

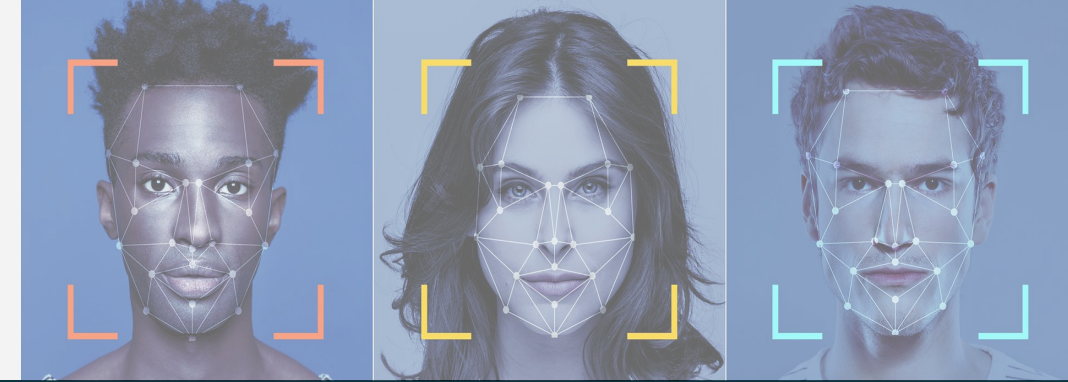
# Face Recognition Based Attendance System

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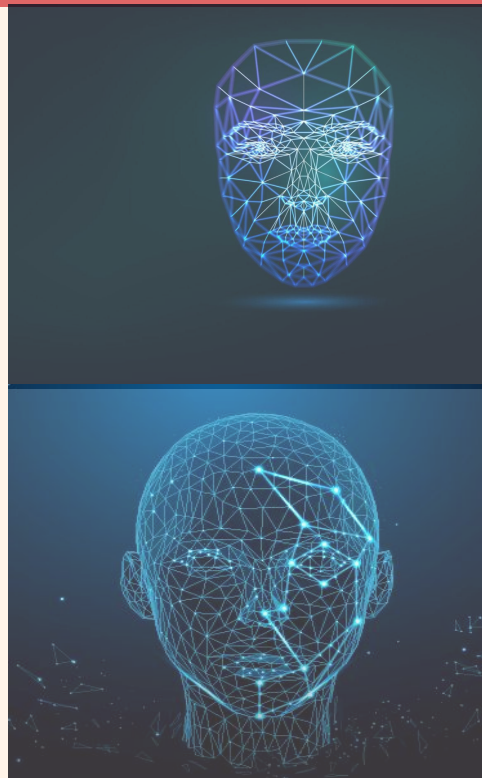
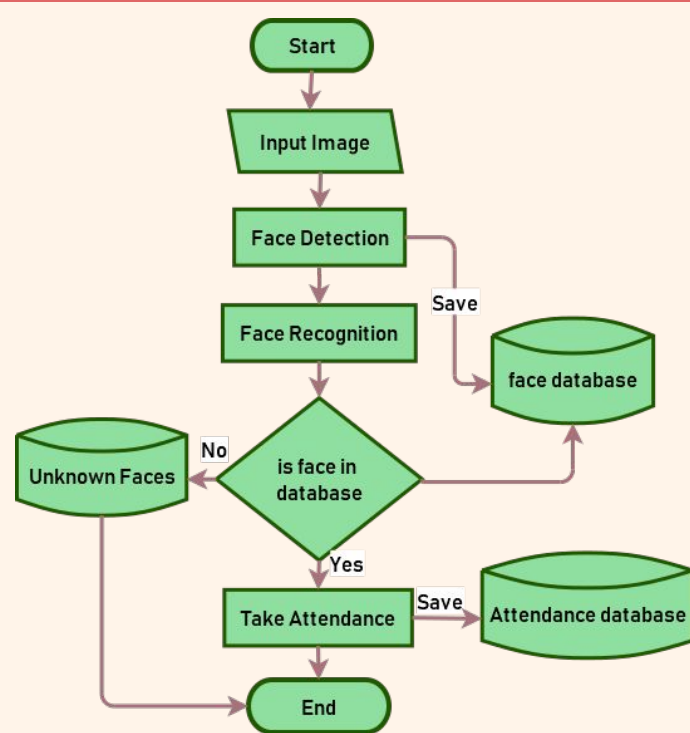
## Pain Point

Attendance of the student is very important for every college, universities and school. Conventional methodology for taking attendance is by calling the name or the roll number of the student is a time consuming process. One step ahead, the technology of QR scanner or Biometric Attendance is also time consuming for students. The paper describes the more advanced way of taking attendance using Image Processing techniques such as Face Detection and Face Recognition. It is an involuntary automatic attendance marking system without creating any kind of interference with the normal teaching procedure.

## Aim and Objectives:

- To develop Face Recognition Based Attendance System.
- To detect the face segment from the video frame.
- To extract the useful features from the face detected.
- To classify the features in order to recognize the face detected.
- To record the attendance of the identified student.

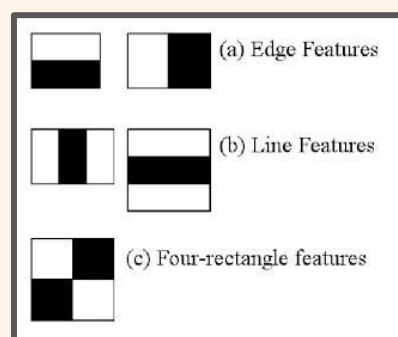
## Flow Chart



## Face Detection:



Fig. Haar Features



Face detection can be performed based on several cues: skin color (for faces in color images and videos, motion (for faces in videos), facial/head shape, facial appearance or a combination of these parameters. Most face detection algorithms are appearance based without using other cues. An input image is scanned at all possible locations and scales by a sub window. Face detection is posed as classifying the pattern in the sub window either as a face or a non-face. We have used Viola Jones algorithm to detect faces which is based on Haar Cascades. Local Binary Pattern Histogram is further used for training and recognition task. Using the LBP combined with histograms we can represent the face images with a simple vector.

## LBPH algorithm in 5 easy steps :

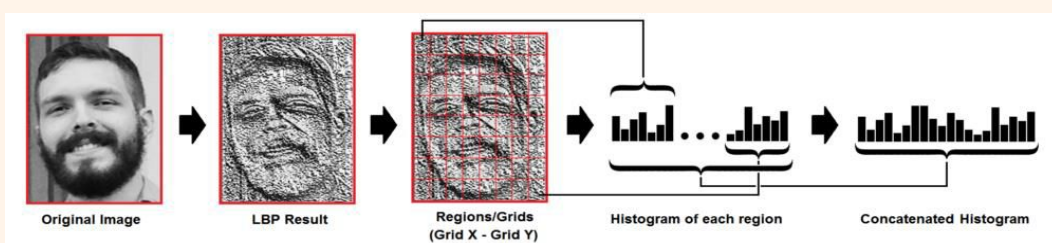
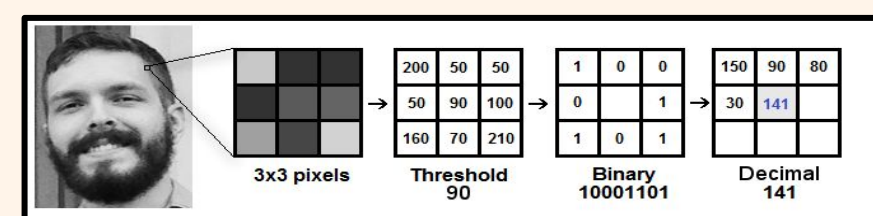
**1. Parameters:** The LBPH uses 4 parameters:

- Radius, Neighbors, Grid X, Grid Y

**2. Training the Algorithm :** For training we will use images of students which are labelled with their IDs. We will apply LBP operation on each student's images.

### 3. Applying the LBP operation :

- We can get part of this image as a window of 3x3 pixels.
- Then, we need to take the central value of the matrix to be used as the threshold.
- For each neighbor of the central value (threshold), we set a new binary value. We set 1 for values equal or higher than the threshold and 0 for values lower than the threshold. We need to concatenate each binary value from each position from the matrix line by line into a new binary value (e.g. 10001101).
- Then, we convert this binary value to a decimal value and set it to the central value of the matrix, which is actually a pixel from the original image.
- At the end of this procedure (LBP procedure), we have a new image which represents better the characteristics of the original image.



**4. Extracting the Histograms:** Now, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image into multiple grids, Which can be seen on above image.

### 5. Performing the face recognition:

So to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram. We can use various approaches to compare the histograms (calculate the distance between two histograms), for example: Euclidean distance, chi-square, absolute value, etc. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^n (hist1_i - hist2_i)^2}$$

The algorithm output is the ID from the image with the closest histogram. The algorithm should also return the calculated distance, which can be used as a 'confidence' measurement. We can then use a threshold and the 'confidence' to automatically estimate if the algorithm has correctly recognized the image. We can assume that the algorithm has successfully recognized if the confidence is lower than the threshold defined.

## Results

- Developed fully functional console application for taking Face Recognition Based Attendance System using OpenCV dependency of python.
- The database is connected with MySQL server which stores the attendance details for each session and student information. This server can be accessed by respective faculties and admins.
- Additional feature of mail assistance is provided to send attendance.

## Future Work

- Can improve security
- Can used in big factory or employee attendance
- Can build fully web based system.

## Contribution (Jay Dave)

- Face Detection part with Haar Cascade in OpenCV.
- Face recognition part with LBPH function.
- Training Dataset Creation.
- Cloud Database of Attendance with MySQL.
- Mail Assistance of attendance information.
- Documentation.



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