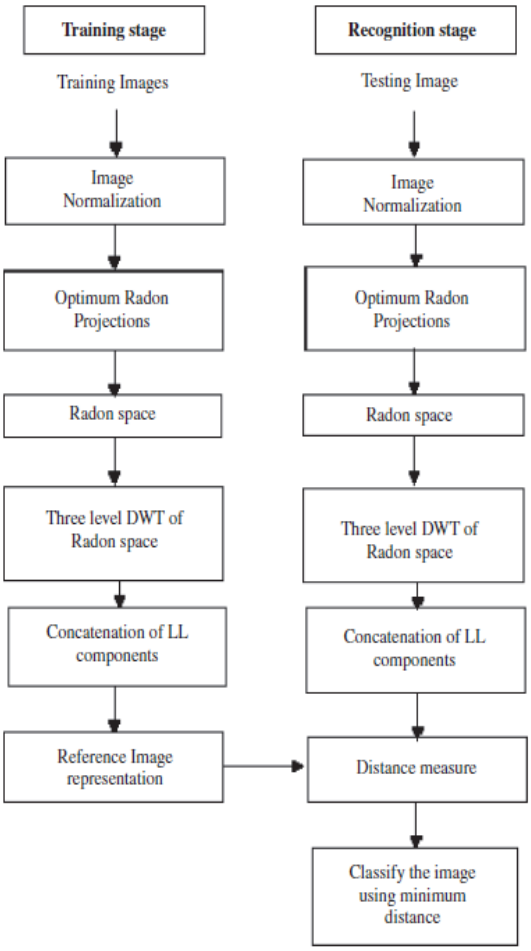

Fig.1 Block diagram of radon and wavelet transform based face recognition based system [1]

RESULTS

In this section, we evaluate the performance of the proposed approach using four databases: (1) face recognition technology (FERET), (2) Yale, and (3) YALE B. The absolute performance index & comparative performance with some available recognition technique like PCA & LDA shows the effectiveness of this method.

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