Investigation of different Face Recognition Databases under Uncontrolled Illumination Variation Method

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Abstract:

Confront acknowledgment framework is a PC application for naturally recognizing or confirming a man from a computerized picture or a video outline from a video source. Confront acknowledgment a framework has affected on numerous useful applications in view of the conditions. In this paper, investigation of two face databases is done with the assistance of a strong Face Recognition System under uncontrolled brightening variety. In this Face acknowledgment strategy comprises of three stages, brightening heartless preprocessing technique, Feature-extraction and score combination. In the preprocessing stage enlightenment delicate picture changed into brightening obtuse picture, and after that to joins different classifiers with corresponding components as opposed to enhancing the precision of a solitary classifier. Score combination figures a weighted entirety of scores, where the weight is a measure of the separating energy of the part classifier. The above strategy is connected into two diverse face databases named Yale and YaleB and results are contrasted and precision of every databases under various light condition.

Keywords **— Face Recognition, Feature extraction, Preprocessing, Score fusion.**

I.   INTRODUCTION

Non specific face acknowledgment frameworks recognize a subject by contrasting the subject's picture with pictures in a current face database. These frameworks are exceptionally helpful in criminology for criminal recognizable proof and in security for biometric verification, yet are obliged by the accessibility and nature of subject pictures. The testing issues of face distinguishing proof are enlightenment changes, confront demeanors, posture varieties and so forth. One noteworthy issue for face acknowledgment is the manner by which to guarantee acknowledgment precision for a vast informational index caught in different conditions. In this face acknowledgment framework utilizing effective exactness in face acknowledgment under uncontrolled brightening circumstances

The proposed framework is utilized to match two face pictures of a similar individual under various

enlightenment condition utilizing Yale and YaleB databases. In the preprocessing stage light delicate picture changed into brightening obtuse picture, and

after that to consolidate numerous classifiers with corresponding components as opposed to enhancing the precision of a solitary classifier. Score combination registers a weighted whole of scores, Where the weight is a measure of the segregating energy of the segment classifier. In this framework showed effective exactness in face acknowledgment under various enlightenment conditions.

II.   RELATED WORK

Illumination variation is the main obstacle for face recognition. Since face image appearances of the same person change under different illuminations. Sometimes, the changes in terms of different illuminations among the same person are greater than those of different persons among the same illumination. Pre-processing algorithms [1]-[5] to minimize the effect of illumination changes for face recognition have been developed, and many developments and advantages have occurred within the 3-D face model training stages.

Based upon Land's Retinex [11], Jobson et al. [12] and Gross and Brajovie [13] developed the

reflectance estimation method with the ratio of an original image to its smooth version. The difference between the two Retinex-based algorithms is that Jobson's filter is isotropic and Gross and Brajovie's filter is anisotropic. Since those approaches do not need a 3-D or 2-D model, they are relatively simple to implement and are generic.

Belhumeur and Kriegman [1] proved that face images with the same pose under different illumination conditions form a convex cone, called an illumination cone. Ramamoorthi and Hanrahan [2] applied spherical harmonic representation to explain the low dimensionality of different illuminated face images. Similarly, Wang et al. [4] introduced the self-quotient image (SQI) method that extracts intrinsic and illumination invariant features from a face image based upon the quotient image technique.

Recently, Li et al. [5] presented an image-based technique that employed the logarithmic total variation model to factorize each of the two aligned face images into an illumination-dependent component and an illumination-invariant component.
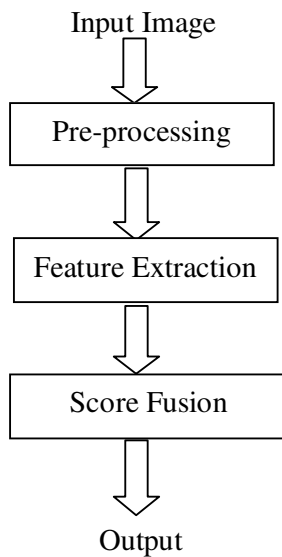
III. METHODOLOGY

Fig.1. Flow of Design

The three stages of proposed methods are,

- Illumination-insensitive pre-processing method

- Hybrid Fourier-based facial feature extraction

- Score fusion scheme

ILLUMINATION INSENSITIVITY PREPROCESSING METHOD

Illumination insensitivity pre-processing method is first stage of in this system. In this stage the input image get decomposed into low frequency component image and high frequency component image. Smoothing is performed on high frequency component image, and normalizing is performed on low frequency component image. Reconstruction is performed by combining the processed low and high frequency component image. This is called Integral Normalized Gradient Image. In this phase used to overcome the unexpected illumination changes in face recognition with limited side effects such as image noise and the halo effect.
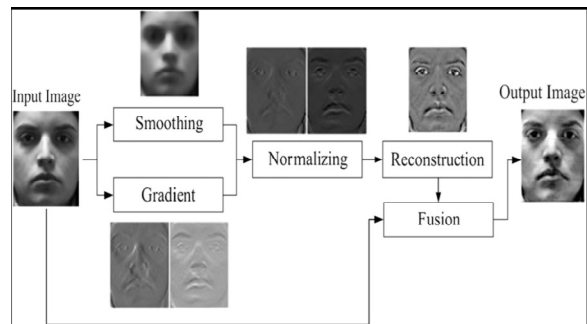

Fig.2. Structure of the integral normalized gradient image

A. FEATURE EXTRACTION

In this face recognition system with selective frequency bandwidth and multiple face models based upon different eye distances. To gain more powerful discriminating features, extract the multi block Fourier features. First divide an input image into several blocks and then apply a 2-D discrete

Fourier filter to each block. The Fourier features extracted from blocks by band selection rules are finally concatenated.

In Feature-extraction three different Fourier features extracted from the real and imaginary component (RI) domain, Fourier Spectrum (Γ) domain, and phase angle (Φ) domain in different frequency bandwidths(B1,B2,B3). All Fourier features are independently projected into discriminative subspaces by PCLDA theory.
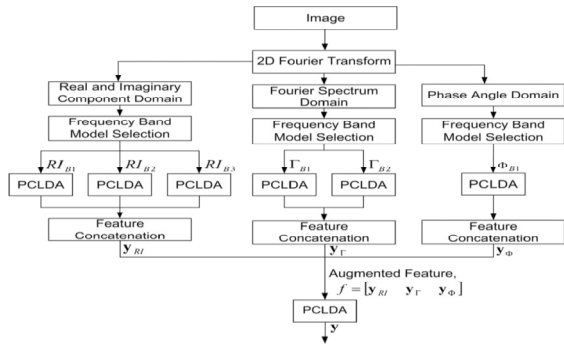

Fig.3. Structure of fourier feature

B. SCORE FUSION

Combining the classifiers can be achieved by processing the set of scores produced by component classifiers and generating a new single score value. This process is called "score fusion." In this system score fusion method based upon a probabilistic approach, namely, log-likelihood ratio (LLR) for face recognition. If the ground truth distributions of the scores are known, LLR-based score fusion is optimal. However, the true distributions are unknown so we have to estimate the distributions. Propose a simple approximation of the optimal score fusion based upon parametric estimation of the score distributions from the training data set. In this paper used Yale and YaleB datasets.

IV. EXPERIMENTS AND RESULTS

The proposed system is implemented using Matlab where it is evaluated for compress the image. The performance of the algorithm is evaluated on several real images. These pictures are the most widely used standard test images used for face recognition algorithms. Original image get decomposed into low frequency component image

and high frequency component image. Smoothing is performed on high frequency component, and normalizing is performed on low frequency component. Reconstruction is performed by combining the processed low and high frequency component image.
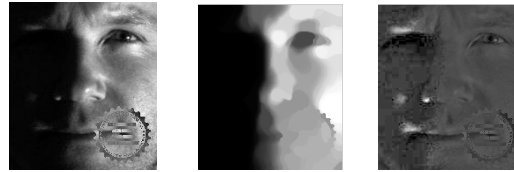

Fig.4. YaleB A) Input image B) Low frequency Component Image C) High Frequency Component Image
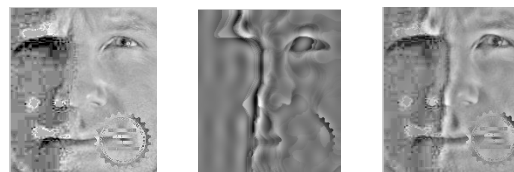

Fig.5. YaleB A) Smoothed Image B) Normalized Image C) Reconstructed Image.

Features are extracted from the reconstructed image, and then to combine scores from multiple complementary classifiers. Thus the original output image is obtained.

Fig.6. YaleB Output Image

Fig.7. Yale A) Input image B) Low frequency Component Image C) High Frequency Component Image
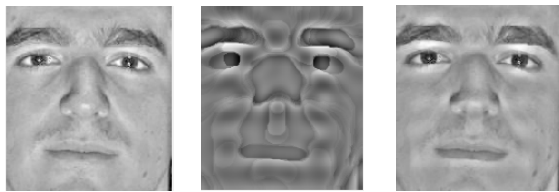
Fig.8. Yale A) Smoothed Image B) Normalized Image
C) Reconstructed Image.

Fig.9. Yale Output Image

Recognition Rate:

Recognition Rate is used to evaluate the quality of various face recognition algorithms. The RR formula is defined as follows:

$$\frac{NumberOfCorrectlyIdentifiedFaces}{TotalNumberOfFaces} \times 100$$

TABLE: 1. RR Value

Data sets	RR Value
Yale	74%
YaleB	82%

TABLE: 2. Computing Time

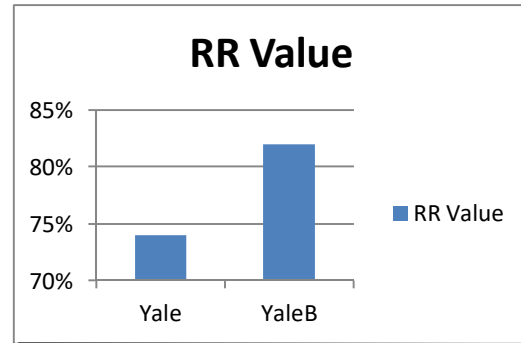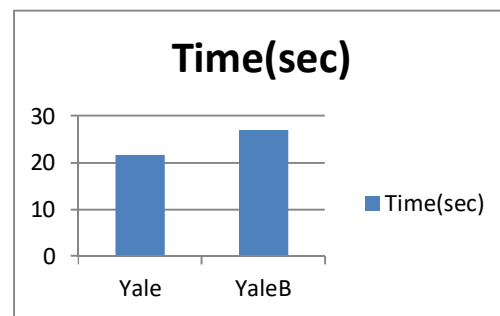| Data sets	Time(sec)
Yale	21.5465
YaleB	26.9865

Fig.10. Performance Analysis of RR Value

Fig.11. Performance Analysis of Time

V. CONCLUSIONS

In this face recognition method with preprocessing, feature extraction and classifier, and score fusion methods for uncontrolled illumination situations, the two databases are checked. First, a preprocessing method, a face image is transformed into an illumination-insensitive image. And then extract the feature from the output of the preprocessed image. The score fusion method based upon the LLR at the final stage of the face recognition system. Here Yale and YaleB datasets used to analyze the performance of RR value and Computing Time. In future this method can be extended to different face databases. There are lot of methods are used to perform face recognition in illumination variation environment and the current work can be compared with them to get analysis results.

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