



An Effective Feature Analytical Fisher-LDA approach for Face Recognition

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Abstract: Face is the most visible biometric component that having its importance not only in authentication system but in many other applications such as activity recognition. Face can be used as the off line as well as online facial component because of the availability of easy extraction of face image. But this recognition system having the limitations in terms of background, colorization, noise etc. In this paper, a facial feature extraction approach is defined using fisher-LDA to perform the facial recognition. The method has defined a two level analysis, first to perform high level classification and later on low level inter-class analysis is performed to perform the actual facial detection. In this paper, the facial recognition model is presented.

Keywords: Fisher LDA, PCA, Biometric Authentication, Recognition

I. INTRODUCTION

A new authorization/identification technique, “biometric,” has been developed that can determine more accurately if a person is authorized to access a computer system and/or its files. A biometric is both the most convenient and the most secure identification device available. It is not based on something the user remembers like a PIN code, nor is it based on something that the user has in possession like a smart card. A biometric is something you are. Nothing is more convenient to use or more secure. Today most of the available applications are providing the personal authentication using biometric authentication. This biometric authentication is the broad area having multiple biometric components and features that includes face, eyes, nose, DNA, voice spectrograph, and signature dynamics etc. Biometric authentication systems are automated system that identifies the behavioral characteristics so that effective recognition will be performed. Facial recognition is one of the effective biometric authentication system that is become very popular because of availability of the biometric facial image from different sources [1][2][3]. The facial recognition and the associated terms are described in this section

A) Face Recognition

Face recognition is having its contribution in different application as well as research areas such as neuroscience, psychology, engineering, management etc. Face recognition only requires the user coordination to provide the correct or valid input image. Once the image is acquired, it performs an automated set of operations to perform the recognition. Face recognition is itself defined as the set of sequential operations shown in figure 1. Each stage perform the filtration over the recognition process so that the effective recognition will be obtained[4][5]. These stages are described in the same section

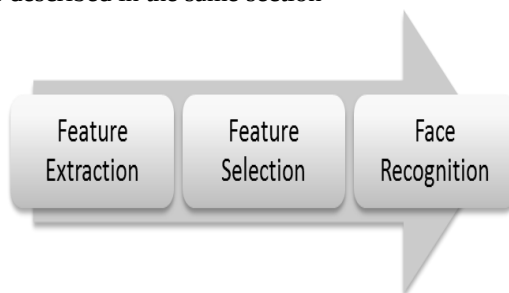


Figure 1: Stages of Facial Recognition Process

B) Feature Extraction

Instead of performing the recognition on complete face image, most of the recognition system extracts the facial features to perform the recognition. The feature extraction is a type of image segmentation in which the relevant image information is extracted to perform the effective recognition. In the outer view of feature extraction, eyes, nose, lips, chin is represented as the facial feature. In the second form of feature extraction, the intensity analysis, directional analysis, distance analysis is defined. There are number of feature extraction approaches

such as Discrete Cosine Transformation, Discrete Wavelet Transformation, Gabor Filter, Eigen Faces, FisherFace etc.[5][6]. In this present work, we have used the Fisher Face the facial feature for effective recognition.

C) Feature Selection

Feature selection is about to select the best and effective feature from the available set of features on the basis of which the actual recognition will be performed. Once the features are extracted, the next work is to perform the recognition and the classification on the basis of selected features. The feature selection basically reduces the dataset size for the efficient recognition process. There are number of feature selection approaches adapted by different researchers such as exhaustive search, best individual feature, sequential feature selection, best growing feature, sequential backward feature selection etc[7][8][9]. In this paper, A fisher-LDA based approach is defined to perform the effective facial recognition. In this section, the introduction to the biometric authentication and face recognition is defined. The facial feature extraction and selection approaches are also explored in this section. In section II, the existing work related in the same direction is defined. In section III, the fisher LDA based approach is defined to perform the recognition. In section IV, the conclusion related to the presented work is defined.

II. EXISTING WORK

The work already done by the earlier researchers in this section is defined. To understand the concept of facial intensification identification we need to understand the concept the face recognition, Eyes Recognition etc. The concept of face recognition is too old. In 1967 a machine learning face recognition system was presented in 1967 in which an image is projected to a photomultiplier matrix and a weighted value is assigned to cells of matrices on which basis the decision making is performed. An image is presented about 250 times on this matrix and after this each image gives 100% accurate results [11]. In 1976, a pattern recognition system is proposed to identify the face. This approach gives an algorithm approach to the pattern recognition by dividing the whole process in 4 stages i.e. Image acquisition, Preprocessing, Feature Extraction and the Discrimination. The system worked with black and white images taken from television cameras only they required all images in proper format in terms of size, lighting, threshold values etc. It gives the accuracy up to 90% [12]. In 1989 a work is performed where the images are compared on the basis of extracted part not on whole image. In this approach at first the surface of the face image is extracted. This extracted surface is presented in the form of a curvature. Once the curvature extracted now this part images is used for the image identification. The image comparison is basically performed on the basis of quadratic distance between the source image and the database images [13]. As the comparison results were based on threshold values the results were not much realistic. A neural network based approach for face identification is presented by M. A. Kerin in 1990, This approach partitioned the faces in disjoint classes respective to the attributes. Instead of working as whole dataset, the work is performed in the form of clusters that gives it a new significance level of the result accuracy [13]. In 1991 a PCA (Principle Component Architecture) based approach is used to identify the face images. This approach is based on the concept of Eigen Faces and Eigen vector. For the m number of images n Eigenvectors are drawn. A database image are trained by using PCA approach and in the same way the source images also gives the respective eigen vector. Once it is extracted now this eigen vector is compared with eigen vectors of database images and the image with lowest euclidean distance is selected as the identified image. PCA is basically a vision based approach to identify the images that compressed the data and generate a vector on which the decision making is performed [14]. The Eigen value approach becomes the baseline for most of the other images after this and lot of work is done in the same direction.

III. RESEARCH METHODOLOGY

The proposed work is about to identify the person face more accurately by identifying the facial features. The work is presented as a model as well as the composition of the some existing recognition system. In the traditional recognition system we always perform the preprocessing after doing the image capture. But in this work we used first an approach to identify the face area and extract that face area from the image. Now the preprocessing is performed on the face area only. The recognition process in this model is divided in two main stages. In first stage, the high level classification is performed. Once the high level classification is done, the interclass analysis will be performed for recognition.

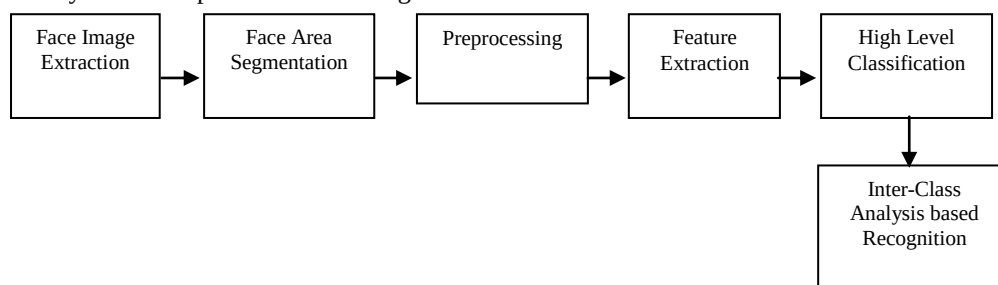


Figure 2: Standard Architecture**A) Model Based Approach**

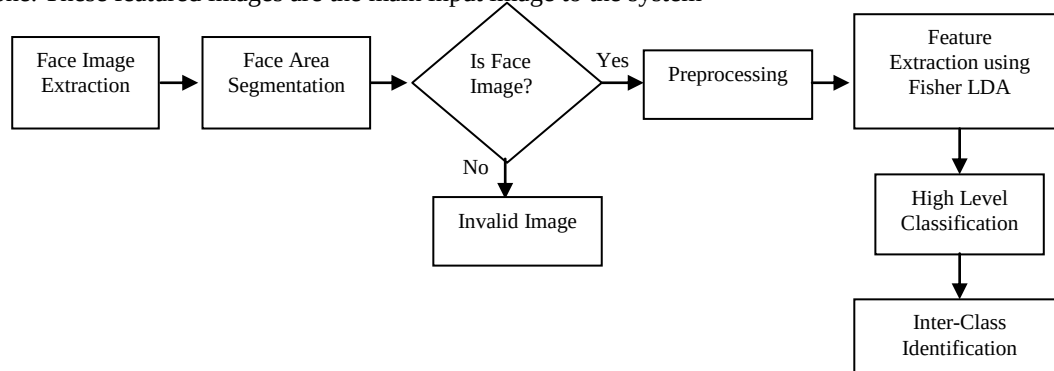
The proposed system is a model driven system in which we include a task to identify the face area between the face image extraction and the preprocessing. In this proposed approach we divide the complete process in a series of sub stages as shown in figure 1. Here figure 2 represents the basic architecture proposed system. In this system at first the image is extracted from some external device means. In this proposed system we are taking some sample images taken from the available image data sources online. Right now we are taking the secondary data base as the processing dataset. Now in our application we extract this image. The face image is a face with background and lighting effects. Now we need to capture the exact face area. The face area is taken by exclusion of background, hair, dress area etc. Once the face area is extracted the next work is to perform the preprocessing on to it. The preprocessing operation will enhance the image that will present the facial features more clearly. As the preprocessing is done next step is to extract the facial features. For this extraction we are using the Fisher-LDA approach. On the basis of these features the face will be identified from the dataset. As the face identified the next work is to identify the facial face. The modified architecture of this system is shown in figure 3. As we can see in figure 3 we have included a new step in the tradition system i.e. to identify the input image is a face image or not. It means if it is not a face image then we need not to continue the process and the process will be terminated. The face image is identified by specifying the skin tone. In case of face image the work will be processes in same way.

The proposed system and the model is the composition of two approaches of feature extraction. One is Gabor filter and other is PCA. Gabor filter is used to identify the face from the database. Now from this face the face expression identified by performing other feature matching based on PCA. The detailed Methodology is presented here in figure 3. Altogether such phase bits are computed for each face. Also an equal number of masking bits are computed to signify whether any face region is obscured by any other component.

The proposed work is here presented in 3 Main Stages.

1. Preprocessing
2. Training the Dataset
3. Matching

The preprocessing work includes the conversion of image to the normalized image as well as to extract the features from the image. The filtration process includes the adjustment of brightness, contrast, low pass, high pass filtration etc. The filtration will be done in two phases for face and for face feature itself. Once the filtration process is done extraction of face area will be performed. Just after extraction process the feature extraction will be done. These featured images are the main input image to the system

**Figure 3: Proposed model**

As we get the database from some easy means the next work is to perform the different operations on these database images in the same sequence defined in figure 3. After identifying the face area the next work is to perform some preprocessing operations on to it. The preprocessing operation we convert all images normalized images i.e. with same resolution, contrast, brightness, sharpness etc. Now need to extract the features from these images. The features of each image are extracted using FisherFace filter as well as using Fisher-LDA. Now these features are again represented as a dataset called facial feature database. Here we have generated 2 different datasets one for FisherFace extracted features called Featured dataset and other for Fisher-LDAextracted features.

Another task is performed on the available database. The database will be trained by using support vector machine. The training process will be done only once and after training a feature analysis based database will be created. The actual match will be performed on this svm trained dataset. Again we have to generate datasets for the face iris.

Third and the final process is to perform the match. The match will performed on both the iris image will be matched based on curvic definition. If both matches give results better than expected value. The person will be identified.

IV CONCLUSION

In this presented work the person will be identified by performing the face match. In this work instead of comparing the whole image we will extract facial feature of the image and the match will be performed on the basis of this Fisher-LDA approach. The paper has defined the recognition model to perform the effective facial recognition process.

REFERENCES

- [1] De-Song Wang, Jian-Ping Li, Yue-Hao Yan "A Novel Authentication scheme of the DRM System based on Multimodal Biometric Verification and Watermarking Technique"IEEE 2008.
- [2] Gui Feng, and Qiwei Lin, "Iris feature based watermarking algorithm for personal identification", Proc. of SPIE, Vol. 6790, pp.679045, 2007.
- [3] Seyed Mohammad Ahadi, Nima Khademi Kalantari, "A Robust Image Watermarking in the Ridgelet Domain Using Universally Optimum Decoder" IEEE Transactions on circuits and systems for video technology, Vol 20, NO. 3, March 2010.
- [4] P. Campisi, D. Kundur, and A. Neri "Robust digital watermarking in the ridgelet domain," IEEE Signal Process. Lett.,vol. 11, no. 10, pp. 826–830, Oct. 2004.
- [5] Kang Ryoung Park, Dae Sik Jeong, Byung Jun Kang, and Eui Chul Lee, "A Study on Iris Feature Watermarking on Face Data", ICANNGA 2007, Part II, LNCS 4432, pp. 415-423, 2007.
- [6] De-Song Wang Jian-Ping Li Yue-Hao Yan "A Novel Authentication Scheme of the DRM System based on Multimodal Biometric Verification and Watermarking Technique" ICACIA 2008.
- [7] Rao, N.N. Thrimurthy, P. Babu, B.R." An efficient copyright protection scheme for digital images using biometrics and watermarking" ICCSIT August 2009.
- [8] Edward, S.; Sumathi, S.; Ranihemamalini, R. "Person authentication using multimodal biometrics with watermarking", July ICSCCN.2011.
- [9] Desong Wang; Jianping Li; Memik, G "Authentication Scheme of DRM System for Remote Users Based on Multimodal Biometrics, Watermarking and Smart Cards" Intelligent Systems, 2009.
- [10] Meihua Wang, Kefeng Fan " A Novel Digital Content Protection System Based on Iris Biometric" FSKD 2007.
- [11] Zuraini Othman," Preliminary Study on Iris Recognition System:Tissues of Body Organs in Iridology", 2010 IEEE EMBS Conference on Biomedical Engineering & Sciences (IECBES 2010) 978-1-4244-7600-8/10©2010 IEEE
- [12] Zhenan Sun," Improving Iris Recognition Accuracy Via Cascaded Classifiers", IEEE transactions on systems, man, and cybernetics—part c: applications and reviews 1094-6977© 2005 IEEE
- [13] Stephanie A. C. Schuckers," On Techniques for Angle Compensation in Nonideal Iris Recognition", IEEE transactions on systems, man, and cybernetics—part b: cybernetics 1083-4419© 2007 IEEE
- [14] Zhi Zhou," Transforming Traditional Iris Recognition Systems to Work on Non-ideal Situations", 978-1-4244-2773-4/09©2009 IEEE