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A Novel approach for Face Recognition System Based on Eigen Vector

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Abstract - Face Recognition is one of the most important requirement in recent years for security as well biometric and other applications. Face recognition is a computer based approach and accuracy is the most challenging task for researchers and programmers. Linear Discriminate Analysis, Elastic Bunch Graph Matching using the Fisher face algorithm, the Hidden Markov model, the Multilinear Subspace Learning using tensor representation, and the neuronal motivated dynamic link matching are also the techniques which are available for face recognition. But no one technique we can say robust as each has a some limitations like much complex algorithm or higher processing time etc. This paper presents a new approach which provides robustness for accurate face detection. This technique for face recognition is called principal component analysis based technique. It follows the sequence of finding hermitian matrix, Eigen vector, Eigen face matrix and Euclidean distance methodology.

Keywords: **Face recognition, Eigen face, Eigen vector**.

1. INTRODUCTION

Face recognition is one of the technique in which identifying, matching or verifying of person is done automatically in computer or in our program from a continuous video from or from current frame of camera. It is typically used in security systems like restricted entry access. In face recognition algorithm creation a database is a much tedious job. It requires a deep knowledge of higher engineering mathematics. First of all we have a database of images in any particular format. Each image has a same dimension and images should be much enough clear so that our algorithm can process. In our approach we are going across three steps to achieve a desired goal, as our goal is to identify a perfect match of a person.

First of all extracts a pixel from all stored images then use our pre stored data and creating a one large matrix database. After that created an Eigen face matrix for which an algorithm is shown below in figure 2. At last in third algorithm current frame which is coming from camera is matched with Eigen face database which is finally created in algorithm 2. All this algorithms are explained in detail in this paper. One more thing is that algorithm is insensitive to facial expression up to some of percentage. It is a good aspect of our algorithm.

2. OUR APPROACH

This approach uses two databases. One database for storing images to whom required to give authority for access only in the case of security application. And the other database comes from camera in current situation. Our pre stored database is a bunch of images and only one image comes from camera frame.

2.1 Database creation

All images which have stored should be in same alignment of face. All should be taken in same lightning condition and their background is also taken into consideration.

STEP 1

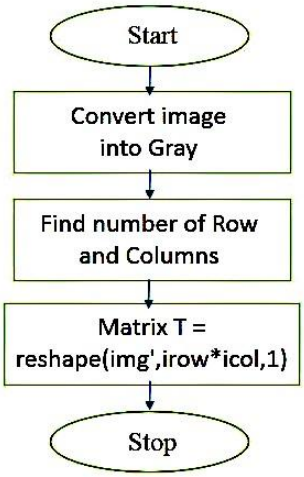

Fig. 1 Algorithm Reshaping Images

As know all this images are in 2-D and each image have a dimension of (a*b) and there are n number of images. All Pre-stored images are 2-D and so on their pixels matrix is also in 2-D. In the algorithm shown in figure 1., reshaping all database images into 1-D. Finally one complete matrix is being generated of (ab x n) dimensions which is combination of all images database.

STEP 2

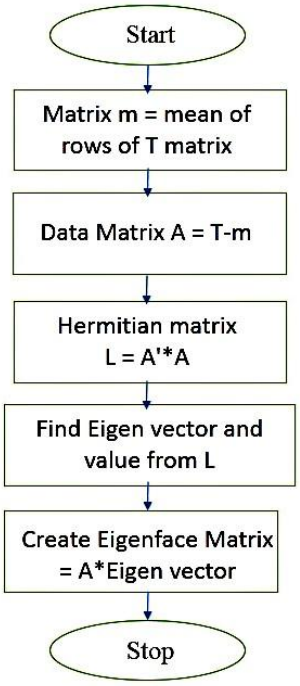

Fig. 2 Algorithm Eigenface matrix

The second algorithm shown in figure 2 gives us an Eigen face matrix. It follows the following mathematical steps. First find a mean of all rows of matrix which we obtain from previous algorithm. Mean is (ab x 1) of our training images.

$$Mean = \frac{1}{n}\sum_{1}^{n} Tb$$

Where n = no. of images

$A = T - Mean$

Then find centered images which is a (ab x n) Matrix of centered image vectors. To find an Eigen vector matrix required to find a hermition matrix as shown in algorithm. Finally we obtain an Eigen face matrix of dimensions (ab x (n-1)) which is Eigen vectors of the training database. This algorithm gives a 2-D matrix.

STEP 3

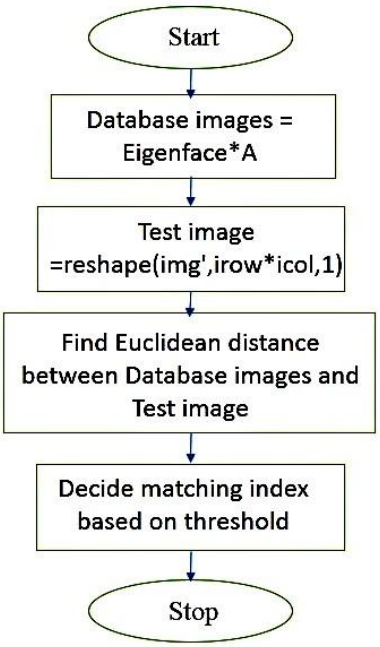

Fig. 3 Algorithm recognition of perfect match

The Euclidean distance d between two vectors X and Y is

$$\text{Euclidean Distance} = \sqrt{\sum(X-Y)^2}$$

Current frame of image also require converting given image into pixels data. It follows the same procedure as algorithm 1 and 2. Finally at last one algorithm compares test image data of current frame with pre-processed data, and based on Euclidean distance and set threshold it gives an index of perfect matching person.

In this algorithm matches test image with pre stored database images. If first image matches 67%, second 84%, third 33%, fourth 92%, fifth 55% and so on. Then finally a maximum match is given as a result.

3. RESULT ANALYSIS

We have taken this images as our database. Our database is a collection of such images of a person to whom we only want to give access as an entry. Our two algorithms make a procession on this database images.

We have taken following image as an input and code developed in MATLAB makes a processing on image database and gives us an index of matched image. Here this test image will match with both index 5 and 6. Algorithm will test maximum percentage of matching and accordingly it will give an index. So, we can decide whether to give access or not. There is also some threshold set, so if an unauthorized person tries to access then algorithm will reject entry.

Inadequate constraint or handling of such variability inevitably leads to failures in recognition.

There are some challenges with which system should to cope up. These challenges are facial expression change, aging of a personal, personal appearance of a person like make up, hair style change, spectacles etc. Other issues related with camera are rotation of image or change in scale or change in camera characteristics etc. Lightning variation is also a crucial issue.

4. CONCLUSION

This proposed method of face recognition is much robust and gives accurate results. It is much enough fast for practical applications. This algorithm gives a satisfactory speed performance in terms of processing images in MATLAB. The output index of matched person is given to the controller to control any security application or to any device which we wish to control. Their implementation on FPGA or DSP is the one of the most important key feature to reduce processing time more.

5. REFERENCES

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