Automatic Face Naming System: Survey

Sheetal Machale[1], Prof. P.S. Deshpande[2]
[1, 2] Dept of Electronics and Telecommunication
[1, 2] SKNCOE Pune, Savitribai Phule Pune University

Abstract- *Face detection and recognition makes possible to use the images of a person face to authenticate him which allows to perform criminal identification, passport verification etc and makes secure system.For given collection of images or video, which contains several faces, the face naming is done for each face it contains. In this paper, a face recognition system is analyzed using Principal Component Analysis (PCA) with Back Propagation Neural Networks (BPNN) and then it is labeled. Frontal view of the faces can be recognized by using Neural network algorithms. PCA technique is used to reduce multi-variant data set. For efficient and robust face recognition BPNN is used for training and learning the data set. The BPNN classifier consist of parameters like hidden layers , weights and learning rate which increases the efficiency of the system.*

Keywords- Face recognition, Back propagation Neural network, Principal component analysis.

I. INTRODUCTION

Face recognition and feature extraction and recognition is not so much important feature of human being. Human beings have ability to instantaneously and correctly recognize things around them. The need of Automated Face Recognition (AFR) system is to decrease the manpower and make efficient system.

There is need to perform some preprocessing steps for image before feature extraction. Automatic face naming is still a challenging, even after successfully performing pre-processing steps. Initially, most of the research related part was based on detecting eyes, nose and mouth. As research area increased, mathematical approaches developed which lead to focus on the facial features, statistical features. Today's face recognition systems are based on different approaches like feature based approach, appearance based approach and etc.

The main contributions described in this paper are:
1) A model is developed which is based on PCA algorithm.;
2) High-level framework design;
3) Implementation of the framework;
4) BPNN is used as classifier.

II. LITERATURE SURVEY

A new scheme for automatic face naming with caption-based supervision has been proposed by Shijie Xiao, Dong Xu in Automatic face naming by Learning Naming by Learning Discriminative Affinity Matrices from Weakly Labeled Image. This paper consists of annotation of each face based on ambiguous supervision from the associated captions.

PengPeng , Paulo Alencar, Donald Cowan proposed a Software Framework for PCA-based Face Recognition in 2016 IEEE International Conference on Software Science, Technology and Engineering. This paper contains a software framework which focuses on face recognition based on PCA algorithm in area of image processing. In this principal component analysis (PCA) is used for data dimensionality reduction approach. PCA efficiently works for face recognition.

Hayet Boughrara and Mohamed Chtourou proposed a modified constructive learning algorithm for "MLP" neural networks which has been developed and applied in face recognition system. In this paper, researcher used constructive algorithm in which the number of output neurons number depends on the input training data. This algorithm is trained using the back propagation algorithm, in which a neural network contains a certain number of hidden neurons and a small number of output neurons.

Xiao Zhang, Lei Zhang proposed a methodology that focuses on finding the celebrities in billions of web images
It's a challenging task of collecting and labelling celebrity faces from general web images. The noise in web data is responsible for the major difficulties. In this process images and names are matched using database and language techniques.

III. AUTOMATIC FACE NAMING SYSTEM

Fig 1 shows the block schematic for Automatic face naming in Video signal and images. Mainly it contains three main functional blocks: 1) Face detection. 2) Feature Extraction and 3) Face recognition by BPNN as a classifier. From fig 1 it is easily observed before face detection, video input is converted into series of images.

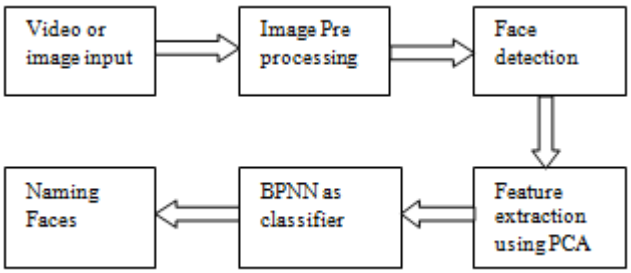


Fig 1: Block Diagram

A. Image Preprocessing

The various conditions like illumination of light affect the real-world performance of a face verification system. Varying illumination is the most important condition which affects most of the face verification systems, others are facial expressions and appearance. This hinders the accuracy and performance of feature extraction of a system. The only pre-processing that was done here was to crop the images of the subjects as per requirement and to convert video signal into series of frames.

B. Dimensionality Reduction using PCA

In the methodology we are using PCA algorithm for face recognition. Karl Pearson invented the concepts behind PCA in 1901. The PCA uses an orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components.

PCA consists of Eigen faces, which is used frequently in face recognition research. The most significant information is extracted from face images which then can be used to form a sub-space named feature space. The dimensionality of the new formed sub-space is much smaller than that of original images, but components which are used for identifying a face are retained. The image set used to build this sub-space is called a training set, and the image set reflecting the components in the sub-space is called eigenfaces. After establishing the sub-space, a testing image can be projected onto the space to generate a new image. The similarity of this new image and the original image can be used for the verification step.

Computation of the eigenfaces:

- For computation of Eigen faces, first training data set is considered. Each image is first resized in N×N pixels.
- Then N×N pixels of an Image is converted in N^2 ×1 Vectors.

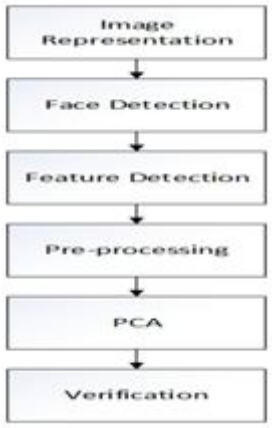
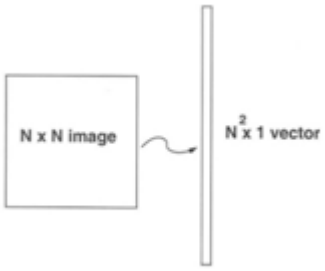


Fig 2: PCA frame work



- Suppose Γ is an N^2x1 vector, corresponding to an NxN face image I.
  The idea is to represent Γ(Φ=Γ - mean face) into a low-dimensional space:

$$\Phi\hat{} - mean = w_1u_1 + w_2u_2 + \cdots w_Ku_K (K << N^2)$$

Step 1: obtain face images I_1, I_2, ...,I_M (training faces)
Step 2: Show every image I_i as a vector Γ_i
Step 3: Compute the average face vector Ψ:

$$\Psi = 1/M \sum_{i=1}^{M} \Gamma i$$

Step 4: Subtract the mean face:

$$\Phi i = \Gamma_i - \Psi$$

Step 5: Compute the covariance matrix C:

$$C = 1/M \sum_{n=1}^{M} \Phi n \, \Phi n^{\wedge} T = AA^T \quad (N^2 x N^2 \text{ matrix})$$

Step 6: Compute the eigenvectors u_i of AA^T

The matrix AA^T is very large so that it is not practical !!
Step 6.1: Consider the matrix A^TA (MxM matrix)
Step 6.2: Compute the eigenvectors v_i of A^TA

Note3:The M eigenvalues of A^TA (along with their corresponding eigenvectors) correspond to the *Mlargest*

eigenvalues of AA^T (along with their corresponding eigenvectors).

Step 6.3: Compute the M best eigenvectors of AA^T :u_i+Av_i

Step 7: Keep only K eigenvectors (corresponding to the K largest eigenvalues).

C. Back Propagation Neural Network

The accuracy and efficiency of a face recognition system depends on its ability to learn real-world data. Pattern classifier is the cause to learn the ability of real world data. Back Propagation Algorithm (BPNN) is a very widely used and well-known learning algorithm in training. Multilayer Perceptron's (MLP). The MLP network is consists of a set of sensory mathematical units which form the input layer, hidden layer(s) and a single output layer. The input signal has unidirectional flow, from left to right, through the multiple layers of the network.

1. MLP in BPNN

BPNN is a multi-layer feed-forward and supervised learning algorithm that has inbuilt the gradient descent learning rule. The important concern while implementing BPNN is to assure that there is a balance between quick responses and accurate responses.

In this process, error is calculated till it reaches to its minima. Weights, training Neural network, Hidden layers and learning rate are the important parameters of the BPNN

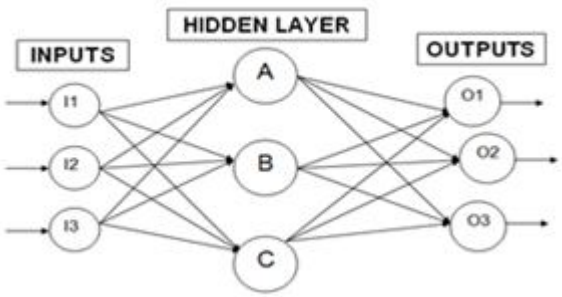


Fig. 3 BPNN network

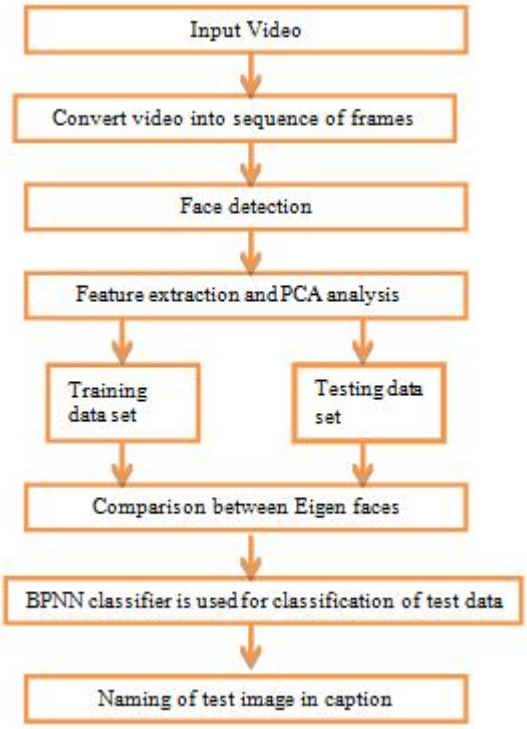


Fig 4 Flow chart

IV. FINDINGS

D. Training Data set for PCA:

We have trained our data set with 5 images each person. The images included in data set are

Fig 5 training data set

E. Eigen faces

V. CONCLUSION

Proposed method is simple and robust for face detection and recognition. The key idea of proposed method is to automatic naming of faces in video with reference to data base. It uses PCA algorithm to recognize the face. BPNN efficiently classifies the face images with respect to names.

As proposed method will perform well compared to previous methods which are based on Automatic face naming by learning discriminative affinity matrix. According to literature temporal information greatly enhances the performance of system. The time of computation depends on the size of data set, if data size increased time required will be more. This future work may reduce the processing time. That makes system faster.

VI. ACKNOWLEDGEMENT

The research work was free of monetary demands and performed solely for educational and academic purposes under guidance of Prof. P. S. Deshpande. I thank my professor for providing insight and expertise that greatly assisted in research work and for providing platform to perform the research.

REFERENCES

[1] T. L. Berg et al., “Names and faces in the news,” in Proc. 17th IEEE Comput. Soc. Conf. Comput. Vis. Pattern Recognit., Washington, DC,USA, Jun./Jul. 2004, pp. II-848–II-854.

[2] X. Zhang, L. Zhang, X.-J. Wang, and H.-Y. Shum, “Finding celebrities in billions of web images,” IEEE Trans. Multimedia, vol. 14, no. 4, pp. 995–1007, Aug. 2012

[3] M. Everingham, J. Sivic, and A. Zisserman, “Hello! My name is Buffy—Automatic naming of characters in TV video,” in Proc. 17th Brit. Mach. Vis. Conf., Edinburgh, U.K., Sep. 2006, pp. 899–908.

[4] M. Guillaumin, T. Mensink, J. Verbeek, and C. Schmid, “Automatic face naming with caption-based supervision,” in Proc. 21st IEEE Conf. Comput. Vis. Pattern Recognit., Anchorage, AL, USA, Jun. 2008, pp. 1–8.

[5] Shijie Xiao, Dong Xu “Automatic Face Naming by Learning Discriminative Affinity Matrices From Weakly Labeled Images” , IEEE transactions on Neural networks and learning System 2015.

[6] PengPeng , Paulo Alencar, Donald Cowan “A Software Framework for PCA-based Face Recognition”, 2016 IEEE International Conference on Software Science, Technology and Engineering

[7] Steve Lawrence, C. Lee Giles, Ah Chung Tsoi, Andrew D. Back, "Face Recognition: A Convolutional Neural Network Approach", IEEE Transactions on Neural Networks, Special Issue on Neural Networks and Pattern Recognition.

[8] Muhammad Azam. "Discrete cosine transform (DCT) based face recognition in hexagonal images", 2010. The 2nd International Conference on Computer and Automation Engineering (lCCAE), 02/2010.