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IMPLEMENTATION OF ADVANCED FACE RECOGNITION MODEL USING HAAR CASCADE CLASSIFIER AND LBPH ALGORITHM

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Abstract: Face is a physical representation of a person. So, we aresuggesting a facial recognition-based automatic student attendance system. In our suggested method, video framing and the camera is activated using a user-friendly interface. To identify and segment the face ROI from the video frame the Viola-Jones method is used. If necessary, image size scaling is done at the pre-processing step to prevent information loss. After using the median filter to reduce noise, color pictures are transformed into grayscale versions. Then, to enhance the assessment of the pictures, assessment-restricted adaptive histogram equalization (CLAHE) is applied.Principal factor analysis (PCA) and stepped forward neighborhood binary pattern (LBP) are used as it should be within side the face identity degree to extract the traits from facial pictures.The original LBP operator is made up of a 9-pixel, 3 3 filter size. It appears to be more rectangular in form than round.The proposed LBP operator uses just 8 bits of computation to extract grayscale features from contrast-improved grayscale pictures. In comparison to the original LBP, enhanced LBP with radius size two performs better and has a more reliable recognition rate.Then, to enhance the assessment of the pictures, assessment-restricted adaptive histogram equalization (CLAHE) is applied. By minimizing the lighting impact and boosting identification rates, the improved local binary pattern outperforms the original local binary pattern in our suggested method. The features that were retrieved from the training pictures and the features that were extracted from the test images are then compared. The face photographs are then diagnosed and categorised the use of the upgraded LBP, PCA, and set of rules that produced the great results.

Keywords: Face recognition, LBP, CLAHE.

INTRODUCTION

The primary goal of this project is to create an automated student attendance system based on facial recognition. The test pictures and training images of this technique are restricted to frontal and upright facial images that only contain a single face to boost performance. To ensure no compromise in quality, the test photographs and training images must be taken using the same equipment.

Aims and Objectives

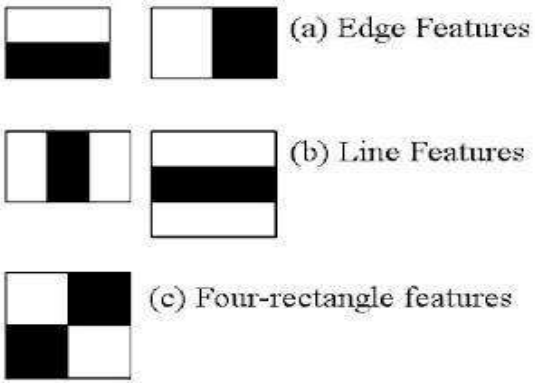
The goal of this project is to create an automated student attendance system based on facial recognition.The following are anticipated outcomes to fulfill the objectives: To pick out the facial phase withinside the video frame.

- To identify the useful aspects on the observed face.
- To categorize the traits in order to identify the observed face.
- To note the indicated student's attendance

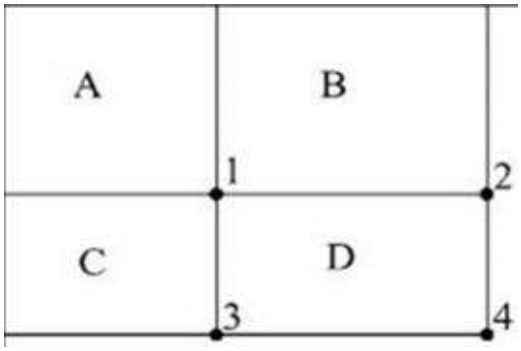
Viola-Jones Algorithm

The maximum extensively used method to discover the face section from a static image or video body is the Viola-Jones algorithm, which changed into evolved via way of means of P. Viola and M. J. Jones in 2001. The Viola-Jones set of rules is largely composed of 4 pieces. The first component is called the Haar feature, the second component is where the integral picture is formed, the third component is where Adaboost is implemented, and the fourth component is the cascade process.

Haar Feature (Docs.opencv.org, 2018)



A given image is examined using the Viola-Jones method utilizing Haar features, which are made up of several rectangles (Mekha Joseph et al., 2016). Several Haar feature types are displayed in above figure. The attributes function window capabilities that map onto the picture. Subtracting the total of the white rectangle(s) from the total of the black rectangle(s) yields a single number representing each feature (Mekha Joseph et al., 2016). The example is displayed in below figure.



Integral of Image

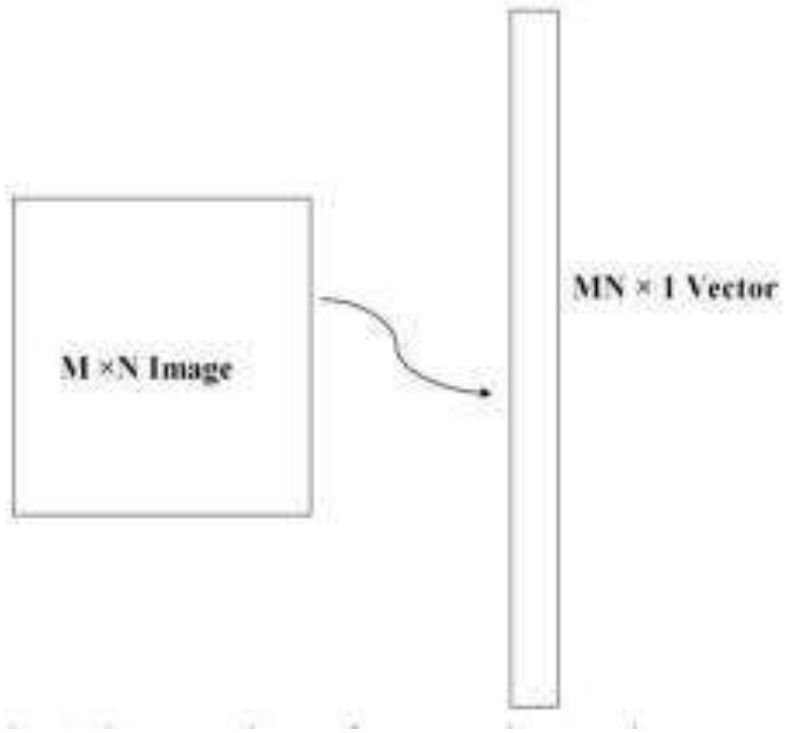
The total of the pixels on the left and the top of the relevant place determines the value of an integrated image in that position. The value of the integral picture at position 1 is the total of the pixels in rectangle A, to provide a clear illustration. The integral image values for the remaining sites add up. For instance, the value at location 2 represents the addition of A and B, (A + B), the addition of A and C, (A + C), and the addition of all the regions, (A + B + C + D), at position 3. (SrushtiGirhe et al., 2015). As a result, to exclude rectangles A, B, and C, the total in the D region may be calculated simply using addition and subtraction of the diagonal at point 4 + 1 (2 + 3).

Facial Images Were Converted To Grayscale, Histogram

Apart from using histogram equalization, there are a few more ways to increase the contrast of photos.

Feature Extraction

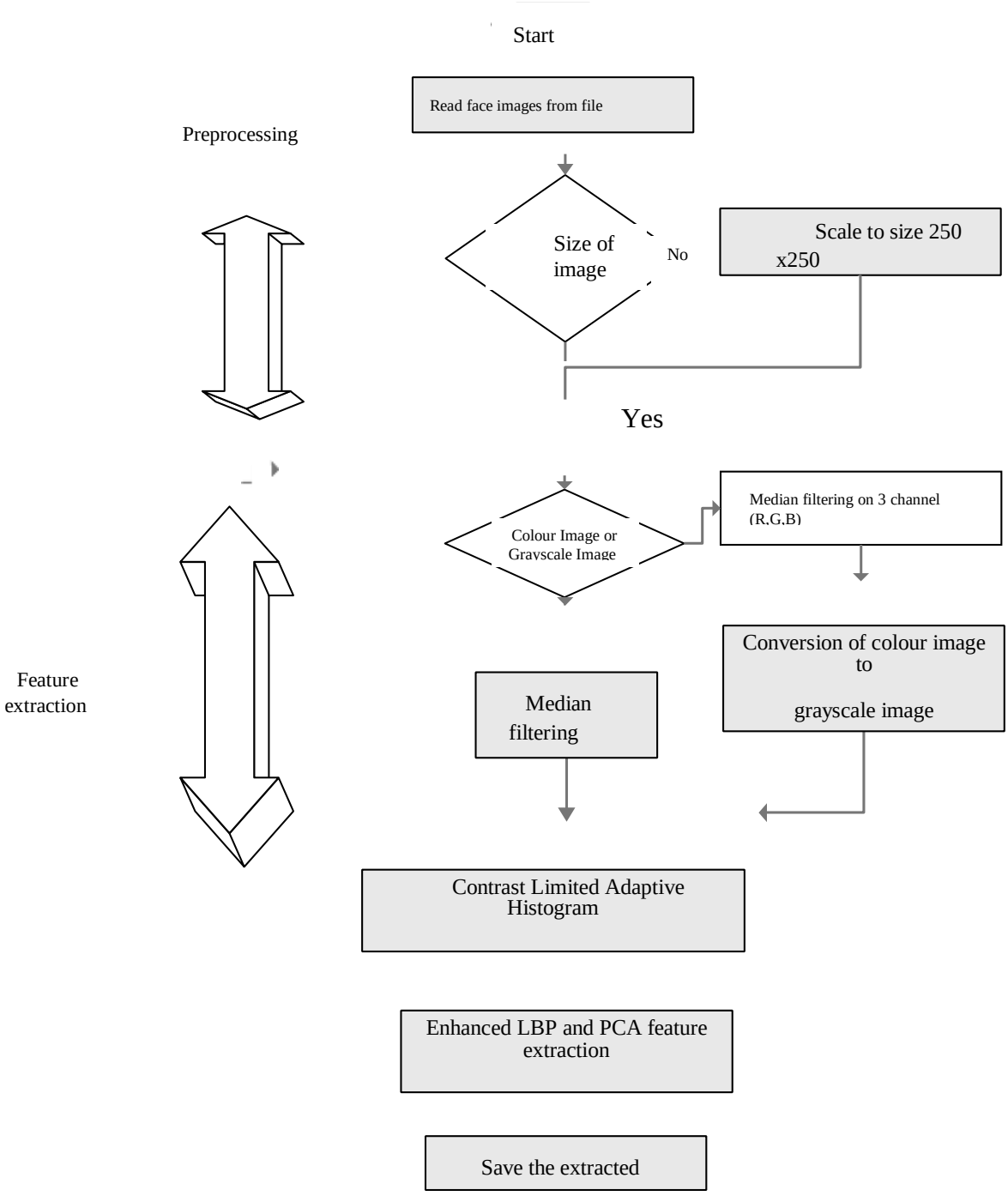
A feature is a collection of data that symbolizes the content of a picture. The most important step in face recognition is facial feature extraction. Yet, choosing features might be difficult. For a feature extraction method to produce results with high accuracy, it must be consistent and stable throughout a range of changes.



PCA Dimension Reduction

Methodology Flow

Training database



Flow of the Proposed Approach

Limitations of the Images

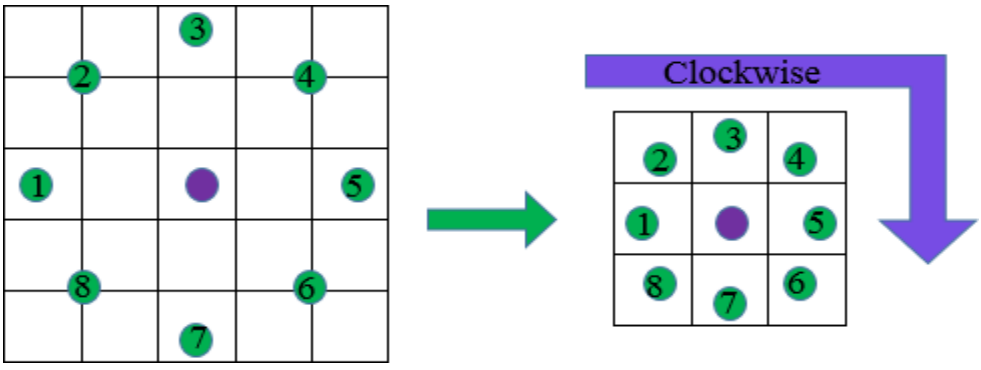
The enter picture for the proposed method have to be frontal, upright and handiest an unmarried face.Although the machine is designed so one can understand the scholar with glasses and without glasses, college students need to offer each facial photos with and without glasses to beeducated to growth the accuracy to be identified without glasses.The education photograph and trying out photograph must be captured via way of means of the use of the identical tool to keep away from pleasant difference.The students must register in order to be recognized. Enrolment may be performed immediately through the user-pleasant interface.These situations need to be glad to make sure that the proposed technique can carry out well.

Working Principle of Proposed LBP

The unique LBP operator is made from a 9-pixel, 3 * 3 clear out size. It appears to be more rectangular in form than round. Every feature, consisting of those who aren't crucial, could be sampled when you consider that there are nine pixels near one another.Due to the tiny clear out out size's emphasis on small scale detail (Lee and Li, 2007), consisting of the shadow produced with the aid of using non-uniform lighting fixtures condition, it's far greater impacted with the aid of using choppy lighting fixtures conditions. In our suggested method, the LBP operator is implemented with a bigger radius size, R. The equation for converting the radius length has been brought withinside the 2013 paintings through Md. Abdur Rahim et al. The effect of changing the radius length changed into now no longer noted withinside the paper, though. To improve the system and lessen the lighting impact, the suggested technique analyses various radius sizes. The filter size will rise when the radius size does as well. R denotes the gap from the middle pixel, the perspective at which the sampling factor became taken, and P the quantity of sampling factors that have been taken on thecircle's periphery and compared to the center pixel. When the neighboring notation (P, R,) is used, the sines and cosines furnished withinside the equation can be used to compute the coordinates of the middle pixel (Xc, Yc) and the P neighbors (Xp, Yp) on the threshold of the circle with radius R (Md. Abdur Rahim et al., 2013):

$$Xp = Xc + Rcos(\theta/P)$$

$$Yp = Yc + Rsin(\theta/P)$$



Proposed LBP Operator with Radius 2 and Its Encoding Pattern

Conclusion

This method provides a detailed description of an automated student attendance system based on facial recognition. With the help of a comparison between the input picture from a video frame that was recorded and the training image, the suggested strategy offers a way to recognize the persons. This suggested method is capable of locating a face from an input facial picture that is taken from a frame of the recorded video. Moreover, it offers a pre-processing technique to improve image contrast and lessen the lighting impact. Both LBP and PCA are used to extract characteristics from the face picture. The system may be stabilized by producing consistent results thanks to the method that combines LBP and PCA. When two photographs per person are taken, the accuracy of the suggested method is 100% for high-quality images, 92.31% for low-quality images, and 95.76% for the Yale face database.

The extraction of face features may be difficult, particularly in variable lighting, as a conclusion to the investigation. Contrast Limited Adaptive Histogram Equalization (CLAHE), used in pre-processing, can lessen the lighting impact. When it comes to improving contrast, CLAHE outperforms histogram equalization. When compared to the original LBP operator, enhanced LBP with bigger radius sizes—specifically, radius size two—perform better, are less impacted by light, and are more consistent when compared to other radius sizes.

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