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FACE PATTERN RECOGNITION IN IMAGE PROCESSING

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Abstract —*We consider visual classification recognition in the structure of measuring similitudes, or comparably perceptual separations, to model cases of classifications. This approach is very adaptable, and grants recognition in light of color, texture, and especially shape, in a homogeneous system. While K nearest neighbor (K-NN) classifiers are regular in this setting, they experience the ill effects of the issue of high change (in bias-variance decomposition) on account of restricted sampling. On the other hand, one could utilize support vector machines yet, they include tedious optimization and computation of pairwise separations. Principal components analysis (PCA) is a quantitatively careful methodology for fulfilling the adjustments of enlightening list. It is in light of the fact that, in enlightening accumulations with various factors, social occasions of factors oftentimes move together. Support Vector Machines (SVMs) have been as of late proposed as another method for design recognition. SVMs with a double tree recognition technique are utilized to handle the face recognition problem Low-dimensional feature portrayal with improved discriminatory power is of fundamental significance to face recognition (FR) frameworks. The greater part of conventional straight discriminant examination (LDA)- based techniques experience the ill effects of the drawback that their optimality criteria are not specifically identified with the classification capacity of the acquired feature representation.*

Keywords- *SVM, PCA, K-NN, Recognition, Features, Pattern.*

I. INTRODUCTION

In pattern recognition, it is used to recognition of various patterns in image processing. For various detection purpose we need some patterns as a reference so by using this kind of references we are able to recognize different patterns. In this paper we are going to discuss about the various patterns recognition methods. In nowadays this pattern recognition is very discussed topic. Every object in image having its own pattern identity. These methods identify this pattern and make them as a reference and make one data base by learning various patterns for same object so we have one own data base and we can take any image and match it with database and identify the pattern and object.
In recent research papers these various methods like SVM, PCA, K-NN, LDA performs very well to pattern recognize. Mostly these methods are used in face recognition. Faces having its own pattern so we teach our pattern learning. And for further verification we match various image pattern and identifies them.
Pattern recognition is mainly focus with the features and classification of values taken from physical and mental process. In pattern recognition preprocessing is necessary in this it remove noise and redundancy in the values taken. There are lots of various mathematical methods used for solving pattern recognition issues [1].

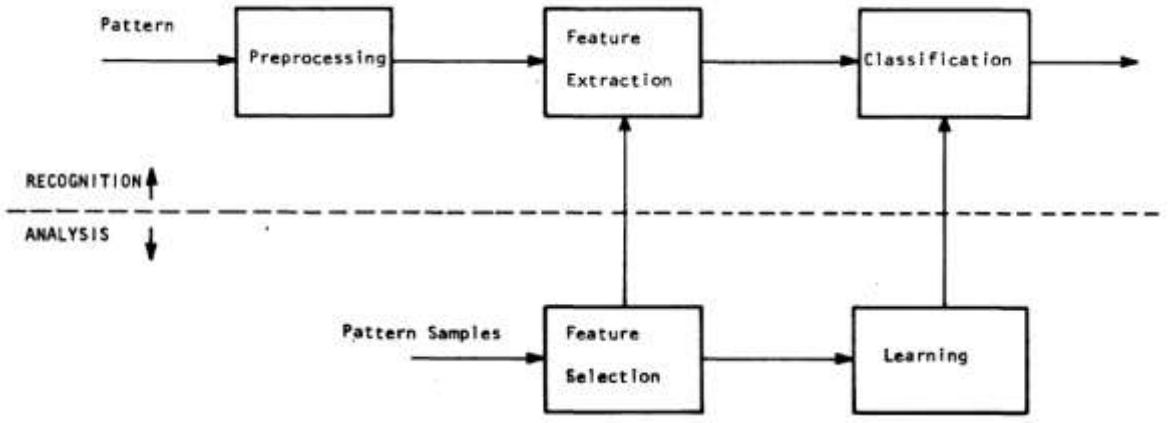

Figure 1. Block diagram of a pattern recognition system.

In this figure 1 it shows the different block of operation to recognition of pattern in image processing. This is divide into two parts 1) Recognition and 2) Analysis. In recognition pattern of image in given to the processing block which process on the pattern and then extract the features of the input pattern / image. After feature extraction it moving on the

classification of the patterns in these different patterns are classify in to various types of classes. These classes are used for the recognition process for new patterns to match with these classes. After this random pattern sample are given to feature selection block and which map with above block of feature extraction and learn the patterns for the recognition process (Fu, 1976).

II. FACE PATTERN RECOGNITION METHODOLOGY

In Image Processing there are various methodologies available. Each having its own signification properties to recognition pattern, features, etc. Here are some of the methodologies.

2.1.SVM

Support Vector Machines (SVMs) have been as of late proposed by Vapnik and his co-workers [6] as an exceptionally powerful strategy for broadly useful pattern recognition. Naturally, given an arrangement of focuses having a place with two classes, a SVM finds the hyperplane that isolates the biggest conceivable portion of purposes of a similar class on a similar side, while boosting the separation from either class to the hyperplane. According to Vapnik[6], this hyperplane is called Optimal Separating Hyperplane (OSH) which limits the danger of misclassifying the cases in the preparation set as well as additionally the inconspicuous cases of the test set.

Figure 2.1.1 Four different face datasets. There are ten images for each face (Guo, 2000).

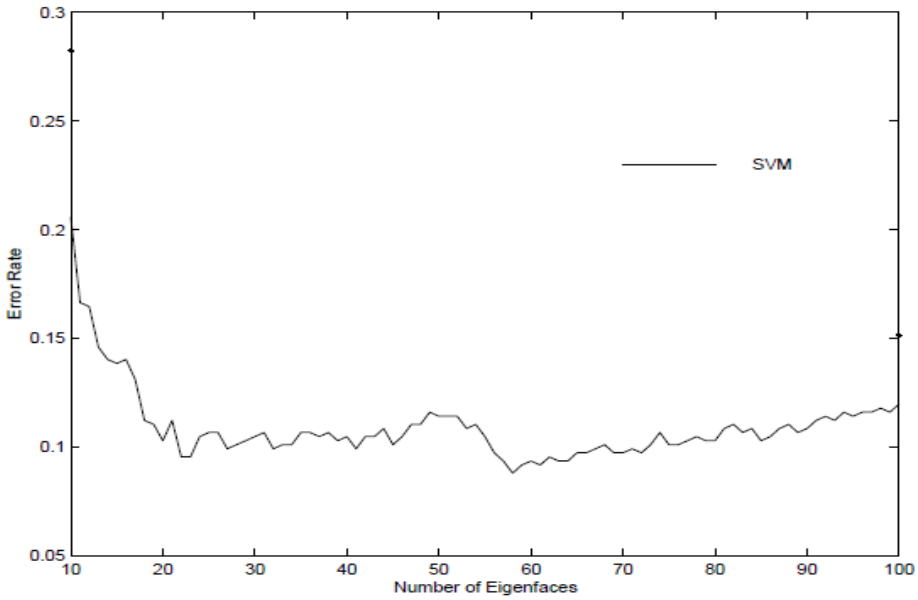

Figure 2.1.2 Variation of images for one face: three head size, three lightning condition, and three head oriantation.

Four different faces are used to SVM method to check its implementation [7]. Four faces with 10 different images used as a database and check it over SVM method and check it results on graph. Figure 2.1.2 shows the error rate and witth respect to numbers of eigenfaces in SVM method.

2.2. PCA

This method (PCA) is a scientific strategy that utilizations to change over an arrangement of analysis of potentially corresponded variables into an arrangement of estimations of uncorrelated variables called principal componentsThe quantity of principal components is not exactly or equivalent to the quantity of unique variables. Principal component analysis is suitable when we need to obtained measures on various watched variables and wish to build up fewer simulated variables (called principal components) that will represent a large portion of the change in analyzed variables[9]. Principal components analysis is a quantitatively thorough strategy for accomplishing the rearrangements of informational index. It is on the grounds that, in informational collections with numerous variables, gatherings of variables frequently move together. One explanation behind this method is greater than one variable might gauge a similar driving standard administering the behavior of the framework. The strategy creates another arrangement of variables, called principal components. Every principal component is a straight blend of the first variables. All the principal components are orthogonal to each other so there is no repetitive data.

Figure 2.2.1 Variation of images for one face: three head size, three lightning condition, and three head oriantation.

This figure 2.2.1 dataset is used by [3] for PCA method analysis and they check single face with different conditions like head size change, light condition low deam and full, head oriantation. And checked PCA method for face detection.

2.3. K-NN

The k-nearest neighbor algorithm (k-NN) method is a generally utilized classifier for classifying objects in view of nearest training cases in the feature space. The K-NN method is the least complex classifier of all machine learning algorithms. In this method image is grouped by a greater part vote related with its neighbors. In K-NN classifier the Euclidean distance in between the trail image feature and each training image feature is resolved to shape a distance matrix. The summation estimation of distance matrix is assessed and arranged in increasing request. The principal K components are chosen and larger part class esteem is resolved for classifying the image precisely [9].

Category	Number of training images	Number of tested images	Correctly detected images	Accuracy (%)	Overall Accuracy(%)
Training Phase	700	700	654	93.42	92.47
Testing Phase	-	350	317	90.7	92.47

Table: Recognition rates usind K-NN method.

This table shows the training and testing phase in training [9] used 700 images and all are tested too from this 700 its 654 images are correctly recognize and in testing phase 350 images they tested and 317 images are correctely recgonize. And in table it shows accuracy rate of K-NN mathod .

2.4. LDA

Linear discriminant analysis (LDA) us widely used in face recognition. Faces have its own kind of pattern for this pattern recognition LDA is widly used. This method allow measurment of identificance of visual information in various features of the face to identify. LDA of faces provide us small dataset of features which contains most relevant details for regognition and classification purpose. Eigenvector method is used to determine this features.Etemad [5] used various training set for face recognitions and gender classification in their research work and their results are shown below in table.

Task	No. of Example	No. of Features	Recognition Rate(%) (Training Set)	Recognition Rate(%) (Test Set)
Face recognition	2000	4	100	99.2
Gender classsification	400	1	100	95

Table: Recognition rates usind LDA method.

This table shows the LDA method accuracy rate.Etemad [5] used 2000 images for face recognition and 400 images for gender classification all images are used for training and they got 99.2% accuracy in face recognition and 95% in gender classification.

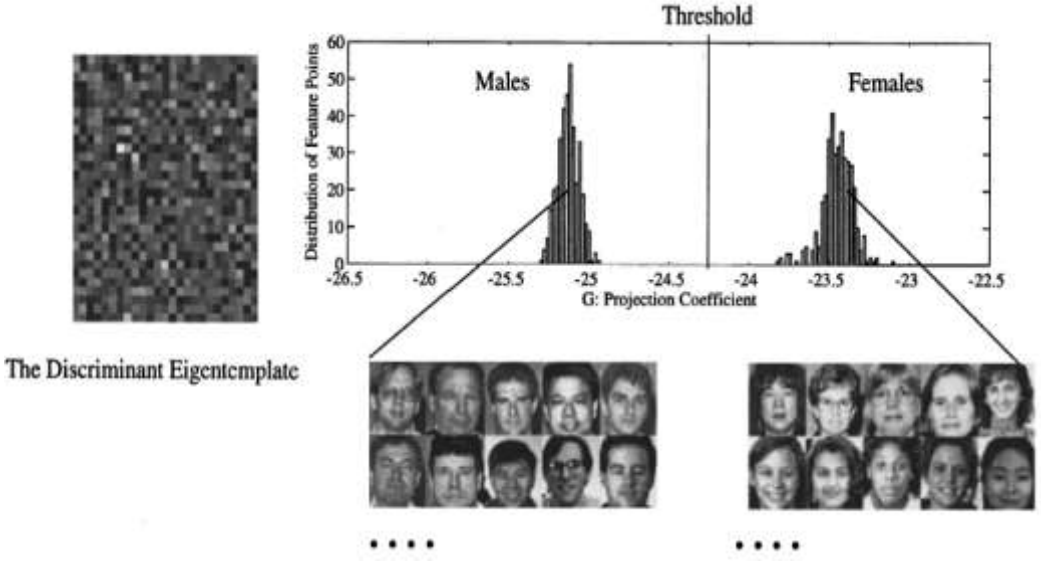

Figure 2.4.1 Feature distribution points for male and female examples in the dataset [5].

This figure 2.4.1 is from reference [5] they show the various male and female faces in it and distribute them in a graph so actually check where the features lies in graph.

III. CONCLUSION

In this paper discussed about SVM, K-NN, PCA, and LDA methods which are used to face pattern recognition and each method are in its own way gives better results.

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