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Accuracy of Facial Expression Recognition using DCT and DWT

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ABSTRACT: Facial expression recognition (FER) method is explicated which uses the DCT and DWT algorithm to evaluate the expression of the face. This method uses a minimal number of steps, which includes normalization techniques, compares the test image, whose expression is to be calculated, with the standard pre-defined images and concludes the expression of the face as that of the image in the database with whom the test image produces minimum Euclidean distance. Experiments and the results demonstrated show that these methodscan calculate the expressions accurately.

KEYWORDS: Face Recognition, Discrete Cosine Transform, Discrete Wavelet Transform.

I. INTRODUCTION

Facial expression recognition provides an efficient way of communication between humans. Applications include personal identification/access control, videophone/calls, and teleconferencing, forensic applications, human-computer interaction, automated surveillance, etc. However, the performance of the face detection affects the performance of all the applications.

Facial expression recognition methods experimented in this project are focused mainly on the recognition of six primary expressions such as happiness, sadness, fear, anger, neutral and surprise for a description of detailed facial expressions. Automatic FER will help in making the communication between man & machine easier. The rise in the significance of robots in human beings' life thus can be eased with robots automatically interpreting the expression of his master.

II. PROPOSED METHODS

1) Viola-Jones

The Viola-Jones algorithm is based on a principle to scan a sub-window that is capable of detecting faces easily across an input image. The input image can be rescaled to different sizes and then run the fixed size detector through these images which are the standard image processing approach. Due to the calculation of the different size images, this approach turns out to be time-consuming. This algorithm rescales the detector instead of the input image and runs the detector many times through the image and each time with different size images. This proposed algorithm has devised a scale-invariant detector that requires the same number of calculations whatever the size is even when both approaches are suspect to be equally time-consuming.

2) Local Binary Pattern

The LBP is a gray-scale invariant texture operator that describes the texture of an image. It labels each pixel of an image by keeping a threshold at its P-neighbor values with the center value and converts the result into a binary number.

3) Local Directional Pattern

The Local Directional Pattern (LDP) is a pattern of eight-bit binary code which is assigned to each pixel of an input image. This pattern is calculated by comparingthe response value of a pixel in different directions.

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4) Support Vector Machine

A model is built by the SVM classifier to predict classes for new examples. It assigns new examples/data points to one of the classes. If there are only 2 classes then it can be called a Binary SVM Classifier.

III. TECHNIQUES

1. Discrete Cosine Transform (DCT)

A Discrete Cosine Transform (DCT) is used to express the finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. In image processing, DCT is intended to de-correlate the image data. DCT featureshave been used for the recognition and some coefficients are selected to form feature vectors.

2. Discrete Wavelet Transform (DWT)

Wavelet and Fourier transform represents a signal through a linear combination of their basic functions. In Fourier transforms, the basis functions are dilations of cosine and sine signals (each spanning the entire time interval). For wavelet transforms, they are different translations and dilations of one function termed the Mother wavelet along with a scaling function (each spanning a logarithmically reduced subinterval).

IV. SOFTWARE

- **MATLAB**

This programming language started with the matrix programming where another linear algebra programming was simple. This programming language run under both batch jobs and interactive programs. MATLAB provides visualization. MATLAB provides matrix manipulations. It has inbuilt commands and math functions that help in matrix calculations, generating plots for performing numerical methods.

MATLAB (matrix laboratory) provide a multi-archetype numerical operational environment. It also provides a Fourth-Generation programming language. MATLAB in our project is used to program the codes for DCT and DWT so that we can compare the accuracy for both techniques

V. RESULTS

In the DCT Confusion Matrix Result, we see the accuracy of the different 6 classes i.e Anger, Fear, Happy, Neutral, Sad and Surprise respectively. Out of the 50 images in each dataset, 40 images are given for training and 10 are for testing. The accuracy of each class is shown out of these 10 images.

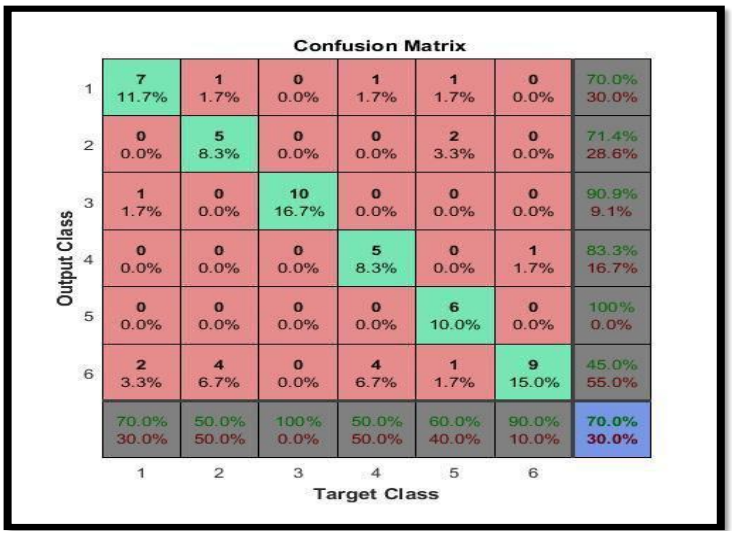

Fig. 1 DCT Accuracy Result (in %).

The overall accuracy of the DCT method comes out to be 70% considering the result of all the classes.

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In DWT Confusion Matrix, we see that 9 out of 10 images of testing of Anger class are recognized correctly. All 10 images of class Happy are identified correctly giving 100% accuracy.

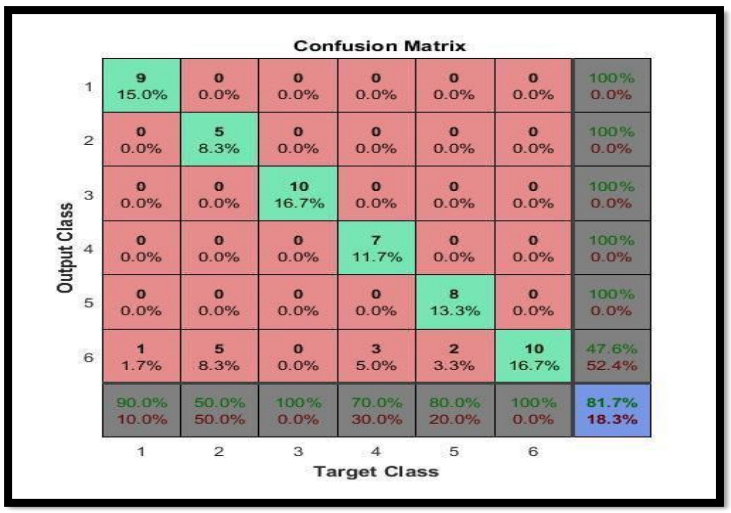

Fig. 2 DWT Accuracy Result (in %).

The overall accuracy of the DWT (wavelet) comes out to be 81.7%. Therefore, the DWT technique, in this case, is more accurate than the DCT technique.

VI. CONCLUSION

Thus, we have carried out two different methods to find out the accuracy of the transforms namely, Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT). We can conclude that after applying two levels of transformation of DWT, we get an accuracy of 81.67% for the DWT technique as compared to DCT which gives accuracy around 70%.

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