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A Novel Approach to Recognize the Face Image from Distant Cameras

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Abstract: ***Face recognition is a technique of identifying person faces by the feature extraction method and sorting of faces method. The main difficult problem in the image processing field is Face recognition. Pose and expressions are the most important challenges among the various factors that control the Face recognition. Pose and expression severely affects the performance of face recognition. Here the pose variation based on LBP (Local Binary Pattern) with Euclidean distance as classifier and LDP (Local Derivative Pattern) with SVM (Support Vector Machines) are compared. The LDP technique provides an accuracy of 100% and the LDP with SVM provides the results in less time than the LBP with Euclidean distance. Here the expressions are also taken into the account. The original image and the probe image are compared and the face is recognized based on the smallest distance between the original image and the test image. These techniques are not difficult even it includes the expressions but produces much better results.***

Keywords: Local Binary Pattern, Euclidean distance, Local Derivative Pattern, Support Vector Machines.

I. INTRODUCTION

Unconstrained face recognition is the important problem in face recognition. Face recognition has received attention [1] due to the large series of commercial, information security and law enforcement and surveillance applications Face recognition is difficult because the identical twins will appear to be more similar and it created the problem. The main factor that produces the challenging problems in face recognition is the pose variation, expressions and occlusion. This paper mainly deals with the problem of recognizing the faces which is taken from the distant camera. The feature extractors used here are local binary pattern and local derivative pattern. Now a days, [2] pose variations and pose variations with expressions was recognized as one of the major unsettled problems in the area of face recognition The objective of this paper is to construct a face recognizer that works under unstable pose and therefore the important problem in unconstrained face recognition.

II. OVERVIEW OF THE PROPOSED SYSTEM

There are two phases in the proposed system. The training phase and the testing phase. The training phase includes feature extraction like LBP (Local Binary Pattern), LDP (Local Derivative Pattern) and the testing phase includes Euclidean distance and classifier like SVM (Support Vector Machine).

A . Local Binary Pattern for Facial Feature Extraction.

The LBP is mainly used for texture descriptor operation. Here, [4] for every pixel of an image, the operator considers a neighborhood pixels of 3*3 size matrix and the 8 neighbors with a binary number are labeled. The middle value is taken as a threshold. Each pixel value which is above the threshold value is taken as one and if the pixel value below the threshold is taken as zero. A binary number is obtained [5] by linking all of these binary values in a clockwise direction. Finally the corresponding decimal value is obtained. Then, the histogram is obtained and it's used as a texture descriptor.

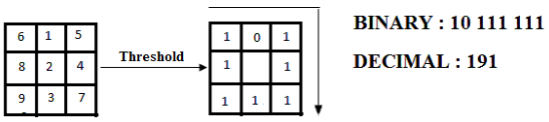

Fig 1: Example of LBP texture Descriptor

B. Local Derivative Pattern for Facial Feature Extraction

LBP [6] in fact encodes the binary outcome of the first-order derivative with limited neighbors by using a simple threshold function as shown in Fig 1, which is not sufficiently expert of describing more detailed information. Similarly, LBP encodes the connection among the middle point and its neighbors; however LDP encodes the variety of unique spatial relationships in a local section and, as a result, contains more spatial information.

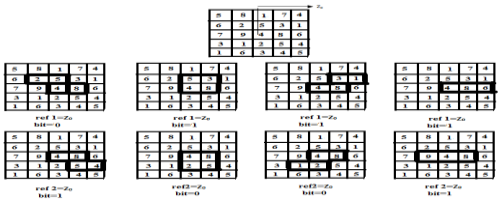

Fig 2: Example of LDP texture Descriptor

Here in this Fig 2 the 5*5 matrix pixels are taken and the center pixel is taken as the threshold. Initially the center value (3, 3), next value (3, 4) and in the above row the (2,2) and (2,3) values are compared . If both the rows values are increasing or decreasing and vice versa then the value of 0 is obtained. Similarly if one of the row value is increasing and the other row value is decreasing and vice versa then the value of 1 is obtained. A binary number is obtained by linking all of these binary values in a clockwise direction. Finally the corresponding decimal value is obtained. Then, the histogram is obtained.

C. Support Vector Machine As Classifier For Face Recognition.

Support Vector Machines (SVM) is one of the important and useful techniques in classification problems. One clear case is face recognition. Alternatively SVM cannot be introduced if the feature vectors defining samples have missing entries. A classification algorithm that has been used here is the Support Vector Machines (SVM). SVMs can proficiently perform non-linear classification of totally mapping their inputs into high-dimensional feature spaces.

III. PROPOSED SYSTEM

A. RRFDP (Robust Recognition of Faces on Different Poses):

The original image and probe image features are extracted. The original image and the probe image are compared using the Euclidean distance.

Euclidean distance= [x-y]^2/[x+y] (1)

In equation (1) x is the original image and y is the probe image.

Block diagram for RRFDP (Robust Recognition of Faces on Different Poses):

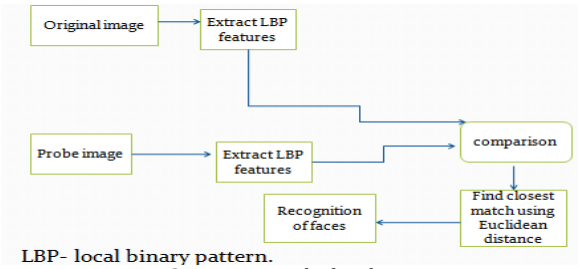

Fig 3: RRFDP Method with poses.

Fig 3 shows RRFDP (Robust Recognition of Faces on different poses) method :

1. Obtain the gallery images of person with different poses
2. For each gallery image extract LBP features.
3. Compare it with probe image and find closest match by means of Euclidean(minimum) distance.

B. RRFDP (Robust Recognition of Faces on Different Poses based on LDP) using SVM

The original image and probe image features are extracted. The original image and the probe image are compared using the SVM.

Block diagram for RRFDP (Robust Recognition of Faces on Different Poses based on LDP) using SVM

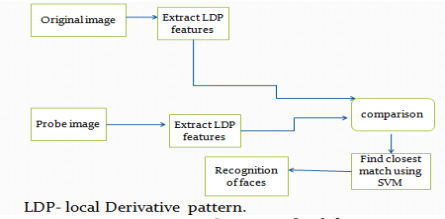

Fig 4: RRFDP using SVM method for poses

Fig 4 shows RRFDP (Robust Recognition of Faces on different poses based on LDP) Using SVM Method:

1. Obtain the gallery images of person with different poses
2. For each gallery image extract LDP features.
3. Compare it with probe image and find closest match using SVM.

C. RRFDP (Robust Recognition of Faces on Different Poses with expressions):

The original image and probe image features are extracted. The original image and the probe image are compared using the Euclidean distance.

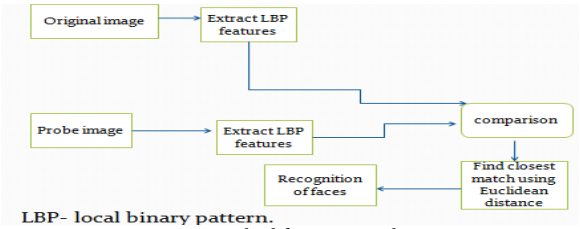

Fig 5: RRFDP Method for poses with expression

Fig 5 shows RRFDP (Robust Recognition of Faces on different poses with expressions based on LBP) Using Euclidean Method:

1. Obtain the gallery images of person with different poses and expressions
2. For each gallery image extract LBP features.
3. Compare it with probe image and find closest match by means of Euclidean distance.

D. RRFDP (Robust Recognition of Faces on Different Poses with expression based on LDP) using SVM

Initially, for the original image and probe image features are extracted. The original image and the probe image are compared using the SVM (support Vector Machines).

Block diagram for RRFDP (Robust Recognition of Faces on Different Poses with expressions based on LDP) using SVM.

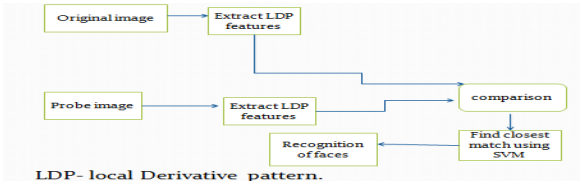

Fig 6: RRFDP using SVM method for pose with expression

Fig 6 shows RRFDP (Robust Recognition of Faces on different poses with expressions based on LDP) Using SVM Method:

1. Obtain the gallery images of person with different poses and expressions
2. For each gallery image extract LDP features.
3. Compare it with probe image and find closest match using SVM

IV. Simulation Results

Fig 7 : Modules of pose variation using LBP

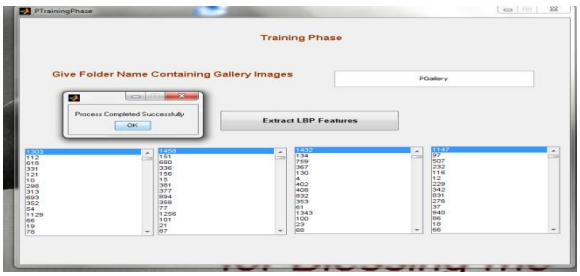

Fig 8 : Training phase of pose variation with LBP

Fig 9 : Testing phase of pose variation with LBP

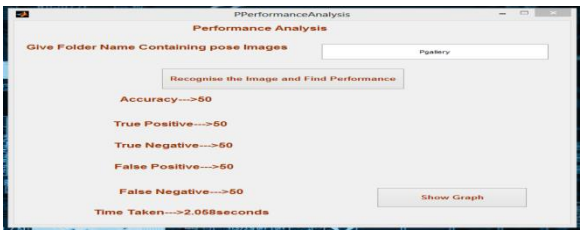

Fig 10 : performance analysis of pose variation with LBP

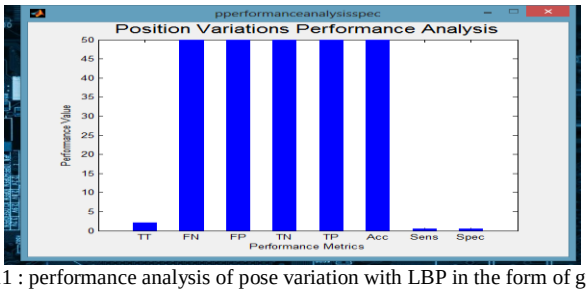

Fig 11 : performance analysis of pose variation with LBP in the form of graph

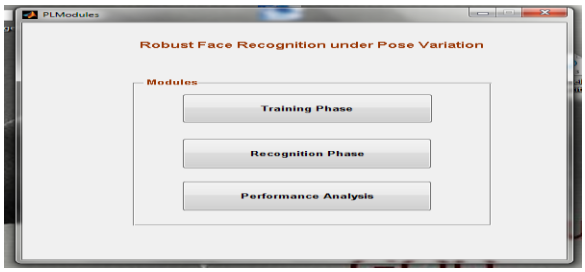

Fig 12 : Modules of Pose variation using LDP

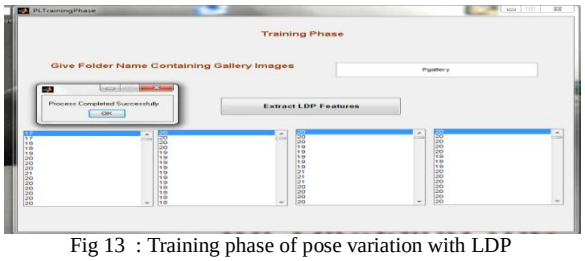

Fig 13 : Training phase of pose variation with LDP

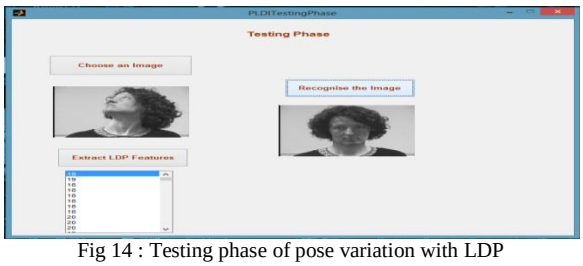

Fig 14 : Testing phase of pose variation with LDP

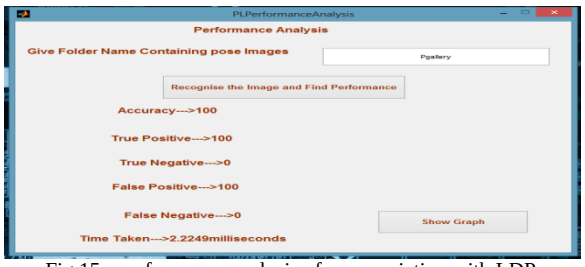

Fig 15 : performance analysis of pose variation with LDP

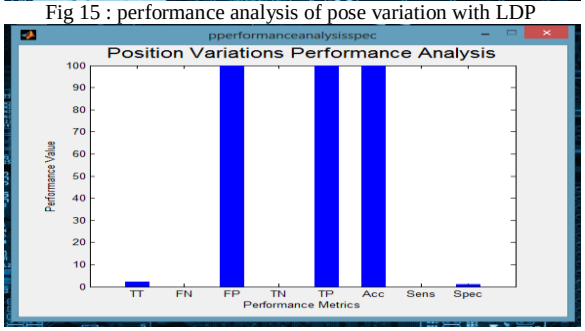

Fig 16 : performance analysis of pose variation with LDP in the form of the graph.

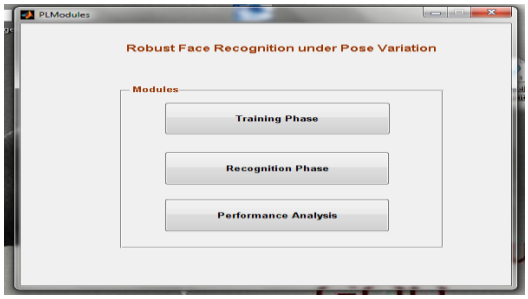

Fig 17 : Modules of pose variation with Expression using LBP

Fig 18 : Training phase of pose variation with Expression with LBP

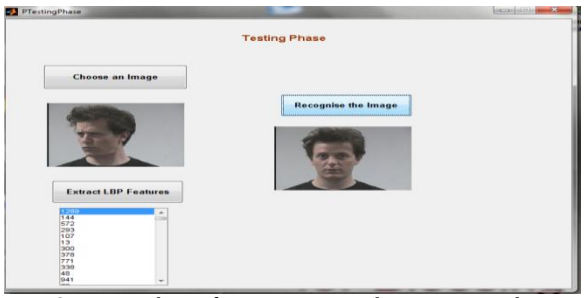

Fig 19: Testing phase of pose variation with expression with LBP

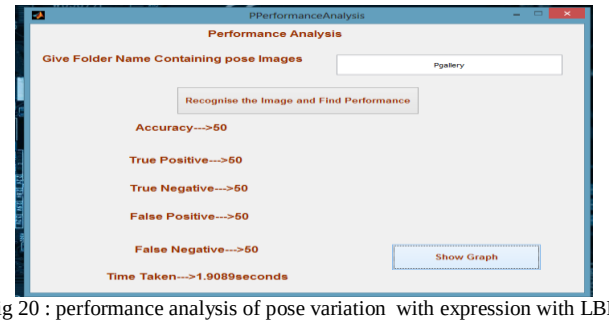

Fig 20 : performance analysis of pose variation with expression with LBP

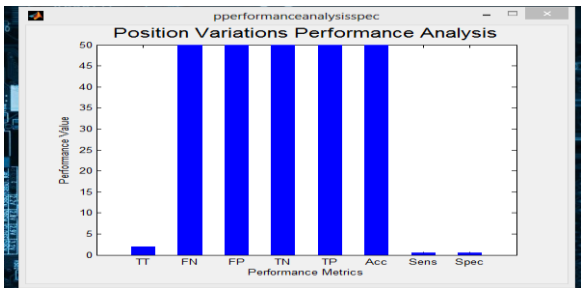

Fig 21 : performance analysis of pose variation with LBP in the form of the graph.

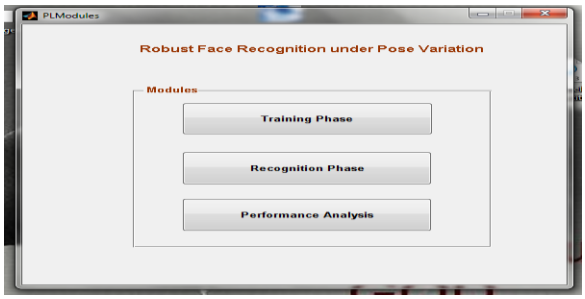

Fig 22 : Modules of pose variation with expression using LDP

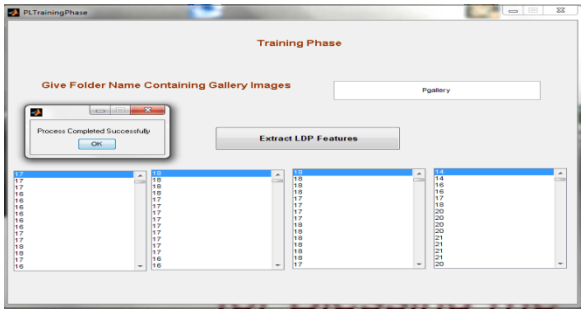

Fig 23 : Training phase of pose variation with Expression with LDP

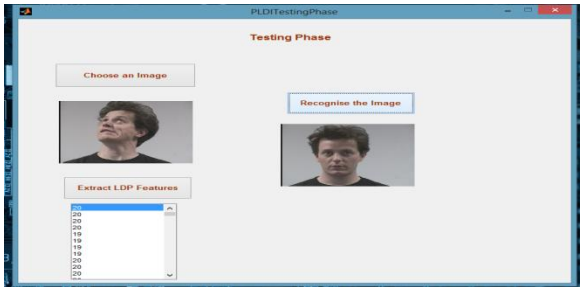

Fig 24 : Testing phase of pose variation with expression with LDP

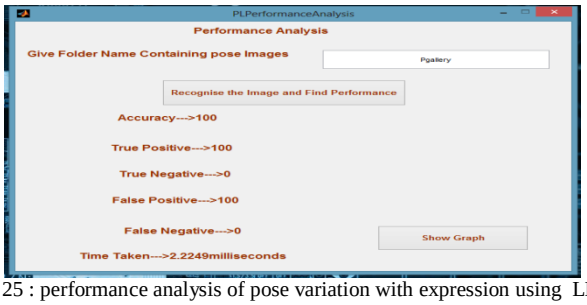

Fig 25 : performance analysis of pose variation with expression using LDP

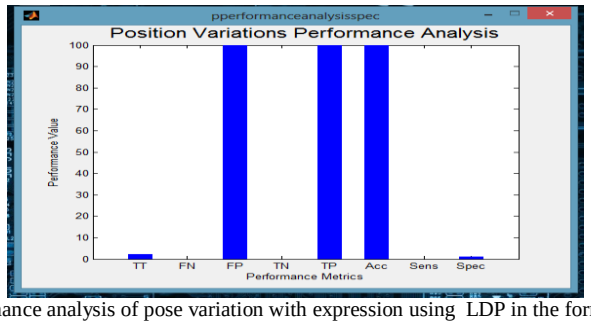

Fig 26: performance analysis of pose variation with expression using LDP in the form of the graph.

Fig 7 to 11 shows the training phase, testing phase and the performance evaluation of the LBP operators for pose variations and Fig 12 to 16 shows the training phase, testing phase and the performance evaluation of the LDP operator for pose variations. Fig 17 to 21 shows the training phase, testing phase and the performance evaluation of the LBP operators for pose variations with expressions and Fig 22 to 26 shows the training phase, testing phase and the performance evaluation of the LDP operator for pose variation with expressions. Here, the LBP operator provides the accuracy of 50% but the LDP operator provides the accuracy of 100% with the least time compared to LBP operators.

V. CONCLUSION

Pose Variation plays the major role in face recognition. Here the LBP and LDP operators are used. But the LDP operators provide the accuracy more than that of the LBP operators and also provide better results when compared to the LBP operators. The LDP with SVM classifier provides the results in ONE microsecond scale whereas the LBP with Euclidean distance provides the results in seconds range.

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First of all I thank the almighty for giving us the knowledge and courage to complete the research work successfully. Next I express my gratitude to our respected Assistant Professor Ms .A.S Senthil Kani, M.E., for following us to do research work effectively. Finally, I wish to express my gratitude to my family and my friends, for providing unending support in every aspect possible, to ease my path on this journey.

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