Facial Expression Detection using PCA

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Abstract - *Face expression recognition has become a popular area for research from the past two decades. We have used Eigen Faces and Keras for detection. In our method we have used face identification and traits removal and emotion classification. Our method uses Euclidian distance and mean distance for the Eigen Faces and PCA. Universally accepted emotions considered for detection. We can use principal component analysis as well as convolutional neural networks to obtain real-time emotion detection. According to the result, the Overall 93.25 recognition rate obtained.*

***Key Words*:—**Principal component analysis, Eigen Faces, mean distance, Facial Expression detection, convolutional neural network.

1. INTRODUCTION

Facial emotion recognition is the process of detecting human emotions from facial expressions. The human brain recognizes emotions automatically, in the same way, the system will recognize emotions furthermore. The technology more accurate all the time and can eventually be ready to read emotions furthermore as our brain does. Artificial intelligence can detect emotions by learning what each expression means.

Human facial expression is a very important part of human beings to communicate their emotions and intentions. Although, the detection of facial expression is critical because of the complexity and variety of facial expressions. Facial expression is attractive for two decades. So, facial expression recognition can be used in many fields such as biometric verification, eliminate the need of recalling a password. It can be used as a very important tool for access control. Facial expression recognition is also useful in big companies to track the mood of their employees.

2. LITERATURE SURVEY

Chitra, N et al [1] in this work, face area divided into small regions. Then facial area. Local binary pattern (LBP), histograms extracted and then concatenated into a single feature.

Daniel Acevedo et al[2] In this paper two methods are considered. The first method uses a simple descriptor which is based on an angle obtained by facial point. Conditional random classifier used for classification. The second method uses binary descriptors. A support vector machine classifier is used. They compared both the approaches. Both methods have their advantages and disadvantages.

Kim, B. K et al[3]In this paper trained multiple deep neural networks used.

Shimla Alizadeh et al[4] In this paper they used a convolutional neural network on grayscale images .because grayscale images can be stored in less storage and also easy for the preprocessing.

Revina et al[5] In this paper they have used many techniques of facial expression recognition. It also explains the complexities of various algorithms.

K weint et al[6]In this paper some classifier techniques are discussed. It also explains some image visual techniques.

3. PROPOSED METHODOLOGY

In the proposed system, we have used the most better method for trait removal that is PCA. Eigenfaces are traits of face images. By using these eigenfaces, we can train our dataset. PCA can ignore gradual face changes. After organizing data mean would be deducted from vector. After mean deducted covariance matrix would be calculated

Then calculate eigenvectors and eigenvalue from the matrix.

Then we will arrange the eigenvalues according to the eigenvectors. By doing this, we can recognize the most relevant object. We can gain a very important eigenvector and they will form the main component of the database returning highest eigenvalue would result in the highest eigenvector.

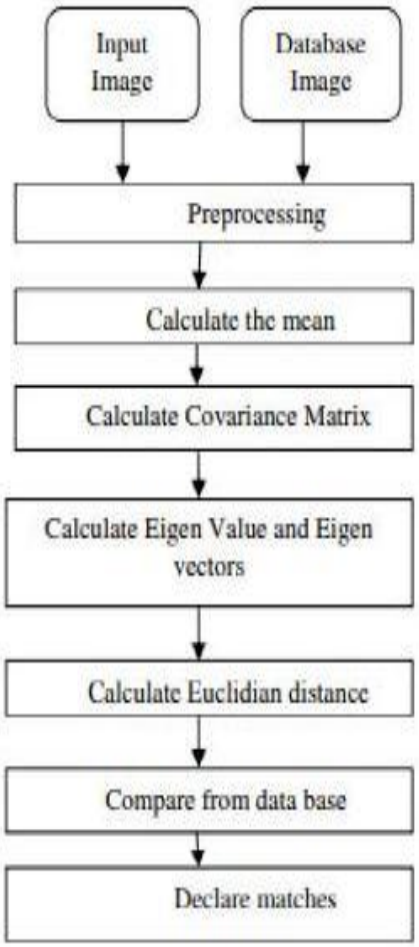

Fig -1: Flowchart

Initially all images are stored in a text file called phase. Then enhanced image resolution (r*c). All images are considered as a single vector as we combined pixels of the original image into a single row. All images are stored in one matrix called M, later mean calculated and subtracted from each original image in matrix M. Then covariance matrix needs to be calculated for eigenvalues. Every eigenvector should have the same dimensionality as the original image. Then all test images considered and changed into common size. Then Euclidian distance calculated. So, by comparing the test image with a trained image, we can best results of facial expression detection. These steps are used to detect the exact facial region by cropping the facial part .these steps are part of image processing begins with the lightning compensation, skin color recognition and to remove the noises from the images. Environmental and other practical variations also need to be adjusted in all images. Image processing phases described as scaling of image, image brightness and contrast adjustment, and other image enhancement options.

Lightning compensation: lightning compensation is a major step in image processing. When we capture images, it can be possible light luminance on the image. This luminance can ruin the expression detection process. So, it needs to be eliminated. In the Lightning compensation process, the image should be converted into YCbCr color space. YCbCr color space has a faster transformation than any other transform. The average luminance needs to be calculated. Skin region extraction: In this step, skin region extraction done .in fact, skin color has major importance here. Skin color is not a constant overall face. It varies from region to region. In this phase whole histogram is extracted and then normalized at a constant pace. Image noise reduction: In this step, we create an element based on the face shape. We also remove extra noise from the image.

Fig -2: RGB Image

A. FACE RECOGNITION

Preprocessing: preprocessing of the image is necessary to eliminate unnecessary parts in the input image. Face cropped images are color images. If RGB image converted into the greyscale, then increment in processing as well as less storage.

Fig -3: Greyscale Image

B. *FEATURE EXTRACTION*

Principal component analysis is a very effective method in feature extraction. To decrease the dimensionality input image feature extraction used. Dimensionality reduction focuses on only useful features of the face. We can use Keras to form an emotion array. Keras would produce output array including these emotions.

INPUT AND OUTPUT IMAGE

When image is given as input to an application, then a lot of processes performed on image and then it will check with the whole set of trained images. Suppose match is found at starting, then also test image is compared with the whole data set to get accuracy. When all finished, display the image with a corresponding emotion.

4. RESULT-

Table -1: Result of Different Expressions

SL NO	EMOTION TYPE	RECOGNITION RATE(%)
1	Anger	99
2	happy	99.99
3	Sad	85
4	Disgust	95
5	surprise	99
6	fear	90
7	Neutral	85
Result		**93.25**

As per the above table, we have taken 60 test images and 44 testing images. We got better results as 99.99 percent for happy faces. Other faces got results between 85 to 90 percent. Overall we got 93.25 percent accuracy.

Fig -4: Input-Output

5. CONCLUSION

In this work, we tried to develop real-time applications that detect the real-time facial expression. In the method, we extract the facial features and that leads to the classification of the image. As a result, we got a very satisfactory impact of real-time facial expression detection. By using our approach accuracy rate is more satisfactory.

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