Automatic Attendance System Using Face Recognition

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Approval

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Declaration

I, **Sajib Deb Nath**, hereby declare that the thesis report entitled **"Automatic Attendance System Using Face Recognition"** is my original work towards accomplishment of the program of Bachelor of Science and Engineering and that to the best of my knowledge, it has been entirely written by me. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma in any other college or university to the best of my knowledge.

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Abstract

“Automatic Classroom Attendance Using Face Recognition” in this system there are mainly two parts. Face detection and face recognition. In this system I use haarCascsde classifier for face detection which is the part of viola-jones algorithm. For face recognition I use LBPH (Local Binary Pattern Histogram) classifier. And the main part of this system is OpenCV. In this venture face discovery and face acknowledgment is utilized. Face discovery is utilized to find the situation of face area and face acknowledgment is utilized for denoting the understudy's participation. The information base of the apparent multitude of understudies in the class is put away and when the essence of the individual understudy matches with one of the countenances put away in the information base then the participation is recorded.

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Chapter 1: INTRODUCTION

Participation is prime significant for both the instructor and understudy of an instructive association. So, it is essential to keep record of the participation. The issue emerges when we consider the conventional cycle of gauging participation in study hall. Calling name or move number of the understudy for participation isn't just an issue of time utilization yet in addition it needs energy. So, a programmed participation framework can tackle every above issue.

This undertaking presents an automatic participation stamping framework, without any sort of impedance with the ordinary educating methodology. The framework can be likewise executed during test meetings or in other training There are some programmed attendances making framework which are presently utilized by much establishment. One of such frameworks is biometric strategy and RFID framework. In spite of the fact that it is programmed and a stride in front of customary strategy it neglects to meet the time limitation. The understudy needs to hang tight in line for giving participation, which is time taking.

This framework kills traditional understudy ID, for example, calling name of the understudy, or checking separate recognizable proof cards of the understudy, which can meddle with the continuous showing measure, yet in addition can be distressing for understudies during assessment meetings. What's more, the understudies need to enroll in the information base to be perceived. The enlistment should be possible on the spot through the easy-to-understand interface.

1.1 Background

Attendance is an important measure in the aspect of both teacher and student for any institute or to an employer and an employee, and also, they have to keep thee record of the same.

There are lot of issues in taking the attendance manually such as proxies and a lot of energy required to call out the name and roll numbers. So, there is a needof the Automatic attendance which can solve all these problems.

Talking about the Automatic System it started from a system such as Biometric attendance i.e., attendance using the finger prints or the technique is RFID system. The only disadvantage of this system is that it takes a lot of timethat one has to stand in the long waiting queue and also a source of the communicable diseases.

This system gives an idea of automatic attendance system platform that can also be used for purposes other than the attendance such as in exam sessionsor other teaching programs. This can also remove the hassle and time-consuming activities such as checking of ID cards etc. This can also help in taking the database of the students as well as staff up to date. This is will also help in registrations as it is done on the spot using facial Recognition

Face Recognition is difficult in daily life to identify people. Human intelligence systems allow us to get information and understand that in the recognition process. We receive information through the eyes of the human, especially retina is the main source of the information. Light act as an electromagnetic wave which helps us to recognize different objects.

After the processing is done by the human system, we classify shapes, sizes and the texture of the object to obtain the information. Once the information isstudied the results will be compared and the face memories that exists in the database. It is difficult to create such advance system which can identify faces as clear as done by the humans. As we need large storage to store the recognized and assigned faces as there are number of students in schools, colleges, universities etc.

Every human face has a unique identity. Thus, in this method the real timeface of the person is compared with the present in the database.

Nowadays, Face Recognition system is very useful due to its simple and high performance. This system is used in airports and also FBI use this system for investigations of the criminals. Facebook also implements Face Recognition toallow the users to tag other people in the photo for entertainment purposes. Furthermore, Intel Company allows the users to access their account using Face Recognition. Many mobile companies add this feature in their mobile phones as an unlock feature.

1.2 Problem Statement

Conventional understudy participation checking procedure is frequently confronting a difficult situation. The face acknowledgment understudy participation framework accentuates its effortlessness by killing old style understudy participation stamping strategy, for example, calling understudy names or checking individual distinguishing proof cards. There are upsetting the showing cycle as well as motivations interruption for understudies during test meetings. Aside from calling names, participation sheet is passed around the homeroom during the talk meetings. The talk class particularly the class with an enormous number of understudies may think that its hard to have the participation sheet being passed around the class. Along these lines, face acknowledgment participation framework is proposed so as to supplant the manual marking of the presence of understudies which are difficult and causes understudies get occupied so as to finish paperwork for their participation. Moreover, the face acknowledgment based computerized understudy participation framework ready to defeat the issue of false methodology and instructors doesn't need to tally the quantity of understudies a few times to guarantee the presence of the understudies.

One of the troubles of facial ID is the ID among known and obscure pictures [1]. Also, the preparation cycle for face acknowledgment understudy participation framework is moderate and tedious [2]. Furthermore, distinctive lighting and head presents are regularly the issues that could debase the exhibition of face acknowledgment-based understudy participation framework [3].

Thus, there is a need to build up a continuous working understudy participation framework which implies the ID cycle must be done inside characterized time requirements to forestall oversight. The extricated highlights from facial pictures which speak to the personality of the understudies must be steady towards an adjustment in foundation, light, posture and appearance. High precision and quick calculation time will be the assessment purposes of the exhibition.

1.3 Aims & Objectives

The goal of this task is to create face acknowledgment participation framework. Anticipated that accomplishments all together should satisfy the targets are:

- To recognize the face section from the video outline.
- To remove the helpful highlights from the face identified.
- To group the highlights so as to perceive the face identified.
- To record the participation of the distinguished understudy

1.4 Proposal of the System

I am setting up to plan a framework involving two modules. The principal module (face indicator) is a versatile part, which is fundamentally a camera application that catches understudy faces and stores them in a record utilizing PC vision face identification calculations and face extraction procedures. The subsequent module is a work area application that faces acknowledgment of the caught pictures (faces) in the record, denotes the understudies register and afterward stores the outcomes in an information base for future investigation.

Chapter 2: LITERATURE REVIEW

2.1 Introduction

In this section we discussed about digital image processing and how we have used this in detecting and recognizing faces. We also have discussion different methods of face recognition.

2.2 Previous work

Face detection technology

Face detection is a hot research direction in the field of computer vision. With the rapid development of biometric technology, face detection technology has been widely usedin various fields, which has a certain commercial value, and also has a very important academic value. The Haar feature proposed by Viola et al [4]. combined with AdaBoost cascade classifier can detect face quickly. Since then, many researchers have devoted themselves to using more advanced features to improve the accuracy of face detection, such as Local Binary Pattern (LBP) [5], Histogram of Oriented Gradient (HOG) [6], Scale-invariant Feature Transform (SIFT) [7] .

Face recognition technology

Face recognition is a kind of biometric recognition technology which extracts the feature information of face image to classify and recognize. Because of its convenience and friendliness, and with the development of information technology, it has been widely used in security, aerospace, medical and other fields. In ideal environment, face recognition technology has made great progress andapplication. Face recognition has become a research hotspotin the field of computer vision.

Deep machine learning

Machine learning mainly refers to learning the regular information in data by computer, so as to acquire newknowledge and experience, so as to improve the intelligenceof computer,

and then make the computer have the same decision-making ability as human. Deep learning is mainly the extension of neural network algorithm in machine learning. The first stage of machine learning is shallow learning, while deep learning is the second stage of machine learning. The layers of neural network are described by depth. Generally, the single-layer perceptron in machine learning can solve the linear separable problem, but it can not solve the linear separable problem adequately. At this time, the use of deep learning multi-layer perceptron can solve the problem of linear inseparability, aiming at the disadvantages of shallow learning can be effectively remedied. Common types of deep learning include cyclic neural network, convolutional neural network and restricted Boltzmann machine [8].

2.3 Research Summary

All this mentioned worked was done recently. Some of these were very impressive. Research work on Computer Vision increasing day by day. Some good result are coming, also the resources are increasing too.

Chapter 3: RESEARCH METHODOLOGY

Face detection involves separating image windows into two classes; one containing face turning the background. It is difficult because although commonalities exist between faces, they can vary considerably in terms of age, skin color and facial expression. The problem is further complicated by differing lighting conditions, image qualities and geometries, as well as the possibility of partial occlusion and disguise. An ideal face detector would therefore be able to detect the presence of any face under any set of lighting conditions, upon any background.

3.1 Background

The face detection task can be broken down into two steps:

The first step is a classification task that takes some arbitrary image as input and outputs a binary value of yes or no, indicating whether there are any faces present in the image.

The second step is the face localization task that aims to take an image as input and output the location of any face or faces within that image as some bounding box with (x, y, width, height). After taking the picture the system will compare the equality of the pictures in its database and give the most related result.

After taking picture the algorithmic system will compare the equality of the pictures in its database and give the most linked result. We will use Windows operating system, open CV platform and will do the coding in python language.

3.2 Student Attendance System

Arun Katara et al. (2017) referenced weaknesses of RFID (Radio Frequency Identification) card framework, unique mark framework and iris acknowledgment framework. RFID card framework is executed because of its effortlessness. In any case, the client will in general assistance their companions to check in as long as they have their companion's ID card. The unique mark framework is surely powerful however not effective in light of the fact that it requires some investment for the confirmation cycle so the client needs to arrange and play

out the check individually. Anyway, for face acknowledgment, the human face is constantly uncovered and contain less data contrasted with iris. Iris acknowledgment framework which contains more detail may attack the security of the client. Voice acknowledgment is accessible, yet it is less precise contrasted with different strategies. Thus, face acknowledgment framework is proposed to be executed in the understudy participation framework.

3.3 Digital Image Processing

Digital Image Processing is the processing of images which are digital in nature by a digital computer. Digital image processing techniques are motivated by three major applications mainly:

- Improvement of pictorial information for human perception.
- Image processing for autonomous machine application.
- Efficient storage and transmission.

Table 3.1: Advantages & Disadvantages of Different Biometric System

System Type	Advantage	Disadvantages
RFID card system	Simple	Fraudulent usage
Fingerprint system	Accurate	Time-consuming
Voice recognition system		Less accurate compared to Others
Iris recognition system	Accurate	Privacy Invasion

3.4 Image Representation in a Digital Computer

An image is a 2-Dimensional light intensity function **f (x, y) = r (x, y) × i (x, y) - (2.0)**. Where, **r (x, y)** is the reflectivity of the surface of the corresponding image point. **i (x, y)** Represents the intensity of the incident light. A digital image **f (x, y**) is discretized both in spatial co-ordinates by grids and in brightness by quantization. Effectively, the image can be represented as a matrix whose row, column indices specify a point in the image and the element value identifies gray level value at that point. These elements are referred to as pixels or pels.

Typically following image processing applications, the image size which is used is 256×256, elements, 640×480 pels or 1024×1024 pixels. Quantization of these matrix pixels is done at 8 bits for black and white images and 24 bits for colored images (because of the three-color planes Red, Green and Blue each at 8bits)

3.5 Steps in Digital Image Processing

Advanced picture handling includes the accompanying essential undertakings:

- Image Acquisition - An imaging sensor and the ability to digitize the sign created by the sensor.
- Preprocessing – Enhances the picture quality, separating, contrast improvement and so on
- Segmentation – Partitions an information picture into constituent pieces of items.
- Description/include Selection – separates the portrayal of picture objects reasonable for additional PC preparing.
- Recognition and Interpretation – Assigning a mark to the item dependent on the data gave by its descriptor.
- Interpretation relegates significance to a bunch of marked items.
- Knowledge Base – This aide for proficient preparing just as bury module collaboration.

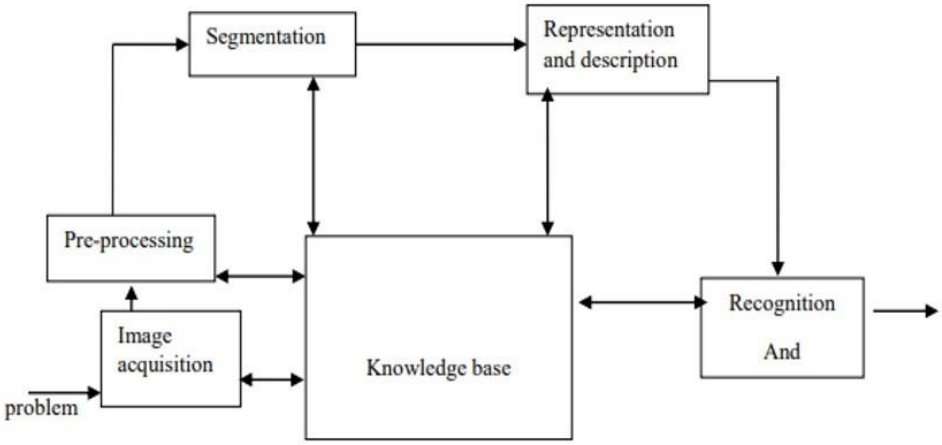

Figure 3.1: A diagram showing the steps in digital image processing

3.6 Definition of Terms & History

3.6.1 Face Detection:

Face identification is the way toward distinguishing and finding all the current appearances in a solitary picture or video paying little heed to their position, scale, direction, age and demeanor. Besides, the discovery ought to be regardless of incidental enlightenment conditions and the picture and video content.

A face Detector needs to tell whether a picture of self-assertive size contains a human face and assuming this is, where it is. Face identification can be performed dependent on a few signs: skin tone (for faces in shading pictures and recordings, movement (for faces in recordings), facial/head shape, facial appearance or a mix of these boundaries. Most face identification calculations are appearance based without utilizing other cues.

An input picture is checked at all potential areas and scales by a sub window. Face location is acted like grouping the example in the sub window either as a face or a non-face. The face/nonface classifier is found out from face and non-face preparing models utilizing factual learning methods. Most present-day calculations depend on the Viola Jones object recognition structure, which depends on Haar Cascades.

3.6.2 Face Recognition:

Face Recognition is a visual example acknowledgment issue, where the face, spoken to as a three-dimensional item that is liable to differing brightening, present and different components, should be distinguished dependent on procured pictures.

Face Recognition is thusly just the undertaking of recognizing a previously identified face as a known or obscure face and in further developed cases telling precisely whose face it is.

3.6.3 Contrast between Face Detection and Face Recognition:

Face recognition addresses the inquiry, where is the face? It distinguishes an article as a "face" and finds it in the info picture. Face Recognition then again responds to the inquiry who is this? Or on the other hand whose face right? It chooses if the identified face is somebody known or obscure dependent on the information base of faces it uses to approve this info image. It can thusly be seen that face discoveries yield (the distinguished face) is the contribution to the face recognizer and the face Recognition's yield is an ultimate conclusion for example face known or face obscure.

3.6.4 Method of Face Detection

The main aim of face detector is to check whether the image capture has any of human face if the human face is presented in the image then the face detection process checks various conditions to classify the image and extract various features such as skin of the face. Shape of the head and combine this result for future use. Many face detecting algorithms works without use of the parameters. Major algorithms involve Viola Jones object detection Face Recognition framework, which is based on Haar Cascades.

3.6.5 Flow chart

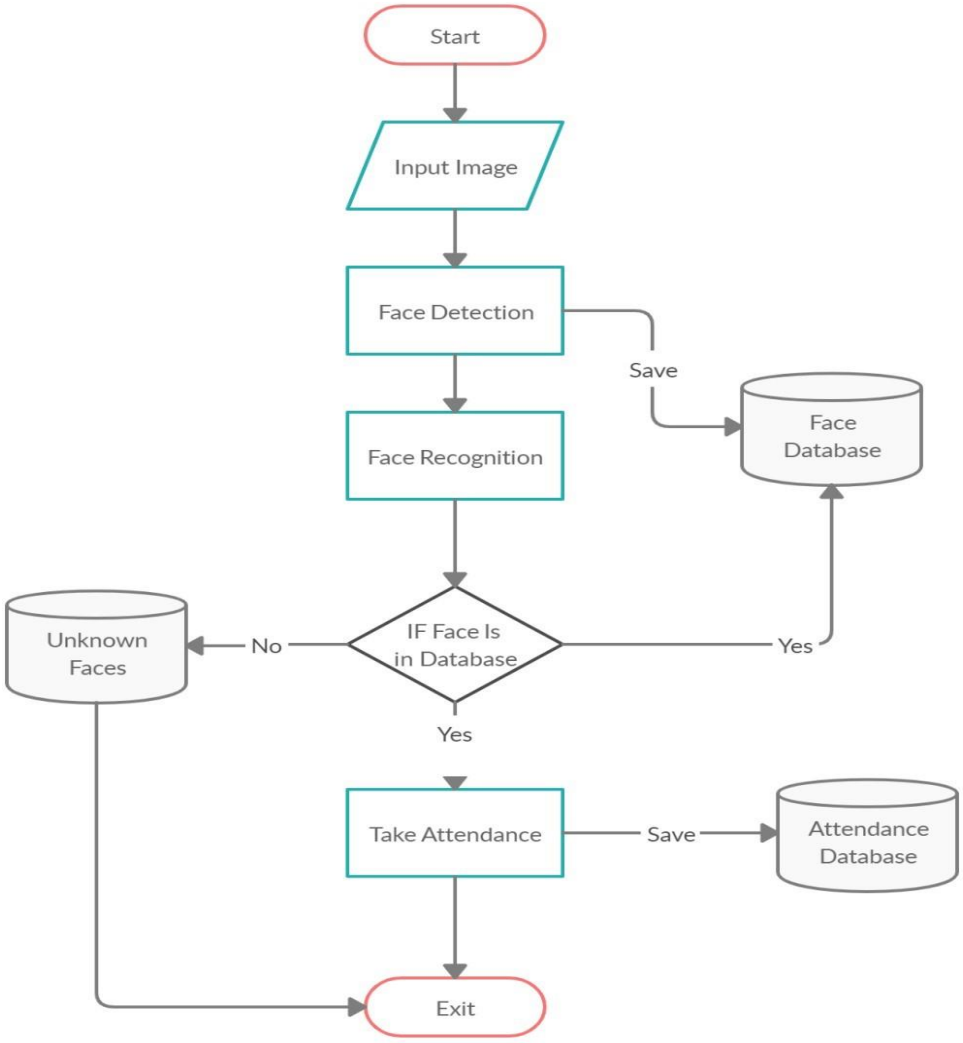

Figure 3.2: System Architecture

This Flow chart gives us proper information that how attendance is marked using face recognition.

Table 3.2: Advantages & Disadvantages of Face Detection Methods

Face Detection Method	Advantages	Disadvantages
Viola Jones Algorithm	High detection Speed. High Accuracy.	1. Long Training Time. 2.Limited Head Pose. 3.Not able to detect dark faces.
Local Binary Pattern Histogram	1.Simple computation. 2.High tolerance against the monotonic illumination changes.	1.Only used for binary and grey images. 2.Overall performance is inaccurate compared to Viola-Jones Algorithm.
Ada Boost Algorithm	Need not to have any prior knowledge about face structure.	The result highly depends on the training data and affected by weak classifiers.
SMQT Features and SNOW Classifier Method	Capable to deal with lighting problem in object detection. Efficient in computation.	The region contain very similar to grey value regions will be misidentified as face.
Neural-Network	High accuracy only if large size of image were trained.	Detection process is slow and computation is complex. Overall performance is weaker than Viola-Jones algorithm.

Viola-Jones algorithm which was introduced by P. Viola, M. J. Jones (2001) is the most popular algorithm to localize the face segment from static images or video frame. Basically, the concept of Viola-Jones algorithm consists of four parts. The first part is known as Haar feature, second part is where integral image is created, followed by implementation of Adaboost on the third part and lastly cascading process.

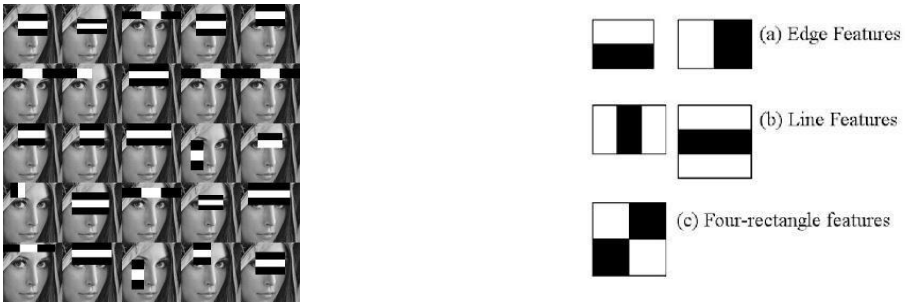

Figure 3.3: Haar Feature

Viola-Jones algorithm analyses a given image using Haar features consisting of multiple rectangles [9].

In the fig shows several types of Haar features. The features perform as window function mapping onto the image. A single value result, which representing each feature can be computed by subtracting the sum of the white rectangle(s) from the sum of the black rectangle(s) [9].

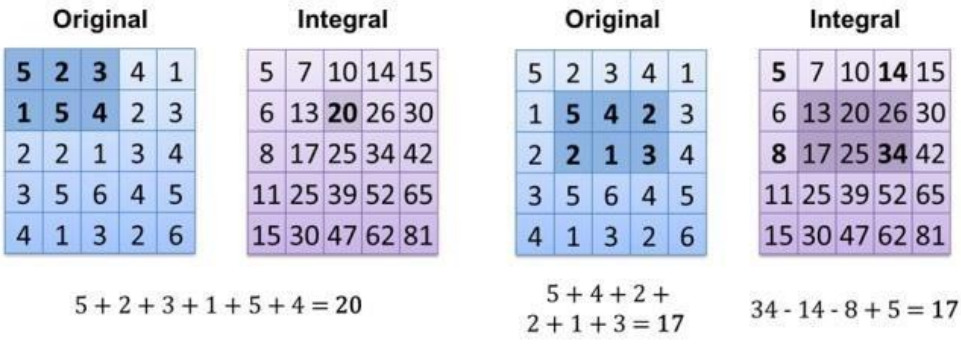

Figure 3.4: Integral of Image

The value of integrating image in a specific location is the sum of pixels on the left and the top of the respective location. In order to illustrate clearly, the value of the integral image at location 1 is the sum of the pixels in rectangle A. The values of integral image at the rest of the locations are cumulative.

For instance, the value at location 2 is summation of A and B, (A + B), at location 3 is summation of A and C, (A + C), and at location 4 is summation of all the regions, (A + B + C + D) . Therefore, the sum within the D region can be computed with only addition and subtraction of diagonal at location 4 + 1 − (2 + 3) to eliminate rectangles A, B and C.

For proper classification of image and to increase the accuracy of the result all the features are applied while training of the image. While recognizing the features that has least error is considered that helps us to get maximum accuracy and it also helps us to give the best classification of images containing face or not.

Finally, the results calculated by taking the sum of all the groups. Each group taking along is termed as a weak classifier while all these are grouped togetherthen this result in strong classifiers. The accuracy of the result is up to 97%. Number of features on which image was trained is approx.6000.

As to calculate results using all the features, these features are combined in number of groups and then the stages of classification started by using one group at a time. If there is an error occurred in earlier stage then the classification stops right there and do not move further.

All the 6000 features are combined to form approx... 40 groups that is result is classified in 40 stages, first five groups contain one, ten, twenty-five, twenty-five and fifty features. According to research approx. 10features are calculatedper sub window.

3.6.6 Local Binary Patterns Histogram:

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

It was first described in 1994 (LBP) and has since been found to be a powerful feature for texture classification. It has further been determined that when LBP is combined with histograms of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets. Using the LBP combined with histograms we can represent the face images with a simple data vector.

LBPH algorithm work step by step:

LBPH algorithm work in 5 steps.

- Parameters: the LBPH uses 4 parameters:
- Radius: the radius is used to build the circular local binary pattern and represents the radius around the central pixel. It is usually set to 1.
- Neighbors: the number of sample points to build the circular local binary pattern. Keep in mind: the more sample points you include, the higher the computational cost. It is usually set to 8.
- Grid X: the number of cells in the horizontal direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.
- Grid Y: the number of cells in the vertical direction. The more cells, the finer the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.

3.6.7 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.

3.6.8 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 parameter's radius and neighbors.

The image below shows this procedure:

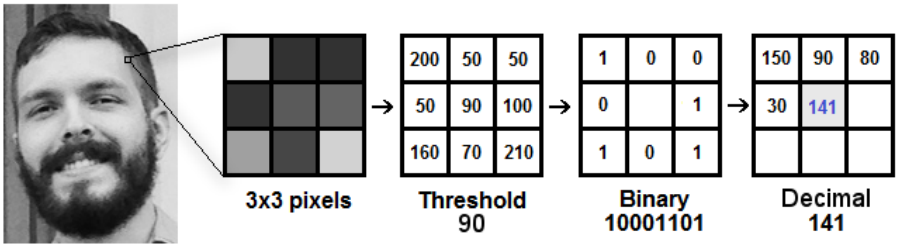

Figure 3.5: LBP Operation

Based on the image above, let's break it into several small steps so we can understand it easily:

- Suppose we have a facial image in grayscale.
- We can get part of this image as a window of 3x3 pixels.
- It can also be represented as a 3x3 matrix containing the intensity of each pixel (0~255).
- Then, we need to take the central value of the matrix to be used as the threshold.
- This value will be used to define the new values from the 8 neighbors.
- 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.
- Now, the matrix will contain only binary values (ignoring the central value). We need to concatenate each binary value from each position from the matrix line by line into a new binary value (e.g., 10001101). Note: some authors use other approaches to concatenate the binary values (e.g., clockwise direction), but the final result will be the same.

- 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.

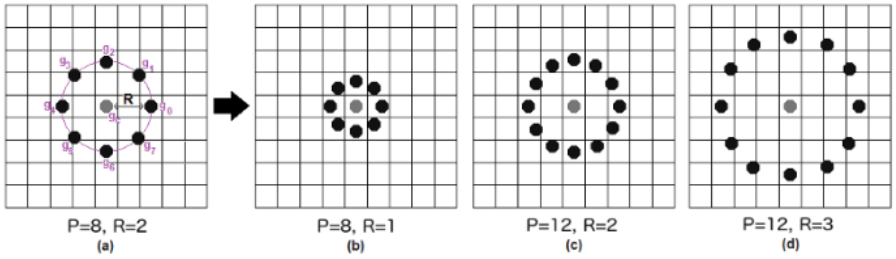

Figure 3.6: The LBP operation Radius Change

It can be done by using bilinear interpolation. If some data point is between the pixels, it uses the values from the 4 nearest pixels (2x2) to estimate the value of the new data point.

3.6.9 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,

as can be seen in the following image:

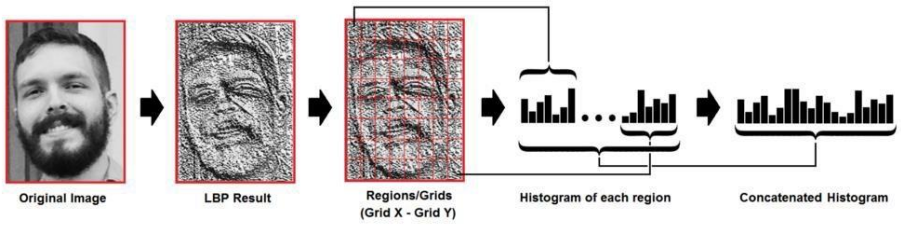

Figure 3.7: Extracting the Histogram

Based on the image above, we can extract the histogram of each region as follows:

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.

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.

3.6.10 Performing the face recognition:

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. 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.

3.7 Model Implementation

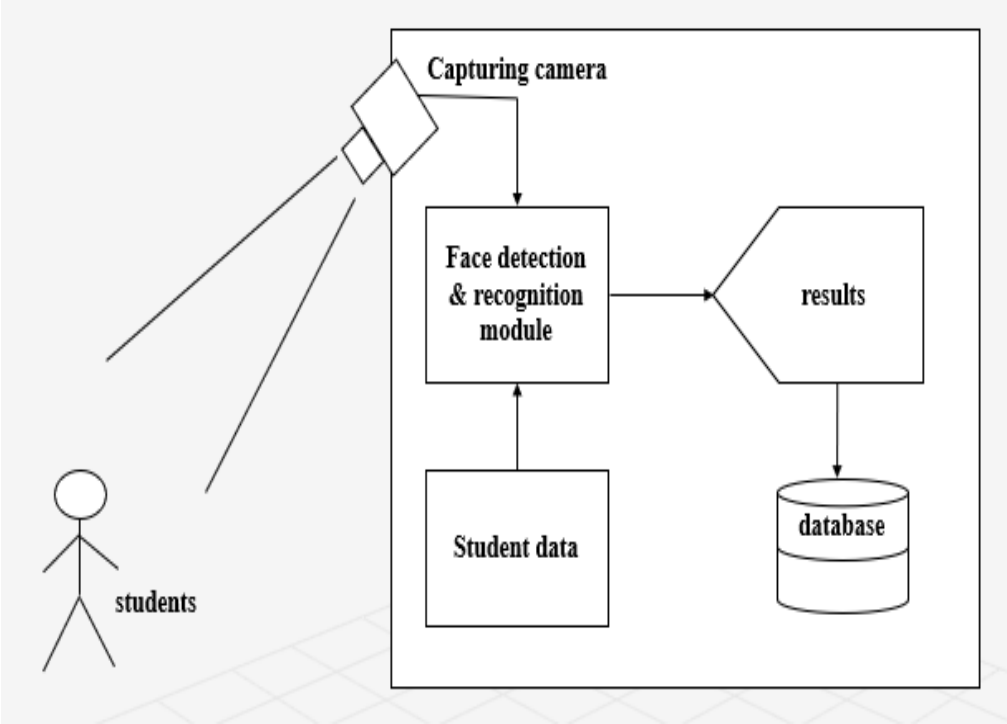

Figure 3.8: Model Implement

The main components used in the implementation approach are open-source computer vision library (OpenCV). One of OpenCV's goals is to provide a simple-to-use computer vision infrastructure that helps people build fairly sophisticated vision applications quickly. OpenCV library contains over 500 functions that span many areas in vision. The primary technology behind Face recognition is OpenCV. The user stands in front of the camera keeping a minimum distance of 50cm and his image is taken as an input. The frontal face is extracted from the image then converted to gray scale and stored. The Local Binary Pattern (LBP) algorithm is performed on the images and the eigen values are stored in an xml file. When a user requests for recognition the frontal face is extracted from the captured video frame through the camera. The eigen value is re-calculated for the test face and it is matched with the stored data for the closest neighbor.

3.8 Design Requirements

I used some tools to build the HFR system. Without the help of these tools it would not be possible to make it done. Here I will discuss about the most important one.

3.8.1 Required Tools

OpenCV

We used OpenCV 3 dependency for python 3. OpenCV is library where there are lots of image processing functions are available [10]. This is very useful library for image processing. Even one can get expected outcome without writing a single code. The library is cross-platform and free for use under the open-source BSD license. Example of some supported functions are given below:

- Derivation: Gradient / Laplacian computing, contours delimitation
- Hough transforms: lines, segments, circles, and geometrical shapes detection
- Histograms: computing, equalization, and object localization with back projection algorithm
- Segmentation: thresholding, distance transform, foreground / background detection, watershed segmentation.
- Filtering: linear and nonlinear filters, morphological operations.
- Cascade detectors: detection of face, eye, car plates.
- Interest points: detection and matching.
- Video processing: optical flow, background subtraction, camshaft (object tracking).
- Photography: panoramas realization, high-definition imaging (HDR), image inpainting.

Pandas

Pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series [11].

NumPy

NumPy is a library for the Python programming language, adding support for large, multidimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays [12].

OS

The OS module in python provides functions for interacting with the operating system. This module provides a portable way of using operating system dependent functionality

Python IDE

There are lots of IDEs for python. Some of them are PyCharm, Thonny, Ninja, and Spyder etc. Ninja and Spyder both are very excellent and Face free but we used Spyder as it features-rich than ninja. Spyder is a little bitheavier than ninja but still much lighter than PyCharm. We used python idle and installed necessary libraries.

Microsoft Excel

This is a kind of spreadsheet that is developed by the Microsoft for all kinds of operating systems. The main features of MS Excel is that it contains various mathematical functions that can help us in calculations and there are lot of tools that can be used to plot graphs in different forms that helps us to analyze data and many other tools such as pivot tables, programming language named Visual basics for various applications.

3.9 Experimental Process

The step of the experiments process is given below:

Face Detection: Start capturing images through web camera of the client side:

- Pre-process the captured image and extract face image
- Calculate the eigen value of the captured face image and compared with eigen values of existing faces in the database.

- If eigen value does not matched with existing ones save the new face image information to the face database (xml file).
- If eigen value matched with existing one then recognition step will be done.

Face Recognition: Using LBPH algorithm the following steps would be followed in for face recognition:

- Find the face information of matched face image in from the database.
- Update the log table with corresponding face image and system time that makes completion of attendance for an individual student.
- This section presents the results of the experiment conducted to capture the face into a grey scale image of 50x50 pixels.

Table 3.3: Test data with results

Test data	Expected Result	Observed	Pass/ fail
OpenCAM_CB ()	Connects with the installed camera and starts playing.	Result Camera started.	Pass
LoadHaar Classifier ()	Loads the HaarClassifier Cascade files for frontal face	Gets ready for Extraction.	Pass
ExtractFace ()	Initiates the Paul-Viola Face extracting Frame work.	Face extracted	Pass
Learn ()	Start the LBPH Algorithm	Updates the facedata. xml	Pass
Recognize ()	It compares the input face with the saved faces.	Nearest face	Pass

3.10 Hardware Implementation

- Operating System (Recommended 64-bit, Windows or Linux)
- RAM- 4GB (minimum)
- SSD card- 128GB
- Webcam

Chapter 4: RESULT & DISCUSSION

This chapter includes the different codes for various features and functioning of the project along with the output's figures captured in running environment

4.1 Dataset

I performed a set of experiments to demonstrate the efficiency of the proposed method. 200 different images of 35 persons are used in training set. Figure 3 shows a sample binary image detected by the ExtractFace() function using Paul-Viola Face extracting Frame work detection method.

Here is my data set sample.

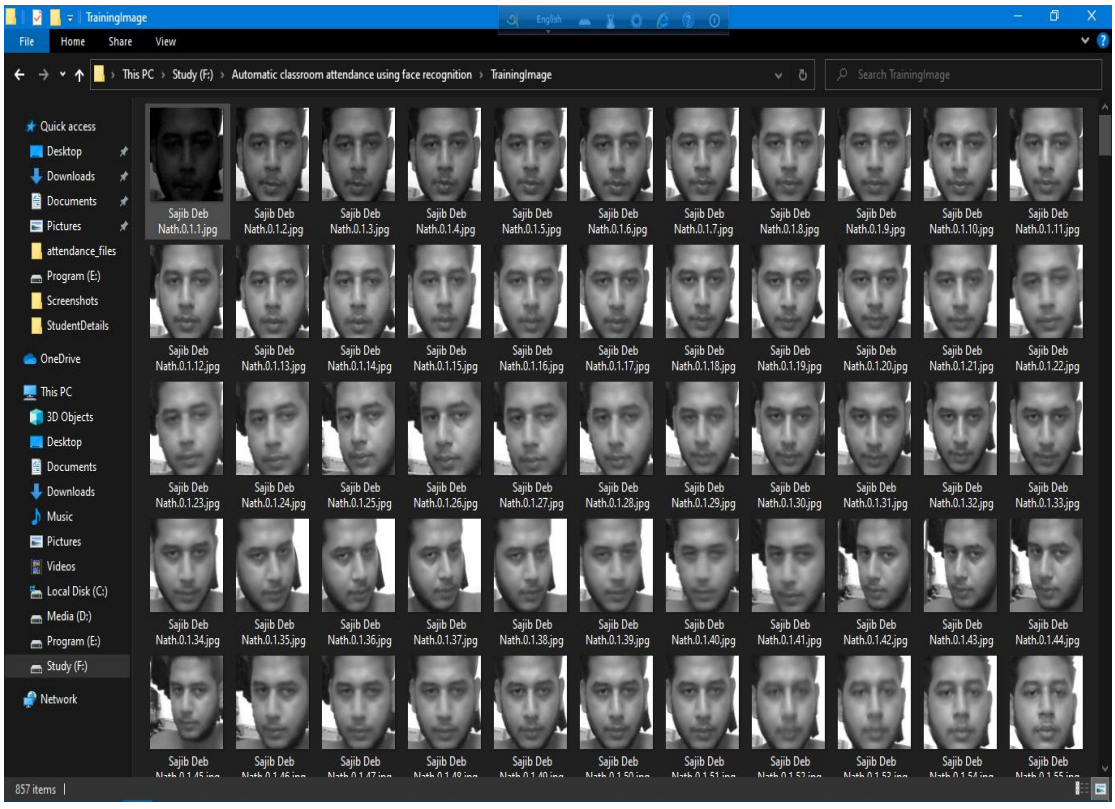

Figure 4.1: Dataset sample

4.2 Main Framework

This file is used to create the basic framework of system. A user menu is created in this file, so that user can call all the other functions from a single file. User can select up to six options which are: enter id, enter name, take image, save profile, take attendance and quit. Each option calls another function which is implementing in different python file. Menu is implemented by using a simple while loop, so that the functionalities can be used again and again.

Here is the main framework:

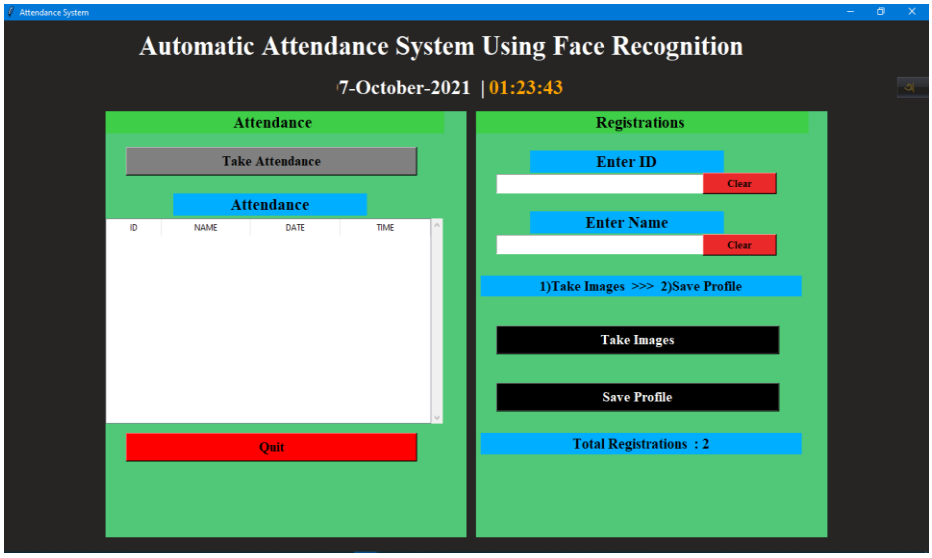

Figure 4.2: Main Framework

4.3 Face Detection

This file is used to capture the images so that model can make predictions on the images. First of all the program asks for the name and roll number of the user whose images are to be clicked. Then roll number is checked whether is only contains integers. Then an object of OpenCV is used to read images. Haar Cascade filter is loaded which is used to detect the frontal face of the user. This filter only works in grey scale so the images are captured in

grey scale format. These images are saved in a jpg format. Also names and roll number of user is saved in a csv file so that it can be retrieved after.

Here is the face detection using Haar Cascade algorithm.

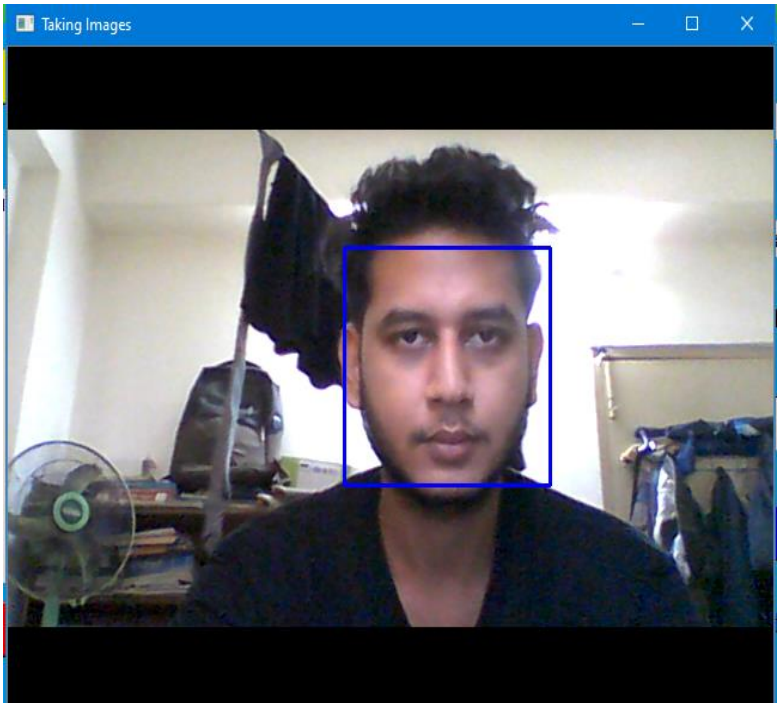

Figure 4.3: Face Detection

4.4 Train Image

This file is used to load the weights of a pre trained inception network and make predictions. First of all the pre trained model is loaded into an object called FRmodel. Then haar cascade and open CV both are used to detect the front face of a user in real time. After the detection of face, the earlier capturedimages of user are passed into the inception network.

Here is the YML file:

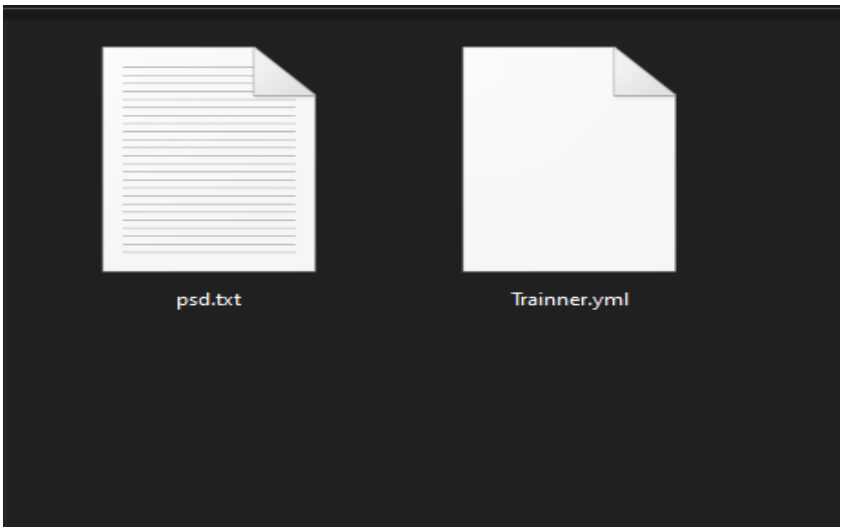

Figure 4.4: YML File

4.5 Face Recognition

After training the detected image the next step is face recognition. In this section when the face matched with training dataset, it automatically stores the attendance in excel file.

Here is the face recognition for student attendance.

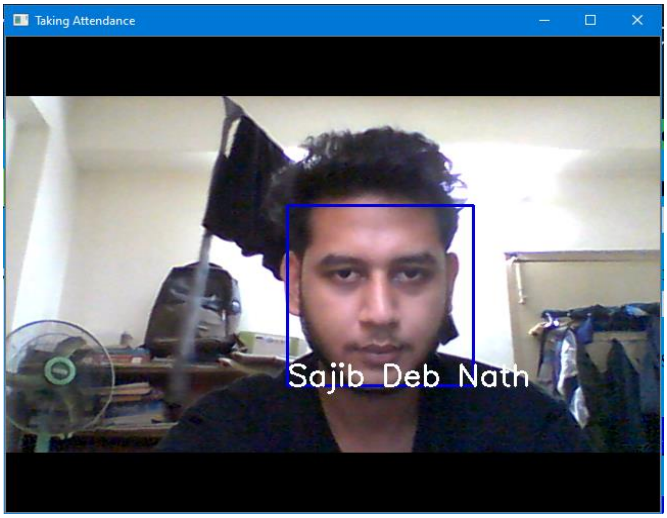

Figure 4.5: Recognize the Faces

4.6 Attendance File

When the recognition faces match with the stored dataset then the attendance stored in excel-sheet.

Here is the attendance file:

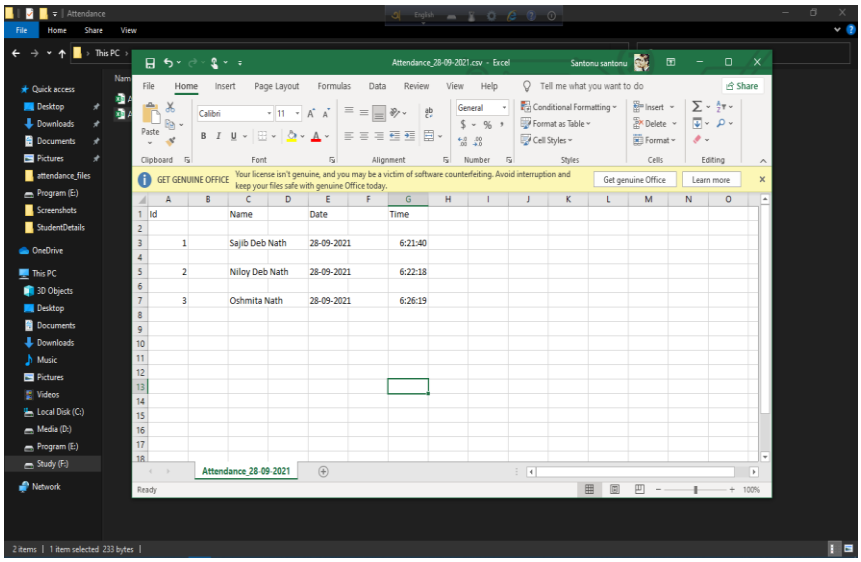

Figure 4.6: Attendance File

Chapter 5: CONCLUSION

Face recognition systems are part of facial image processing applications and their significance as a research area are increasing recently. Implementations of system are crime prevention, video surveillance, person verification, and similar security activities. The goal is reached by face detection and recognition methods. Knowledge-Based face detection methods are used to find, locate and extract faces in acquired images. Implemented methods are skin color and facial features. Neural network is used for face recognition. LBPH is performed to classify to solve pattern recognition problem since face recognition is a kind of pattern recognition. Classification result is accurate. Classification is also flexible and correct when extracted face image is small oriented, closed eye, and small smiled.

5.1 Future Scope of Work

There are so many future scopes on this project. Some of them are

- Can improve security
- Can use Neural Network for high accuracy
- Can used in big factory or employee attendance
- Can build on fully web base system

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