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An Efficient Face Recognition & Tracking using Hybrid Filtering & Eigen Faces

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***Abstract*— As peoples use a huge amount of their time familiar with computers of one kind or a different way. In contrast, computers are expressively unsighted and uninterested to the emotional circumstances of their customers. Human communicate with computer which does not think emotions take no notice of a whole control of existing information.**
Faces contain a huge component of our expressively meaningful behavior. We make use of facial expressions to demonstrate our emotional circumstances and to agreement with our communications. In addition, we state and understand sentiments in faces naturally. Alternatively, automatic recognizing of facial expressions is an extremely complicated job computationally, particularly in the attendance of extremely inconsistent masquerade, appearance, and explanation. Here a new way of classifying Facial Expression using Feature Extraction and Segmentation based methodology is implemented which improves the accuracy.

***Index Terms*— Facial Expressions, Feature Extraction, Filtering, Mean Filtering, Eigen Faces.**

I. INTRODUCTION

Facial appearance is the utmost commanding means that the individuals to organize discussion and interconnect feelings and other rational, communal and physiological cues. Accurate and vigorous make over appearance study could advance the recital of facial gratitude organizations that can used extensively in refuge or investigation systems. Reflex facial appearance analysis can also serve as an efficient tool for scientist in other fields. A vigorous unconscious facial countenance organization which can help to make all these potential applications into a reality. Facial lexes can be secret in numerous conducts – in rapports of non-prototypic languages such as “elevated summits,” prototypic words such as expressive labels (e.g. “happiness”) or facial actions such as an Action Units defined in the Facial Exploit Coding Scheme (FACS) [1]. Particular psychologists entitlement that nearby are 6(six) varieties of unanimously standard facial words are gladness, sorrow, anxiety, fury, abhorrence and surprise [2]. Existing expressions analyzers [3], [4], [5] typically categorize the inspected appearance into one of the rudimentary appearance sorts. These 6(six) basic expression sorts are only a minor subsection of all face mask languages expressible by the humanoid face. For “mixed” languages, this might be more sensible to order them quantitatively into manifold expression categories. Considering the concentration gauge of the unlike massage words each person has his/her own maximal intensity of displaying a particular facial expression as it shows. It is also useful to recognize the temporal intensity change of expressions in videos.

Facial Expression Recognition

Facial expression recognition is the task of identifying mental activity, facial motion, and facial feature deformation from still images, image sequences or videos, and classifying them into intellectual courses based on the pictorial material only. Generally, this is possible because human facial gestures are similar. Internal feelings of humans are often rejected spontaneously on their faces thereby changing the fiducial appearances and dynamics, and making the face `index of mind'. Thus, expression recognition helps to interpret mental states and differentiate between facial gestures. Figure 1 shows a neutral face and six expressions posed by a subject of the popular Japanese Female Facial Expression (JAFFE) database [6].

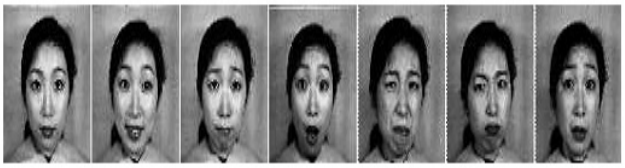

Figure 1: Different facial expressions [6]

Feature Extraction

Humans can recognize faces since we are five years old. It looks to be an automated and dedicated process in our brains [7]. What it’s clear is that we can recognize the people we know even when they are wearing glasses or hats. We can also recognize the person who has grown a beard. It is not very difficult for us to see our grand mom’s wedding photos and recognize her although she was 23 years old. All these processes seem trivial but they represent a challenge to the computers system.

II. LITERATURE SURVEY

In this paper author [46] has presents a time-line analysis of the various applications area of automatic face expression recognizer’s techniques, the distinctiveness of an best scheme and they also try to the existing databases that have been used and the progress made in terms of their consistency and a aspect outline of the up to date. Here in this paper author also talk about makeover

parameterization using FACS Action Units (AUs) and MPEG-4 Facial Animatronics Parameters (FAPs) and the current move forwards in face detection, chasing and article withdrawal approaches.

Facial Expression Gratitude is debauched flattering area of importance in human computer interface. This paper shows [47] the methodology for a well-organized facial expression investigation and classification. The most communicative way of demonstrating the sentiments by human is all the way through the facial expressions. In this paper author shows a recognition of facial expression is researched with the help of numerous properties join together with the face itself.

Here they present [48] automatic, real-time replicas constructed with mechanism knowledge procedures which use videotapes of topic's faces in combination with physical capacities to forecast rated feeling. Contribution contained of videotapes of 41 themes viewing expressively reminiscent films along with events of their cardiovascular action, somatic action, and electro dermal responding. So the author try to find with the help of algorithms based on extracted points from the subject's faces as well as their physiological answers.

In this paper [49], author has proposed a hierarchical outline founded on Active Bayesian Net for simultaneous facial article chasing and facial appearance gratitude in contrast to the typical move towards, we put together a probabilistic perfect grounded on the Dynamic Bayesian Net (DBN) to capture the facial interactions at different levels. Consequently, in this proposed model the flow of information's two-way, not only bottom-up, but also top-down by steadily characterizing and modeling put in the ground relationships among different levels of facial behavior, besides the temporal evolution information, not only the facial feature tracking can add to the expression/AUs recognition, but also the expression/AU recognition helps to additional get better the facial feature tracking presentation.

In this paper [50] author has investigation the modern progress in 3D and 4D facial expression recognition. Here author try to find the new research expansions in 3D facial data acquisition and tracking, and author in attendance at this time accessible 3D/4D face databases appropriate for 3D/4D facial expressions examination in addition to the existing facial expression recognition systems that make use of either 3D or 4D data in aspect. As a final point, confronts that have to be concentrate on if 3D facial expression recognition systems are to become a part of prospect requests is comprehensively conversed.
In this paper [51], we empirically assess facial symbol based on arithmetical indigenous topographies, Local Dualistic Patterns, for person-independent facial expression recognition. Different machine learning techniques are thoroughly examined on several databases.

III. PROPOSED METHODOLOGY

The Proposed Methodology implemented consists of following steps:

1. Take an input dataset containing a number of facial Training images.
2. Filter each of the training Dataset Images using Mean Filter.
3. Apply Eigen Faces on each of the training Datasets.
4. Store Features of all the training dataset images.
5. Take an input Image.
6. Apply Mean Filter on the test input Image.
7. Extract features from the image using Eigen Faces.
8. Track Facial Features based on Stored Features.

EIGEN FACES

1. Number of images on your training set.
2. Assign Standard Deviation and Mean value of the images
3. Read and show images
4. Concatenates two strings to form the name of the image
5. Get the number of rows (N1) and columns (N2) of the images
6. Creates a (N1*N2)x1 matrix
7. X is a N1*N2xM matrix
8. Change the mean and std of all images to normalize all images
9. To reduce the error due to lighting conditions.
10. Show normalized images
11. Mean value of image
12. Obtains the mean of each row
13. Converts to unsigned 8-bit integer (Values range from 0 to 255)
14. Takes the N1*N2x1 vector and creates a N2xN1 matrix
15. Creates a N1xN2 matrix by transposing the image.
16. Change image for manipulation
17. Covariance matrix C=A'A, L=AA'
18. vv are the eigenvector for L
19. dd are the eigenvalue for both L=dbx'*dbx and C=dbx*dbx';
20. Sort and eliminate those whose eigenvalue is zero
21. Sort to get an ascending sequence
22. Normalization of eigenvectors
23. Access each column
24. Eigenvectors of C matrix
25. Normalization of eigenvectors
26. Show Eigen Faces
27. Find the Weight of each face in the training set
28. Select Test Image
29. Test image which is the same size as the ones in the training set.
30. InputImage = input('Please enter the name of the image and its extension \n','s');
31. InputImage = imread(InputImage);
32. m is the mean image, u is the eigenvector
33. Show the reconstructed image
34. ll = 1:M;
35. figure

36. subplot(1,2,1)
37. stem(ll,InImWeight)
38. title('Weight of Input Face','fontsize',13)
39. Find Euclidean distance

Flow Chart

The figure shown below is the flow chart of the proposed methodology implemented here for the facial features extraction and recognition. The Initial phase consists of taking an input training Dataset. First of all filter each of the training Dataset Images using Mean Filter then next step is to apply Eigen Faces on each of the training Datasets and store Features of all the training dataset images. Finally Take an input Image and apply Mean Filter on the test input Image and Extract features from the image using Eigen Faces and track Facial Features based on Stored Features. Hence recognition and tracking of features can be done.

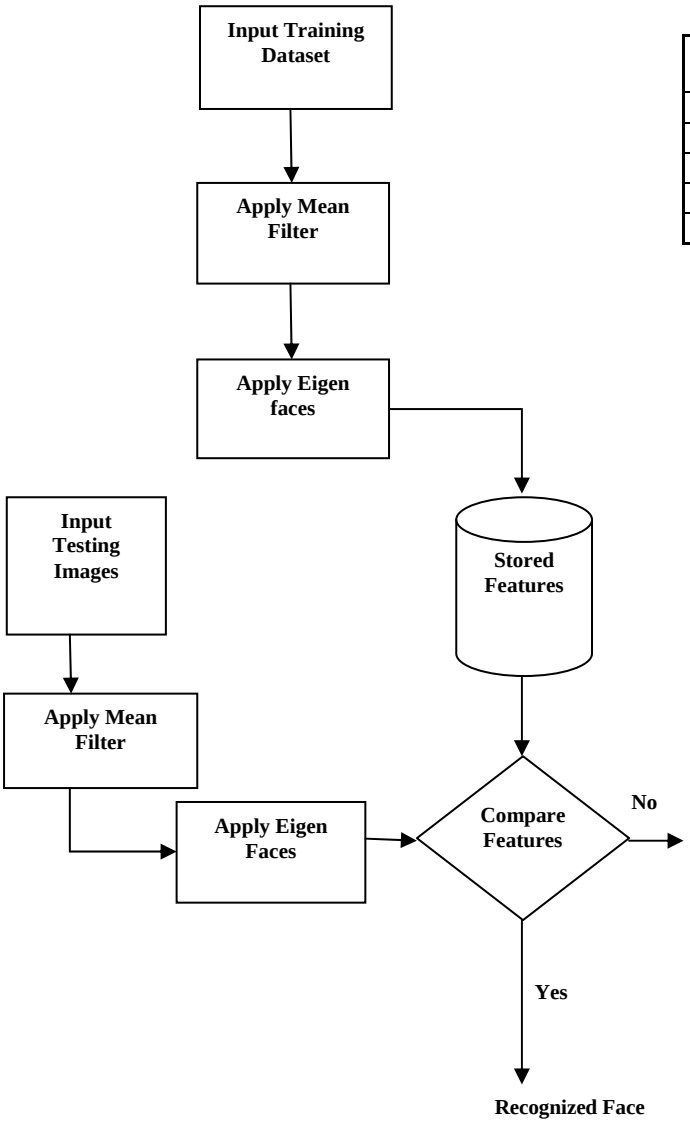

Figure 1. Flow Chart of the proposed methodology

IV. Result Analysis

Our face detection technologies find optimal facial features using Mean Filtering and Eigen Faces to use as key identifiers. Our face detection mechanism randomly selects pixels from all over the face, and increasing the accuracy of recognition.

DataSet	Face Detection Accuracy of Previous Work	Face Detection Accuracy of Proposed Work
CIT	96.45%	98.56%
BaoFace	95.34%	97.43%
Essex	95.78%	97.96%

Table 1. Face Detection Accuracy of Previous & Proposed Work

The Table shown below is the analysis o Various Performance Parameters on Bao database on Various Images.

BAODATABASE	Mean Square Error	PSNR	NCC	NAE
1.jpg	1.08E+04	7.7789	0.086	0.8915
2.jpg	1.09E+04	7.7647	0.0642	0.9197
3.jpg	5.76E+03	10.5244	0.0546	0.9289
4.jpg	1.55E+04	6.2279	0.0308	0.9515
5.jpg	1.68E+04	5.8706	0.079	0.8921

Table 2. Performance Parameters on Various Images of BaoFace Dataset

The Table shown below is the analysis on Various Performance Parameters on ESSEX database on Various Images.

ESSEX	Mean Square Error	PSNR	NCC	NAE
pic00001.jpg	2.60E+03	13.9859	0.0158	0.9763
pic00002.jpg	2.25E+03	14.6052	0.0166	0.9741
pic00005.jpg	2.09E+03	14.9372	0.0185	0.975
pic00007.jpg	3.50E+03	12.6936	0.0127	0.9781
pic00008.jpg	2.23E+03	14.6439	0.0172	0.9749

Table 3. Performance Parameters on Various Images of Essex Dataset

V. Conclusion

Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images. It detects facial features and ignores anything else, such as buildings, trees and bodies. Many algorithms implement the face-detection task as a binary pattern-classification task. That is, the content of a given part of an image is transformed into features, after which a classifier trained on example faces decides whether that particular region of the image is a face, or not. Face detection is used in biometrics, often as a part of (or together with) a facial recognition system.

The planned method implemented here is an efficient technique which provides better features extraction as related to further existing techniques. The technique

implemented here provides high rate of accuracy and less error rate.

In future the work can be extended for feature abstraction procedures improving recognition rate either by introducing the new feature abstraction procedure or using the hybrid approach for the feature abstraction for the facial countenance gratitude.

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