Face recognition based automated attendance system

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***Abstract*—The face is an identity of a person. The accurate recognition of a person is the sole aim of a face recognition system.In this project we are going to make the attendance of students by recognizing his/her face from the database. A particular student database will contain name and its captured image. For marking attendance, first it will detect the face using color moment canny edge detection algorithm and edge histogram descriptor of each image, then it will check these images with those in existing database. On checking the image with database the corresponding student attendance will be marked**

***Keywords*—color moment, MATLAB, face recognition, Euclidean distance.**

I. INTRODUCTION

The purpose of recognition and identification has gone past the mere need for security. The use of face recognition software has been recently used to ease mundane tasks. The age of automation has given rise to such exploitation and it has been remarkable. The techniques that surround face recognition and identification are the basic concepts of Image Processing. The use of optimized algorithms to refine the results and produce a better and quick result was a goal that has been achieved in most of the implementations, the idea of using this technique to calculate the attendance has been the heart of our entire project. The task can be explained in three phases: 1. Construction of image and text database. 2. Taking the input from camera for checking and preprocessing. 3. Performing image retrieval and marking the attendance. In the case of every organization, institutional or business, there exists the need to maintain a regular log of attendance. It is also important that such data is consistent, regularly updated, secure from manipulation and also accurate to the second. Practically, there have been many instances where such data is not in its desired form. The causes may vary but the end result is ultimately inaccurate. This gave rise to automated systems to record attendance which was, and in most places, still is a manually executed task. The rate of error rises with the manual working and hence the automation is the need of the hour. The crucial and most important stage of the entire system is the database that needs to be prepared to provide the basis for comparison during the working of the system.

II. SYSTEM OVERVIEW

The figure1gives the over view of this face recognition system. In this recognition system for reading the image as input camera is required at recognition and while creating a database of person's images. After getting the frontal face image first step is to crop the image into pre-defined size and this cropped image is processed for extraction of features of color features and for edge features as well after extracting the features by using suitable algorithms like color moment and edge histogram descriptor this features are stored and when any person comes then this all above mentioned steps are done again and the features calculated of test person are checked with existing database features for similarity measures, if the calculated features matched with feature in database then attendance of the corresponding person is marked on the attendance sheet.

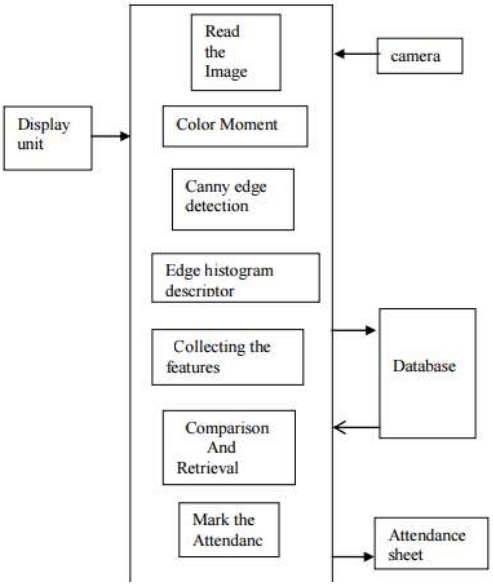


Fig 1

III. COLOR MOMENT

For Color feature extraction color moments are calculated Color moments are key tools that can be used for differentiating the images based on their feature of colors Once the moments are calculated ,these moments provide a measure of color similarities between two images these all values of similarity can be compared to the values of image indexed in the database for image retrival.there are three central moments in a image color distribution these are Mean,standard deviation and skewness,but color can be defined by three or more values but we will stick to the Hue, Saturation and brightness.

Mean= $\sum_{j=1}^{N}(1/N)$ Pj

Standard deviation= = $\sqrt{(1/N(\sum_{j=1}^{N}(\text{Pj}-\text{mean})^2)}$

Skewness=$\sqrt[3]{1/N\sum_{j=1}^{N}(Pj-mean)^3}$

mean can be considered as the average color value in image the standard deviation is square root of variance of the distribution. skewness can be understood as measure of the degree of asymmetry in the distribution.as we know we are having three channels of color (hue, saturation and value).now image is characterized by 9 moments ,3 moments for each 3 color channel.

Similarity between two image distributions is measured by Sum of the differences between the moments of two distribution.

d(1,2)= $\sum_{i=1}^{r}(Wi1(E1i-E2i)+Wi2(D1i-D2i)+ \quad Wi3(S1i-S2i)$

where d(a,b) is distance between the moments of two different images.

where E1= mean of image1

E2=mean of second image

D2=standard deviation of 2nd image

S1=skewness of 1st image

S2=skewness of 2nd image

Wi=weights for each moment

r=is number of channels

i=is current channel

Pairs of images can be ranked based on values of d(distance). Those who are having greater values are ranked lower and considered as less similar than those who have higher rank and lower value of d. Wi values are user specified weights, value of weighting coefficient depends on application and also on the condition of the image this weights can be manage such that different Preferences can be given to the different features. This weighting coefficient can be modified to increase or decrease the importance of any factor such as lightning condition.

IV. CANNY EDGE DETECTION AND EDGE HISTOGRAM DESCRIPTOR

In this process removal of noise is the first step, therefore for removing the noise Gaussian filters are applied on image since detection results are easily affected by noise it is essential to filter the noise to prevent the false detection caused by noise.

Here we can see example of 5×5 Gaussian filter

$$\mathbf{B}=\frac{1}{159}\begin{bmatrix}2&4&5&4&2\\4&9&12&9&4\\5&12&15&12&5\\4&9&12&9&4\\2&4&5&4&2\end{bmatrix}*\mathbf{A}.$$

Where A is the image on which the filter is to be applied For removal of noise.

An edge in image can be in a variety of direction, so it uses four filters for detecting the edges in horizontal, vertical and diagonal. Edge detection operators e.g. Robert, prewitt and sobel. It gives the value of first derivatives in horizontal direction (Gx) and and in vertical direction (Gy) using this gradient and direction can be calculated .

$$G=\sqrt{{G_x}^2+{G_y}^2} \qquad \text{And}$$

$$\theta=\tan^{-1}\frac{G_y}{G_x}$$

After calculation of intensity gradient next step is non maximum separation, if the gradient angle is 0°degree that is the edge is in the north-south direction the point is considered to be on edge if its gradient magnitude is greater than the magnitude of at pixels in east and west direction.

If the rounded gradient is 90 degree that is the edge in the eastwest direction point will be considered to be on edge if its gradient magnitude is greater than the magnitude at pixel in north-south direction. if the rounded gradient angle is 135° degree that

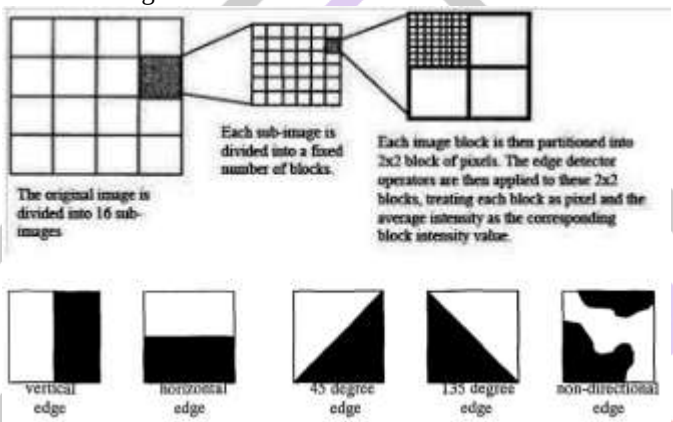
is the edge is in the northeast–southwest direction. the point will be considered to be on the edge if its gradient magnitude is greater than the magnitudes at pixels in the north- west and south east directions.

If the rounded gradient angle is 45° degree that is the edge is in the north west–south east direction the point will be considered to be on the edge if its gradient magnitude is greater than the magnitudes at pixels in the north east and south west directions.

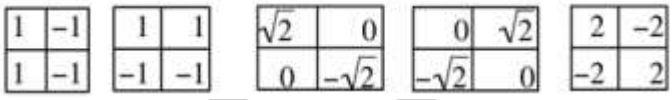
After applying non-maximum separation next step is to apply double thresholding to determine potential edges.there are still some edge pixels at this point caused by noise and color variation. In order to get rid of the spurious responses from these bothering factors, it is essential to filter out the edge pixel with the weak gradient value and preserve the edge with the high gradient value. Therefore two threshold values are decided to clarify the different type of edge pixel. There are two types of threshold values, one is called high threshold value and other is called low threshold value if edge pixels gradient value is higher than the high threshold value they are considered as strong edge pixels and suppose if the edge pixel gradient value is less than the high threshold value and greater than the low threshold value, they are considered as weak edge pixels. if the gradient value of pixel is less than the low threshold value than it should be suppressed.

Next step is to track the edges by hysteresis so thatstrong edge pixel should be involved in the final image of edge However, There will be some debate on the weak edge pixels, as these Pixels can either be extracted from the true edge, or the Noise/color variations. To achieve an accurate result, the weak Edges caused by the latter reasons should be removed. Usually a weak edge pixel caused from true edges will be connected to a strong edge pixel while noise responses are unconnected. To track the edge connection, blob analysis is applied by looking at a weak edge pixel and its 8-connected neighborhood pixels. As long as there is one strong edge pixel is involved in the blob, that weak edge point can be identified as one that should be preserved.

So the edge image is obtained, now this image will be processed for image histogram descriptor in this, first step is to segment the edge image into 4×4 parts that is into 16 parts These blocks are non-overlapping blocks it represents the frequency of occurrence of 5 type of edges in each sub image



For defining the characteristic of image block then we generate a histogram of edge distribution for each image block. The edges of image block characterized types: vertical, horizontal, 45-degree diagonal, 135-degree diagonal and nondiagonal edges A simple method to extract an edge histogram in the image block is to apply digital filters in the spatial domain. We have the coefficient of vertical edge filter, horizontal edge filter, diagonal 45 edge filter, diagonal 135 edge filter and non-diagonal edge filter.



Directional selective isotropic

High retrieval performance cannot be achieved only by applying the local histogram alone. It may not be enough. Rather, we may need edge distribution information for the whole image space as well. That is, beside the local histogram, we need the global histogram. The global edge histogram represents the edge distribution for the whole image space. Note that the bin values for all global histograms can be obtained directly from the local histogram. Since there are five edge types, the global edge histogram also has five bins. Consequently, hence we have 5 bins for 16 segments of image therefor total 80 bins (local).

V. CONCLUSION

Automated attendance system has been envisioned for the purpose of reducing the errors that occur in the traditional attendance taking system. The aim is to automate and make a system that is useful to the organization such as an institute. The database is crucial to the execution of the system and the details of every student must be consistent. The image capturing and processing phase is the source of the input to the system. The final phase is the retrieval of the corresponding student and marking of the attendance.

VI. FUTURE SCOPE

The current recognition system has been designed for frontal face views of face images. A neutral architecture (may be together with a feature based approach) can be implemented in which the orientation of the face is first determined.. And then the most suitable recognition method is selected. In future for face recognition 3D modeling techniques can be used to increase the efficiency of recognition system so that the difference of angle or position of face will not affect the recognition.

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