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FACE RECOGNITION USING LOCALBINARY PATTERN

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Abstract

In this article, uniform LBP texture features have been used for face detection. Even though LBP features are old, uniform patterns are observed and fed as feature vectors to the SVM Classifier. To understand therobustness of LBP features, Gabor features are also computed and evaluated using the classifier. In learningthe features, 3000 facial data images are segregated as 60% for training and 10% for validation and the remaining data is used for testing. The experimental results show good results of improvement of 10% in comparison to Gabor features.

I INTRODUCTION

The face of a human being conveys a lot of information about identity of the person. Facerecognitionis an interesting and challenging problem, and impacts important applications in many areas such as identification for lawn for cement, authentication for banking and security system access, and personal identification among others. In our research work mainly consists of three parts, namely face representation, feature extraction and classification. Face representation represents how to model a face and determines the successive algorithms of detection and recognition. The most useful and the face an disused to measure similarities between images impacts important applications in many area such as identification for lawn forcement, authentication. Modern Civilization heavily depends on person authentication for several purposes.

A novel descriptor based on local binary pattern texture features collected from local facial regions is presented in this research. The eigen features method described by Pentland was one of the first face descriptors based on information derived from local regions. Finding

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effective descriptors for face appearance is a fundamental topic in face analysis. Different holistic methods have been studied extensively, including principal component Analysis(PCA), Linear discriminant Analysis (LDA), and themore recent 2D PCA, but local descriptors have recently gained attention due to their robustness .

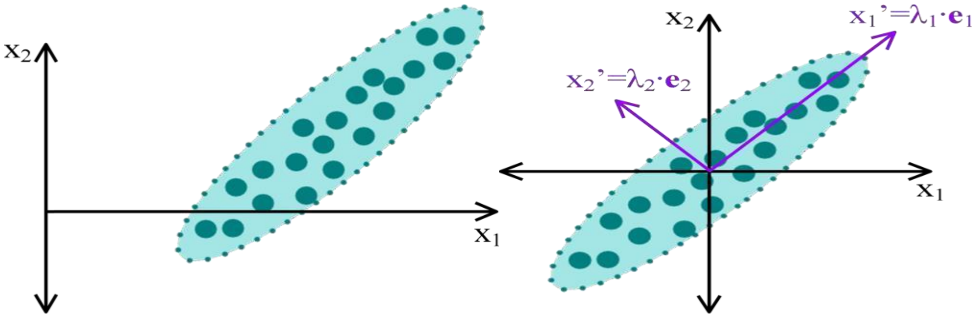


Figure 1. PCA transformation applied to a two dimensions example

Figure 1 is intended to give an overview of the PCA transformation with a two dimension example, whereit can be observed that eigenvectors describe the principal directions, and the eigenvalues represent the variance of the data along each principal direction

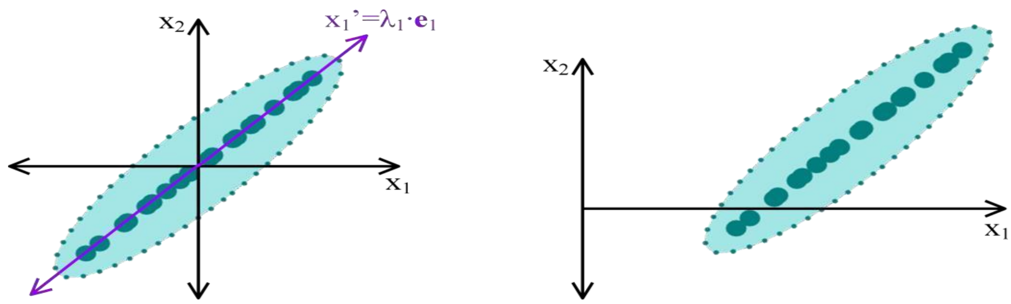
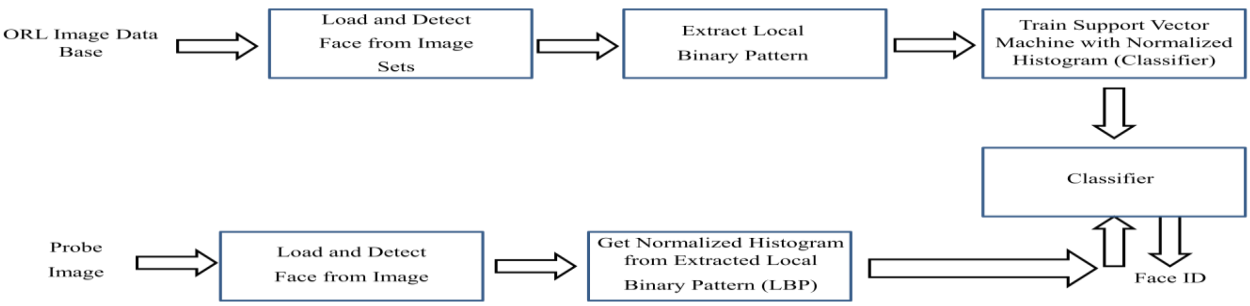


Figure 2. Dimension reduction and PCA back-projection

Figure 2 show the result of reducing data dimensionality (setting λ_2=0) and back- projecting to the initial space. The result is an approximation of the original data without redundant information and the lower theeigenvalue λ_2 the better the estimation.

Proposed Model:



II PROPOSED METHOD

A schematic of the proposed face recognition system is illustrated in Fig. 1. It consists of three main modules: dataset,feature extraction, and classifier. In the beginning, the dataset was split into training and testing data. Afterwards, we carrieda learning process that creates an output of a system model. Eventually, we evaluated the system performance with the testing data and the previously derived model.

A. Dataset

1. Face Image Databases

As it is explained, there are several face detection methods in literature. However, little attention is given to the development of an image database for face detection. Face data bases are important because they are necessaryfor most methods which need to be trained with a training set. If effective face database is constructed, face detection methods may give better results, so face databases are important to test the detection methods. Face detection methods are giving different detection rates when they are tested with different databases. When two or more face detection methods are wanted to be fairly compared, they should be tested with the same database[1]. So it can be concluded that some methods are effective with specific data bases. Some of the existing face databases are discussed below.

2. The Color FERET Database

The FERET database [56] was collected in 15 sessions between August 1993 and July1996. The Data base contains 1564 sets of images for a total of 14,126 images that includes 1199 individuals and 365 duplicate sets of images. A duplicate set is a second set of images of a person already in the database and was usually taken on a different day. For some individuals, over two years had elapsed between their first and last sittings, with some subjects being photographed multiple times.This time lapse was important because it enabled researchers to study, for the first time, changes in a subject's appearance that occur over a year.

3. The Yale Face Database

Yale Face Database [62] contains 165grayscale images in GIF format of 15 individuals. There are 11 images per subject, one per different facial expression or configuration: center-light, w/glasses, happy, left-light, w/no glasses, normal, right-light, sad, sleepy, surprised, and wink.

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B. Local Binary Pattern (LBP)

It is a popular technique used for image representation and classification. The most common approachhowever dictates that each 3x3 window in the image is processed to extract an LBP code. The processing involves thresholding the center pixel of that window with its surroundings pixels using the window mean, window median or the actual center pixel, as thresholds. Now, we are going to explainabout how LBP works.

The original LBP computes a local representation of texture as a result of comparison of each pixelwith its surrounding neighborhood as illustrated in Fig. 5. Each pixel is compared with its eight neighbors in a 3x3 neighborhood. The local representation noted with 0 if the value of centre pixel is greater than the neighbors, and 1 if it is smaller or equal than neighbor pixel value. The result of this comparison storedby its order into several digits and became a binary number.

Example

i_0	i_1	i_2
i_7	i_c	i_3
i_6	i_5	i_4

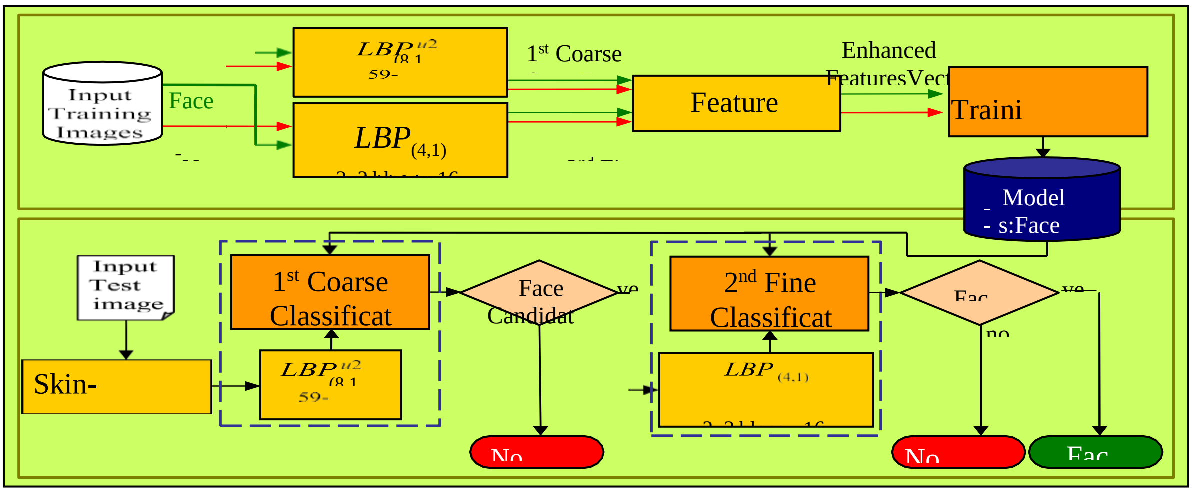
$$\text{LBP} = \sum_{n=0}^{7} s\,(i_n - i_c)2^i$$

Where,

$$s(z) = \begin{cases} 1, & z \geq 0 \\ 0, & z < 0 \end{cases}$$

i_n= Neighbour pixel Value
i_c=Centre Pixel Value

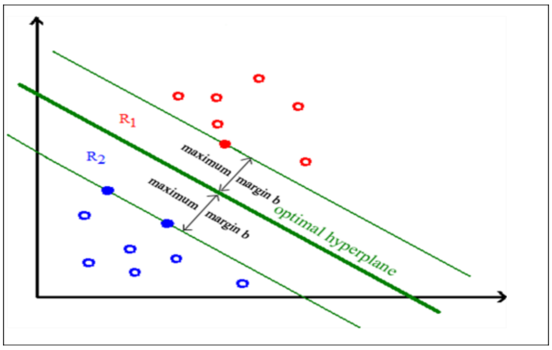
LBP Labelling



C. Support Vector Machine (SVM)

A Support Vector Machines (SVM) classifier is selected in order to train and detect frontal faces. This classifier is selected due to its well standing in statistical theory and since it has been successfully applied to various detection tasks in computer vision. A special property of SVM is that it simultaneously minimizes the empirical classification error and maximizes the geometric. Therefore, it is also known as maximum margin classifiers. A support vector machine constructs a hyperplane orset of hyperplanes in a -high or infinite-dimensional space, which can be used for classification, regression or other tasks.

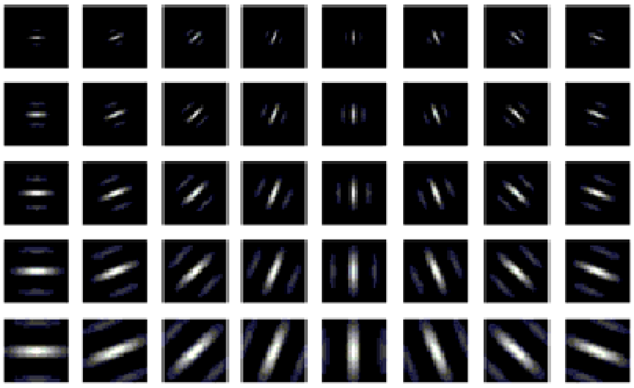
An hyperplane is selected called as Optimal Separating Hyperplane (OSH), which minimizes the risk of misclassifying the images in the training set and input test image data set and should minimize the classification error. A solid hyperplane (OSH) is separating training data of class 1 and 2, outliers are handled by means of soft margins.



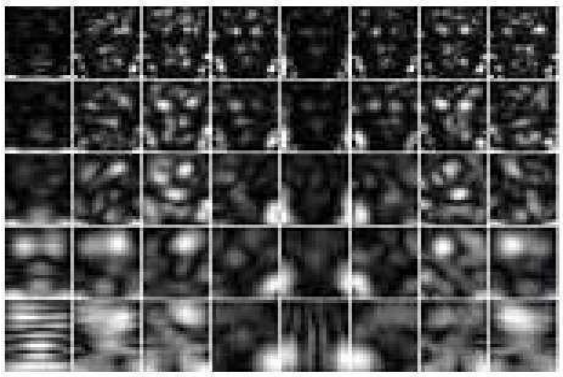
D. GABOR FILTER

In appearance-based face detection methods, a window with a predefined size, scans the image for each location and categorizes current region with a classifier as face or non-face region. To categorize the sub images, the classifier first needs to be trained. Facial features are constructed from images which are separated before a face and non-face images, is used to train the classifier. And then it can be said that the system is ready to detect the faces in the input images. When an image is given as an input, a window scans it and for each location a facial features are constructed and then with respect to these features classifier determines if current sub image contains a face ornot.

In this thesis support vector machine is used as classifier and Gabor filter is used for feature extraction. Moreover, Principle Component Analysis (PCA) method is used to reduce the dimensionality of feature vector to minimize the complexity and the computation cost.



The real part of the Gabor filters with five frequencies and eight orientations



Face sample image and its forty Gabor filtered images

RESULTS

This system detects faces by normalizing an image pattern at 19 x 19 and classifying them using SVM to determine the appropriate class (face/non-face). We use 1000 images to extract face samples,which contain 1000 real faces from Bio ID database. Moreover, we use 471 face images from CMU database. Each manually cropped face box is normalized into 19 ×19pixels and gives one face sample. For non-face patterns 2500 non-face images are used from CMU Data base. We can divide our systeminto two parts; first is training and second is test part.

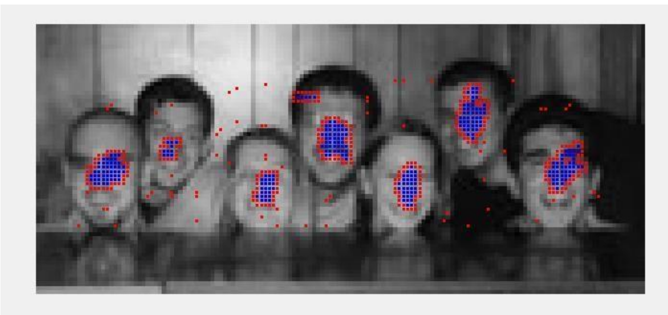


Fig1

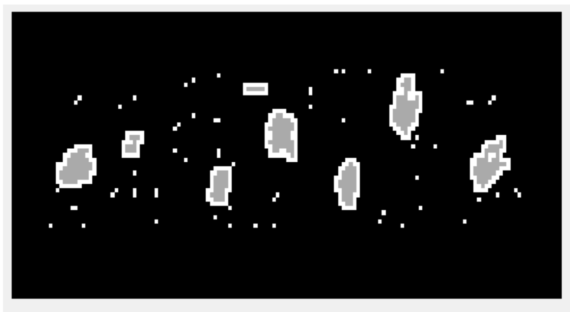


Fig2

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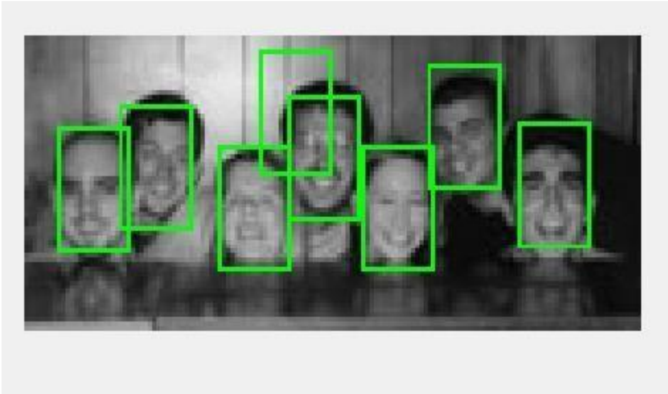

Fig3

Objective Analysis for Face Detection:

Method	**Accuracy**
Gabor Filter	87.24
LBP Features	94.17

Accuracy noted by using Different Methods

CONCLUSION

Face Image can be seen as a composition of micro patterns of texture where 58 uniformpatterns are observed along with a non-uniform pattern. Even direct application of Principle Component Analysis (PCA) also fails to detect facial images. Similarly, Gabor's features are showing poor performance. With a little effort of 59 LBP features, there is a good improvement. All these features are passed through aunique SVM Classifier to apply similar conditions to it. Both subjective and Objective analysis has been carried out.

REFERENCES

[1]. Ming Hsuan Yang, David J. Kriegman, and Narendra Ahuja. Detecting Faces In Images: A Survey. IEEE Transactions on Pattern Analysis and Machine Intelligence, vol.24, no. 1, pp. 34– 58,January2002.

[2]. Ming-Hsuan Yang Ahuja, N. Detecting Human Faces in Color Images, Proc. of the1stIEEEConf. on Image Processing, vol. 1,pp.127-130, 4-7Oct1998

[3]. G. Yang and T. S. Huang, Human Face Detection in A Complex Background, Pattern Recognition, vol. 27, no.1, pp. 53-63, 1994.

[4]. H.Schneider man and T.Kanade. A Statistical Method for Object Detection Applied to Facesand Cars. In International Conference on Computer Vision and Pattern Recognition, pp. 1746- 1759, 2000.

[5]. H.A.Rowley,S.Baluja,andT.Kanade,NeuralNetwork-BasedFaceDetection,IEEE Trans. PatternAnalysis

Machine Intelligence, vol. 20 no. 1, pp. 23-38, January1998

[6].Hong-BoDeng, Lian-WenJin ,Li-Xin Zhen, Jian-Cheng Huang,A new Facial Expression Recognition Method Based on Local Gabor Filter Bank and Pca Plus LDA, International Journal ofInformation Technology, vol. 11, no. 11, pp. 86-96,2005

[7].C. Kotropoulos and I. Pitas, Rule-Based Face Detection in Frontal Views, Proc.of IEEE Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP 97), vol. 4,pp.2537- 2540,1997

[8].S. Pigeon and L. Vandendrope, The M2VTS Multimodal Face Database, Proceedings of the First International Conference on Audio- and Video-Based Biometric Person Authentication, vol. 1206, pp. 403-409, 1997

[9]. S.A. Sirohey, Human Face Segmentation and Identification, Technical Report CS- TR 3176, Univ. of Maryland, pp. 1-33,1993.

[10].J.Canny,AComputationalApproachtoEdgeDetection,IEEETrans.PatternAnalysisand Machine Intelligence, vol. 8,no. 6,pp. 679-698, June1986.

[11]. D.Chetverikov and A.Lerch, Multi resolution Face Detection, Theoretical Foundations of Computer Vision, vol. 69, pp.131-140, 1993.

[12]. H.P. Graf, T. Chen, E. Petajan, and E. Cosatto, Locating Faces and Facial Parts, Proc. First Int’l Workshop Automatic Face and Gesture Recognition, pp.41-46,1995.

[13]. T.K. Leung, M.C. Burl, and P. Perona, Finding Faces in Cluttered Scenes Using RandomLabeled Graph Matching, Proc. Fifth IEEE Int’l Conf. Computer Vision, pp.637- 644,1995.

[14].P.Sinha,Object Recognition Via Image In variants: A Case Study, Investigative Ophthalmology and Visual Science, vol. 35, no. 4,pp. 1735-1740, 1994

[15].C.-C. Han,H.-Y.M.Liao,K.-C.Yu,andL.-H.Chen,FastFaceDetectionViaMorphological-Based Pre-Processing, in Proceeding so of the Ninth International Conference on Image Analysis andProcessing, pp.469-476, 1998

[16].J.R. Quinlan, C4.5:Programs for Machine Learning,1993.

[17].M.F. Augusteijn and T.L. Skujca, Identification of Human Faces through Texture Based Feature Recognition and Neural Network Technology, Proc.IEEE Conf. Neural Networks, pp. 392-398, 1993.

[18].R.M.Haralick, K.Shanmugam, and I.Dinstein, Texture Features for Image Classification,IEEE Trans. Systems, Man, and Cybernetics, vol. 3, no. 6, pp. 610- 621,1973.