# CHAPTER 1

## 1. Introduction

The purpose of the attendance monitoring system using face recognition is to ease the attendance process which consumes lot of time and efforts, it is a convenient and easy way for students and teacher. The system will capture the images of the students and using face recognition algorithm mark the attendance in the sheet. This way the class-teacher will get their attendance marked without actually spending time in traditional attendance marking.

The identification process to determine the presence of a person in a room or building is currently one of the routine security activities. Every person who enters a room or building must go through several authentication processes first, so that later this information can be used to monitor every single activity in the room for a security purpose. Authentication process that is being used to identify the presence of a person in a room or building still vary. The process varies from writing a name and signatures in the attendance list, using an identity card, or using biometric methods authentication as fingerprint or face scanner.

The proposed system consists of a higher solution digital camera to monitor the classroom or office room. It is embedded on a micro – controller based motor system which enables it to rotate in left & right directions. The data or images obtained by the camera are sent to a computer programmed system for further analysis. The obtained images are then compared with a set of reference images of each of the employees or students & mark the

corresponding attendance. The system also provides for continuous monitoring of the classroom by an operator if needed. The camera module can be a wireless or wired system.

## 1.1 Motivation

Nowadays many educational institutes are using a manual monitoring system and most of the time they accidentally loss their attendance sheet so that they cannot properly monitor the attendance of their students .Therefore it is important to design software which will help these institutes to mark the attendance of the students by face recognition which will save their time.

# CHAPTER 2

## 2. Literature survey

1. Face recognition is one of the most important applications of biometrics based authentication system in the last few decades. Face recognition is kind of recognition task pattern, where a face is categorized as either known or unknown after comparing it with the images of a known person stored in the database. Face recognition is a challenge, given the certain variability in information because of random variation across different people, including systematic variations from various factors such as lightening conditions and pose [1]. Computational methods of face recognition need to address numerous challenges. These type of difficulties appear because faces need to be represented in such a way that best utilizes the available face information to define a specific face from all the other faces in the database. Face pose is a specifically difficult problem in this aspect simply because all faces seem similar; specifically, all faces consist of two eyes, mouth, nose, and other features that are in the same location .[1] [2]

2. The second research journals "Face Recognition Based Attendance Marking System" (SenthamilSelvi, Chitrakala, Antony Jenitha, 2014) is based on the identification of face recognition to solve the previous attendance system's issues. This system uses camera to capture the images of the employee to do face detection and recognition. The captured image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is found in the face database. The main advantage of this system is

where attendance is marked on the server which is highly secure where no one can mark the attendance of other. Moreover, in this proposed system, the face detection algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested in the accuracy of the face detection algorithm, the system is yet not portable.[3] This system requires a standalone computer which will need a constant power supply that makes it not portable. This type of system is only suitable for marking staff's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not portable. Thus, to solve this issue, the whole attendance management system can be developed on an portable module so that it can be work just by executing the python program.[2] [3]

3. Paper of Monica .C, Nithya. R, Prarthana . M, Sonika .S.V, Dr . M. RamakrishnaThe design is expressed in sufficient detail so as to enable all the developers to understand the underlying architecture of Attendance system. The Existing system is a manual entry for the Admin and also Faculty. Here the attendance will be carried out in the hand written registers. Maintaining the records for the Faculty is a tedious job.[4]

4. The paper of Abdoulrahmaine Mohammad, Mohammad Elmi Hassan, Muslim Musa 2018 .In this we study it capable of eliminating time wasted during manual collection On attendance and for the educational administration. The new system has been designed as per the user requirements so as to fulfill almost all them. -User friendly -Report Generation -Less paper work.[5]

# CHAPTER 3

## 3. System Analysis

Appearance-Based (Holistic) Methods Appearance-Based methods attempt to identify faces using global representations that based on the entire image rather than local facial features. Many methods for object recognition and computer graphics are based directly on images without intermediate 3 dimensional models, most of these methods depends on image representation that induce a vector space structure and requires dense correspondence in principle .

Global facial information is fundamentally represented by a small number of features that are directly derived from the pixel information of face images, these small number of features distinctly capture the variance among different individual faces and are used to identify unique individuals. In appearance-based method, the whole face region is considered as an input for face detection system to perform face recognition . Appearance-based methods, can be classified into linear and non-linear subspaces.

- **Linear Analysis** Three classic linear classifiers, PCA, LDA, and ICA with several other methods are explained in this paper, each classifier has its own representation of high dimensional face vector space based on different statistical viewpoints. The projection coefficients are used as the feature representation of each face image through the projection of the face vector onto the basis vectors. The matching score between the test face image and the training prototype is

calculated between the coefficient vectors of the images, smaller matching score leads to a better matching process .

- **Non-Linear Analysis** The face manifold is more complicated than linear models. Linear subspace analysis is an approximation of this non-linear manifold. Direct non-linear manifold modeling schemes are explored to learn this non-linear manifold. One of the methods used is Kernel Principal Component Analysis (KPCA) .

## 3.1 Software Requirements And Specification

### 3.1.1 Project Scope

The scope of the system is to reduce the time of the teacher as well as student which they wasted by doing traditional attendance.

### 3.1.2 User Classes and Characteristics

Identify the various user classes that you anticipate will use this product. User classes maybe differentiated based on frequency of use, subset of product functions used, technical expertise, security or privilege levels, educational level, or experience. Describe the pertinent characteristics of each user class. Certain requirements may pertain only to certain user classes. Distinguish the most important user classes for this product from those who are less important to satisfy.

### 3.1.3 Assumptions and Dependencies

This document will provide a general description of our project, including user requirements, product perspective, and overview of requirements,

general constraints. In addition, it will also provide the specific requirements and functionality needed for this project such as interface, functional requirements and performance requirement

### 3.1.4 Functional requirements

Functional user requirements may be high-level statements of what the system should do but functional system requirements should also describe clearly about the system services in detail.

## 3.2 External Interface Requirements

### 3.2.1 User Interfaces

The user interface for the software shall be compatible to any Android version by which user can access to the system. The user interface shall be implemented using any tool or software package like Android Studio, MYSQL etc.

### 3.2.2 Hardware Interfaces

Since the application must run over the internet, the hardware shall require to connect internet to the hardware which is android device for the system.

### 3.2.3 Software Interfaces

This system is a Single-user, multi-tasking environment. It enables the user to interact with the server and attain interact with the server to show the animal information also leaves a record in the inbuilt database. It uses Java

and android as the front end programming tool and MySQL as the back end application tool.

### 3.2.4 Communication Interfaces

The e-store system shall use the HTTP protocol for communication over the internet and for the intranet communication will be through TCP/IP protocol suite.

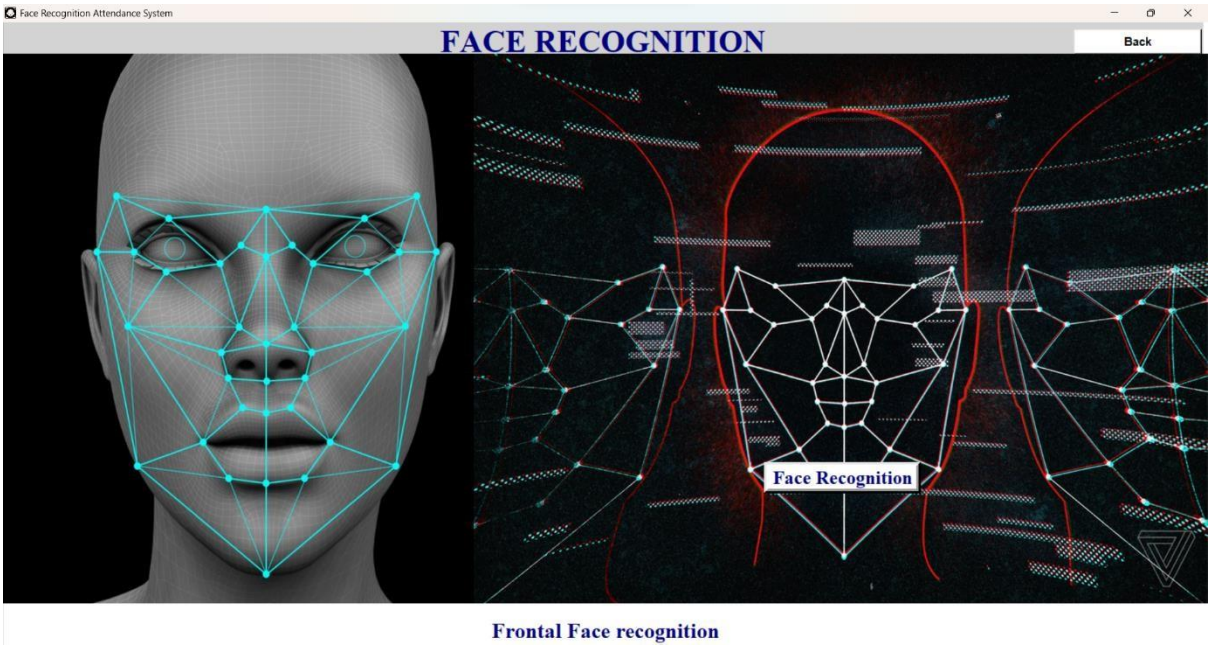


**Fig 3.1 Frontal Face recognition**

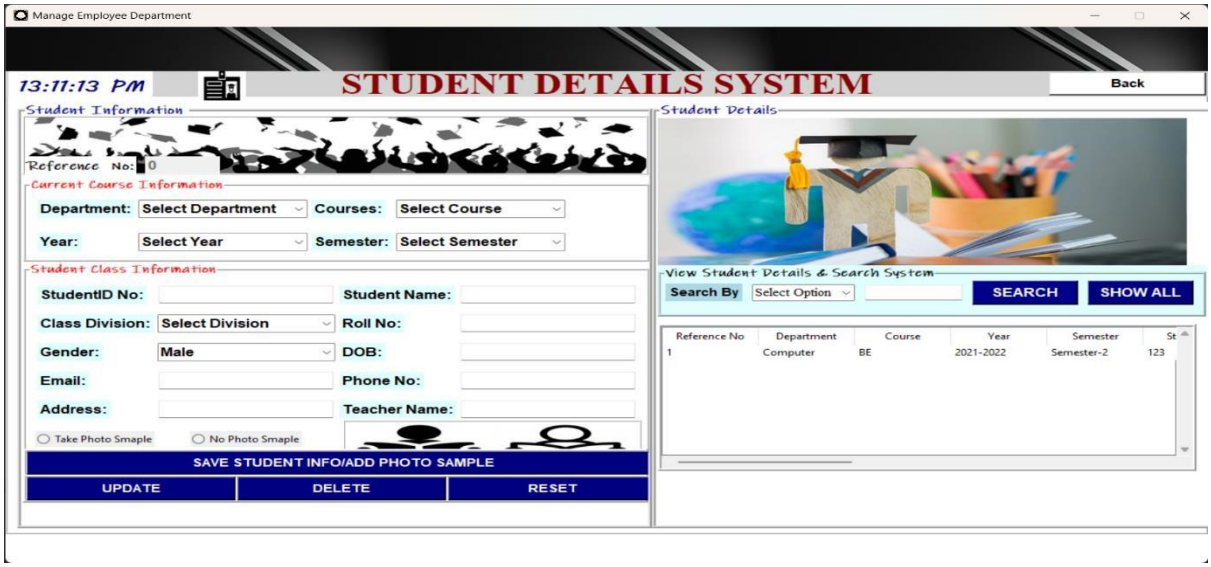


**Fig 3.2 Student Management system**

# CHAPTER 4

## 4. System Design

The core basis for Hear classifier object detection is the Hear-like features. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are used to determine relative light and dark areas. Two or three adjacent groups with a relative contrast variance form a hear-like feature. hear-like features as shown in figure are used to detect an image. hear features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to detect objects of various sizes.

The cascading of the classifiers allows only the sub-images with the highest probability to be analysed for all hear-features that distinguish an

object. It also allows one to vary the accuracy of a classifier. One can increase both the false alarm rate and positive hit rate by decreasing the number of stages. The inverse of this is also true. Viola and Jones were able to achieve a 90% accuracy rate for the detection of a human face using only 100 simple features. Detecting human facial features, such as the mouth, eyes, and nose require that hear classifier cascades first are trained. In order to train the classifiers, this gentle AdaBoost algorithm and Haar feature algorithms must be implemented. Fortunately, Intel developed an open source library devoted to easing the implementation of computer vision related programs called Open Computer Vision Library. The OpenCV library is designed to be used in conjunction with applications that pertain to the field of HCI, robotics, biometrics, image processing, and other areas where visualization is important and includes an implementation of Haar classifier detection and training. Thus with help of this algorithm system will detect the person's face in the video. Face of the person gets Green Square as an indication of detection process. As soon as the face gets detected user can paused the video and enters the data of detected person such as person's name, address, profession, criminal record if any. If the detected person has criminal record then it can be defined as suspect.

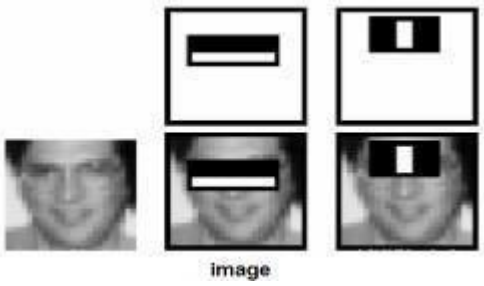


**Fig 4.1**. Haar Features

Check box option is given in the system where user can tick whether the person is suspect on not. This is the working of first module in which sample video is browsed and face is detected.

### 4.1 Non Functional Requirements

### 4.1 Performance Requirements

1. System can produce results faster on 2GB/4GB of RAM.
2. It take LESS time for peak loads at main node.
3. The system will be available 100% of the time. Once there is a fatal error, the system will provide understandable feedback to the user.

### 4.2 Safety and Security Requirements

1. The system is designed in modules where errors can be detected and fixed easily.

### 4.3 Software Quality Attributes

1. **Reliability:** The Client machine will change the status of data indicating successful data transmission.
2. **Usability:** The application should be easy to use through interactive interface.
3. **Maintainability:** The system will be developed using the standard software development conventions to help in easy review and redesigning of the system.
4. **Support ability:** The system will be able to support to transfer different types of SQL queries.

5. **Portability:** This software is portable to any system with the requirements specified. There must also be a server where the database can be set-up.

## 4.4 SYSTEM REQUIREMENT

### 4.4.1 Software Requirements Platform :

1. Operating System : Windows OS
2. Platform: Android Studio
3. Programming Language : PHYTON

## 4.5 Hardware Requirements

1. Processor: INTEL Pentium 4 Processor Core
2. Hard Disk: 40 GB (min)
3. RAM: 256 MB or higher

## 4.6 BASIC FLOWCHART DIAGRAM

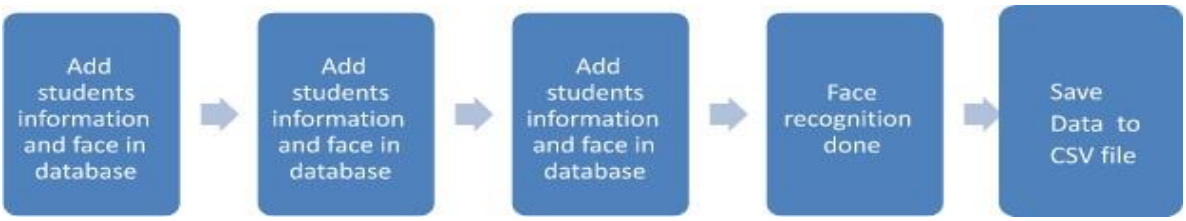


**fig 4.1** .Flow chart

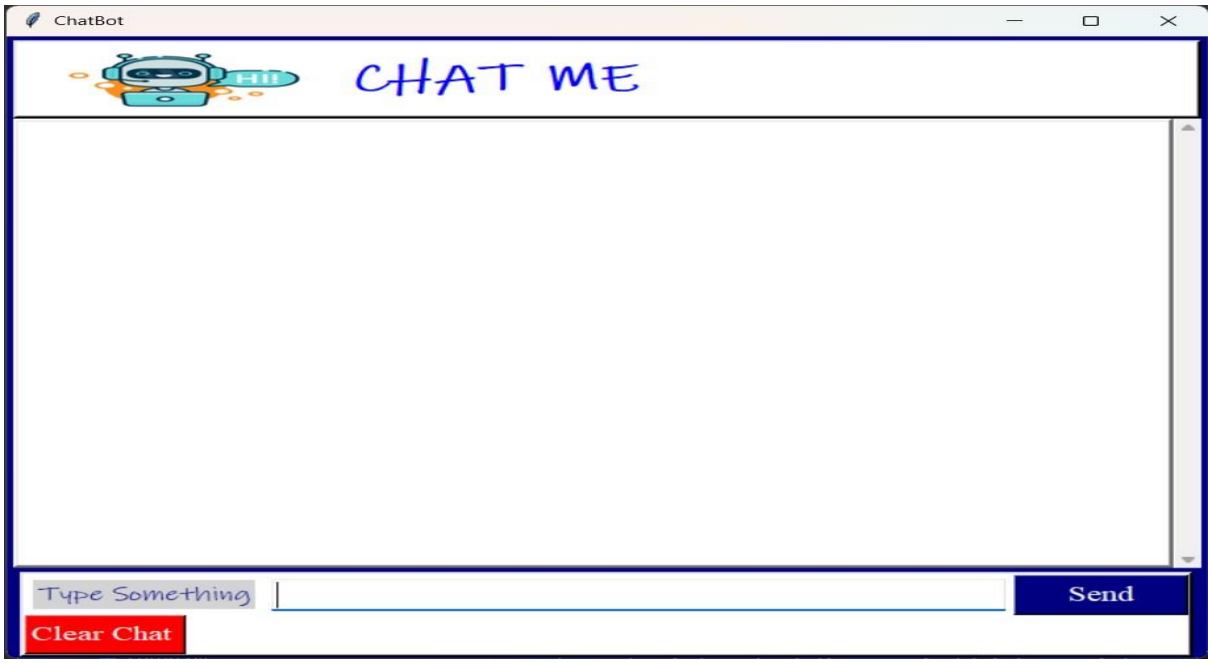


**Fig4.2** Dialogue box

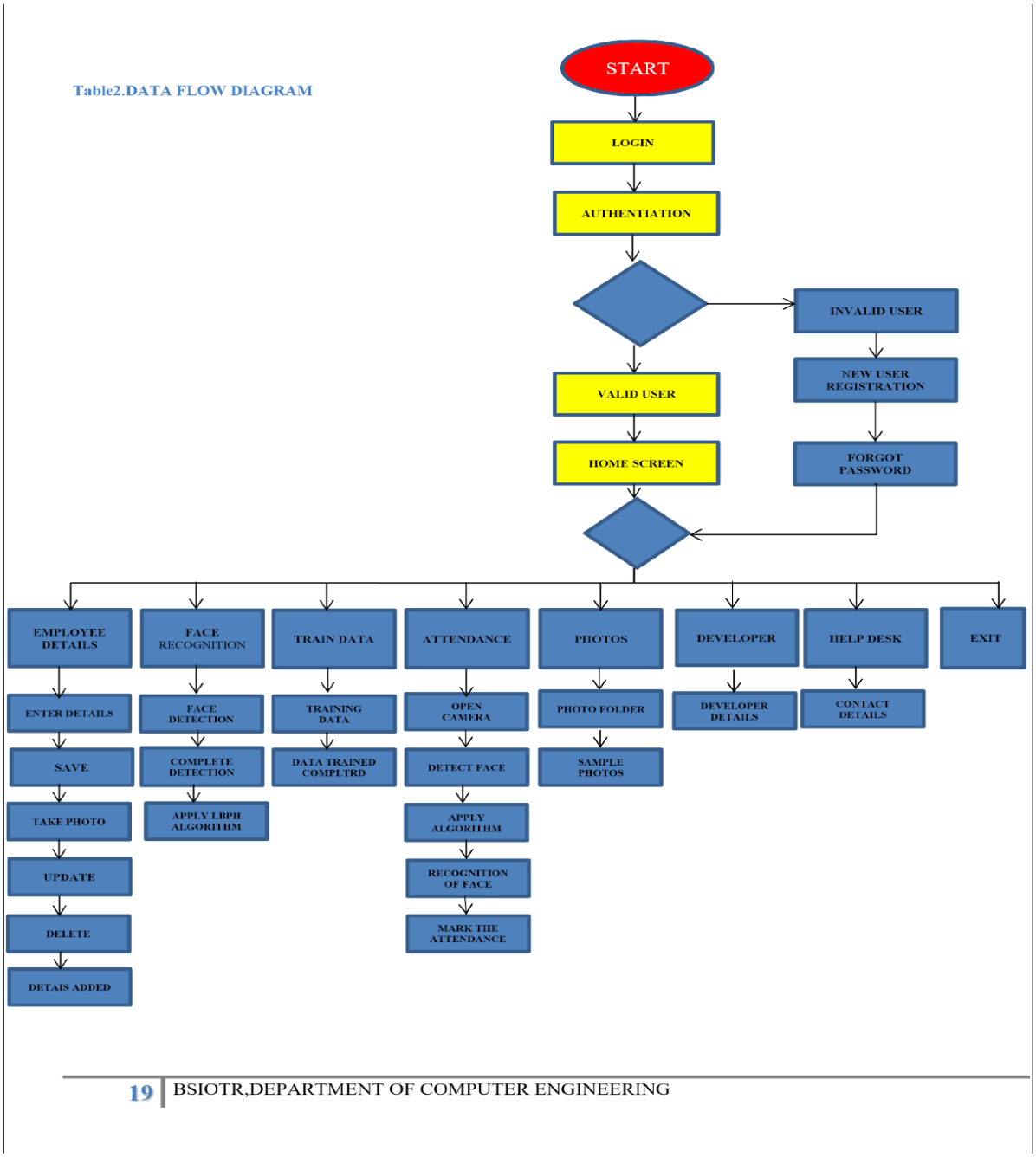


Fig 4.3 Data flow chart

# CHAPTER 5

## 5. System implementation

## 5.1 Introduction to LBPH algorithm

**5.1.1 Local Binary Pattern (LBP)** is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number.

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbours.

## 5.2 Applying the LBP operation:

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters **radius** and **neighbours**.

The image below shows this procedure:

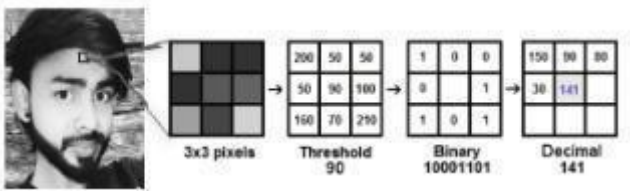


**Fig 5.1** Applying the LBP operation

### 5.2.1 Performing the face recognition:

1. In this step, the algorithm is already trained. Each histogram created is used
   to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image.
2. 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.
3. 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:

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

4. So 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. **Note**: don't be fooled about the 'confidence' name, as lower confidences are better because it means the distance between the two histograms is closer.

5. 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.

### 5.3 Training the algorithm:

First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output.

Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

### 5.4 Applying LBH Operations

The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbours.

### 5.5 Important points

1. Suppose we have a facial image in grayscale.
2. We can get part of this image as a window of 3x3 pixels.
3. It can also be represented as a 3x3 matrix containing the intensity of each pixel (0~255).
4. Then, we need to take the central value of the matrix to be used as the threshold.
5. This value will be used to define the new values from the 8 neighbours.

6. For each neighbour 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.

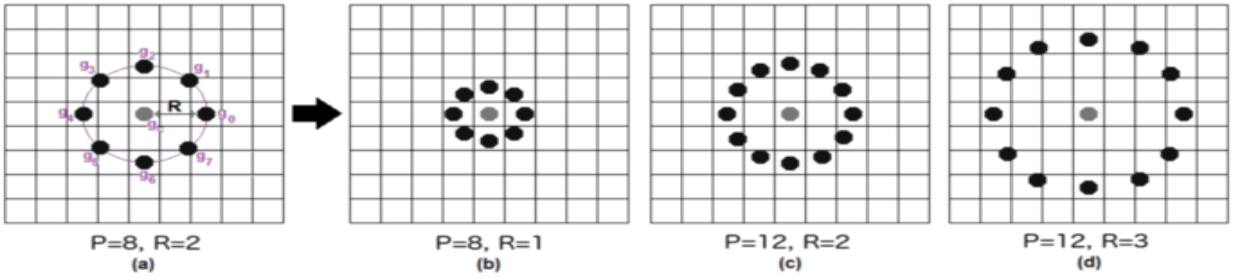


**Fig 5.2** Radius of central pixel

## 5.6 EXTRACTING THE HISTOGRAM

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, as can be seen in the following image based on the image above, we can extract the histogram of each region as follows:

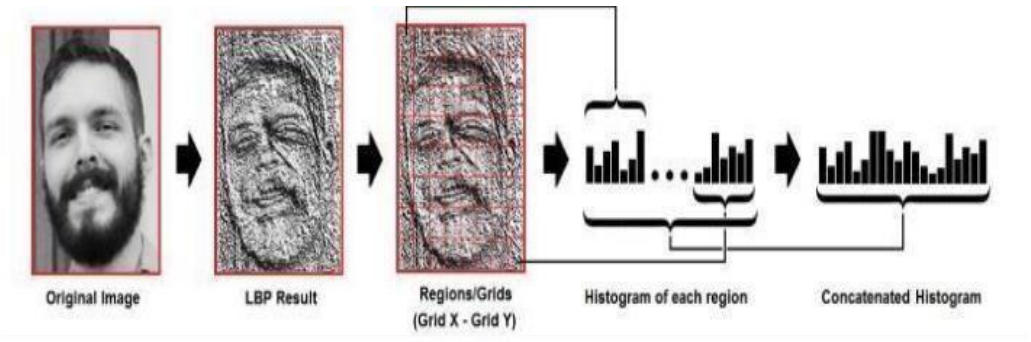


**Fig 5.6** Extracting

1. As we have an image in grayscale, each histogram (from each grid) will contain only 256 positions(0~255) representing the occurrences of each pixel intensity.

2. Then, we need to concatenate each histogram to create a new and bigger histogram. Supposing we have 8x8 grids, we will have 8x8x256=16.384 positions in the final histogram. The final histogram represents the characteristics of the image original image.

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In this step, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image.

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:

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

So 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.

1. 'confidence' name, as lower confidences are better because it means the distance between the two histograms is closer.
2. 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

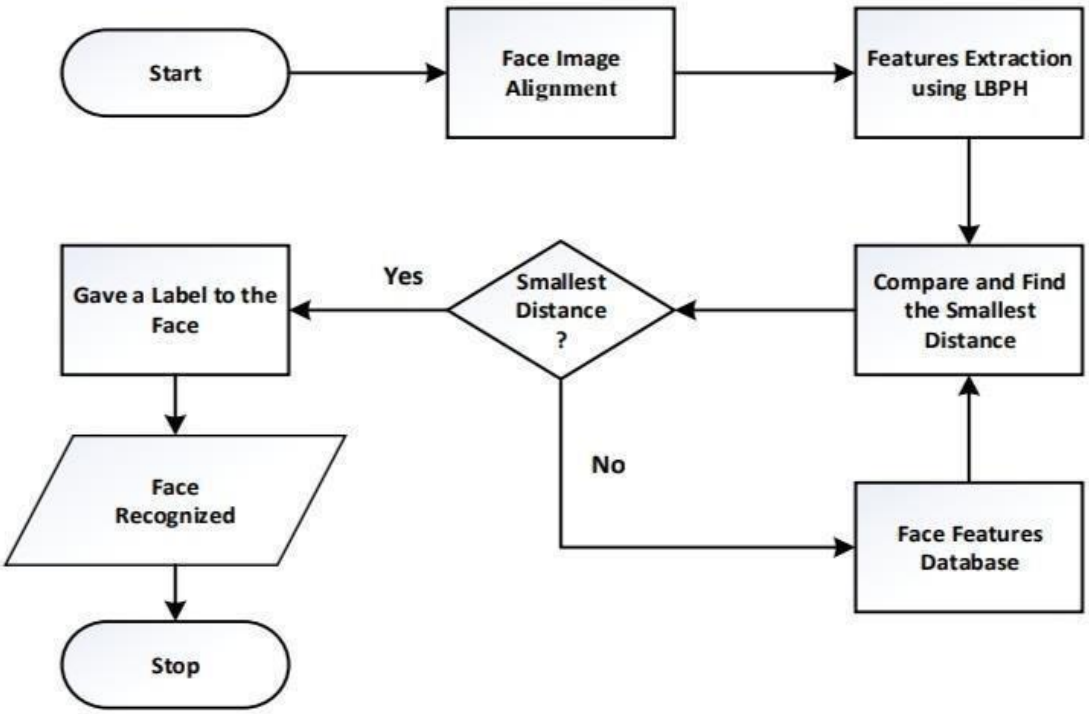


**Fig 5.3** Face argument and Feature Extraction

**CHAPTER 6**

# 6. Other specifications

## 6.1 Advantages:

1. It is trouble-free to use.
2. It is a relatively fast approach to enter attendance.
3. Is highly reliable, approximate result from user .
4. Best user Interface .
5. Can obtain accuracy up to 85 percent.

## 6.2 Limitations:

1. While training there generates nearly 100 of copies of sample image.
2. While dealing with high volume of data system required the powerful processor which is more costly

## 6.3 Applications:

It is very useful for educational institutes to get attendance easily. We can get attendance of students as well as teachers without doing conventional attendance

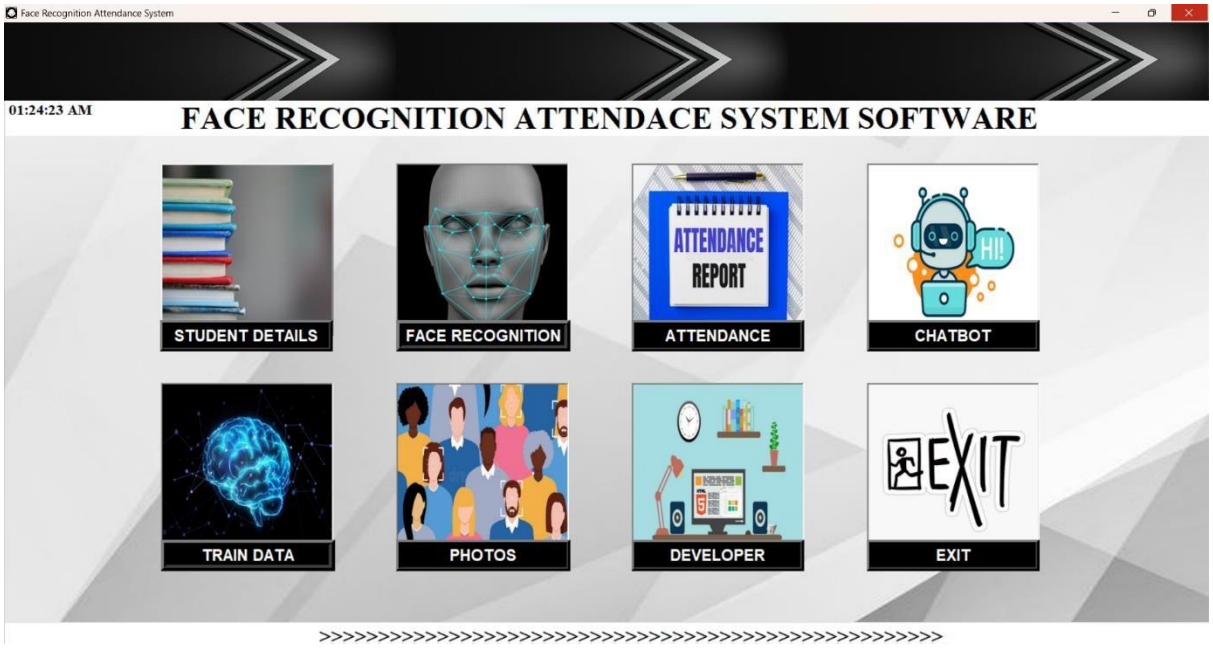


**Fig 6.1** conformation of student

# CHAPTER 7

## 7. Conclusion and Future Scope

### 7.1 CONCLUSION

The Attendance Management System is developed using Machine Learning meets the objectives of the system which it has been developed. The system has reached a steady state where all bugs have been eliminated. The system is operated at a high level of efficiency. The system solves the problem. It was intended to solve as requirement specification.

The system can recognize and identify the face well with an accuracy of 85 %, at a face distance 40 cm from the camera with adequate lighting.

### 7.2 FUTURE SCOPE

We have planned to create the application for multiple college campuses and for the multiple schools.

## CHAPTER 8

# 8. References

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