Implementation of Automatic Attendance Management System Using Harcascade and Lbph Algorithms

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***Abstract*:-Industries today are concerned about their time because they think that time equals money. Calling out the names or getting the employee to sign a piece of paper are the two main traditional ways to record attendance. They both take more time and effort. Therefore, a computer-based attendance management system is needed to help them maintain attendance records automatically. Using 'TKINTER' and 'PYTHON', we created an automatic attendance system for this project. Our plan to implement an "Implementation Of Automatic Attendance Management System Using Harcascade And Lbph Algorithms" have been projected. Because the application is entirely software-based and features face recognition, it can be deemed environmentally friendly because it reduces the use of paper and saves time. Due to the face being utilized as a biometric for authentication, this technology also completely eliminates the possibility of fraudulent attendance. This technique can therefore be used in a profession where attendance is crucial. The proposed system was created using the TKINTER platform and is supported by a PYTHON script and a SQL database. The algorithm utilized by the system is based on image comparison using the encoded values of the face from the image from the database with the image recorded by the system in run time. A spreadsheet in excel format is the system's output.**

Keywords*: *face detection, face recognition, feature extraction, harcascade, lbph

I. INTRODUCTION

A person's face is an important and distinctive feature of their head. Since Woody Bledsoe, Helen Chan Wolf, and Charles Bisson first utilized computers to recognize faces in 1964 and 1965,face recognition has come a long way. [1]. Though it was later discovered that they concentrated on facial landmarks, or points on the face like the centres of the eyes and the space between the lips, among other things, it is believed that most of their work went undetected. Aside from that, computerised facial recognition has been the subject of numerous theories and investigations, making it one of the most cutting edge technologies now in use. Most social networking apps, like Facebook, employ face recognition to identify people in uploaded images, making it simpler for app users. Mobile camera apps also employ face recognition to determine age and identify traits that make the face more attractive. Apps like Instagram and Snapchat employ facial recognition and augmented reality to display a variety of entertainment features.

Conversely, most institutions, including schools, universities, and other employee-based organisations, utilise the attendance criterion to decide whether students are allowed to take tests or to determine an employee's pay based on how many days they have worked. In educational institutions, it is frequently observed that students use proxy attendance (attendance that is recorded even when the student is not present), giving them an unfair advantage. [2].

Additionally, when taking attendance, teachers could unintentionally make a mistake. An employee-based business may experience a situation where the employee's attendance is inaccurately recorded in the ledger. To get around this restriction, you can automate the process by utilizing an artificial intelligence system that recognizes the person as they enter the building, logs their attendance, and stores the information for a considerable amount of time in a database. In any case, having this data on hand will be helpful. In this system, face recognition is helpful in a variety of ways, some of which are listed below.

- Reduces the possibility of human error.
- Saves time and resources because administrators don't have to manually record absences in the Register.
- Compared to manual attendance systems, AI-based attendance systems are much more automated. These systems update and save daily records in real time. Facial recognition attendance systems can be set up to take care of daily attendance as well as producing highly accurate timesheets for specific employees on a large scale.

II. BACKGROUND STUDY (LITERATURE)

Smart Attendance Monitoring System: It is a Face Recognition based Attendance System for Classroom Environment [1]. developed an attendance system that eliminates the manual technique of the current system. The mechanism used to take attendance is face recognition. Even the person's position and facial expression are taken into account by the algorithm when taking attendance.

Attendance System Using Face Recognition and Class Monitoring System's author states that facial images of various people and students from attendance recognition would be uploaded to a database in Attendance System Using Face Recognition [2]. This suggests that face recognition-based automatic attendance systems reduce manual labour as well.

Automatic Attendance System Using Face Recognition [3] for Students. The Viola-Jones and PCA facial recognition algorithms are used in this system. A digital camera is used in this system to take two pictures, one at the beginning and the other at the end of the lesson. This system will process both photos, which will play a crucial part in the process of employing face recognition to identify the student. If the student is identified both at the beginning and conclusion of class, their attendance will be recorded.

Class Room Attendance Managenent System Using Facial Recognition System [4], a novel method known as a 3D facial model is created to recognise a student's face inside of a classroom. It will be possible to recognise students in an automated attendance system by using these analytical studies. In order to record their attendance and assess their performance, it recognises faces from images or video streams.

RFID-based attendance systems [5] requires the placement of RFID tags and ID cards on the card readers in order to record attendance. RS232 is employed to link the system to the computer and save the database's recorded attendance data. This system will cause a surge in the issue of fraudulent access. A person will enter the corporation with authorization from an ID card, just like any hacker.

An iris recognition wireless attendance management system's design and installation [6] The iris can be employed as a biometric feature in this system to recognise irises. A wireless technology called Iris Recognition was designed and put into practise. The Daugman algorithm serves as the foundation of the iris recognition system. This iris recognition system uses the following steps to capture an iris recognition image: extracting the image, saving the image's features, and comparing those characteristics to the image that is stored in the database. The iris recognition topography, however, is poor.

III. METHODOLOGY

The strategy outlined here is to develop an automatic attendance system that logs attendance and recognizes people based on their faces. This method can be applied in both businesses and educational institutions where staff members are required to keep track of their attendance. Administrators and participants in the institution's attendance may both receive the system's advantages. Additionally, by minimising human error that could occur when documenting attendance, such as proxy attendance in educational institutions, the system aims to lower the amount of resources required to maintain attendance.

The suggested method makes use of a histogram of oriented gradients as a workable answer for the application. A high-definition camera will be installed outside the classroom or work place as part of this system to track attendance. camera will be positioned within the classroom so that every student or employee may be seen by the camera's lens. camera will have facial recognition and identification systems that will scan the subjects' faces and document their attendance.

A person entering the front entrance turns his face in the direction of the camera, creating 128-d encodings. next we compare these 128-d encodings to the known encodings produced after our system was trained using the data we collected. We add the person's name to our database, which is organized by the date and time of his admission into the premises, if the matches are found. This makes it easier for us to manageably and systematically track attendance. The system will simply keep scanning for the subsequent visitor if no match is found, indicating that the person's photo has not yet been programmed into the system.

Until the system is shut off, this continues. By visiting the configured home page with proper credentials Admin can view the attendance and details of employee or student. We update the attendance in real time into a local excel sheet that can be read by admin.

IV. ALGORITHMS

4.1 Harcascade:

The Haar Cascade classifier uses the Haar Wavelet technique to divide the pixels in the picture into squares according to their functions. To compute the "features" that are detected, "integral image" concepts are used. With the use of cascading techniques, Haar Cascades can detect faces in images by selecting a small number of highly effective classifiers from a wide collection of available characteristics using the Adaboost algorithm. Following are some HaarFeatures.

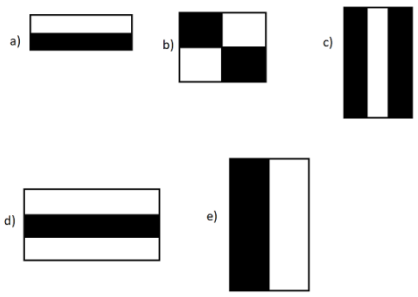
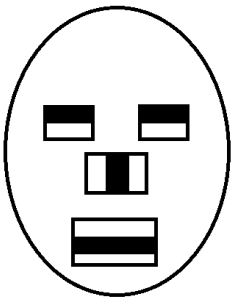


Fig 1.Examples of Haar feature extraction kernals

Haar Cascades employ machine learning strategies that include training a function using a large number of both positive and negative images. Feature extraction is this algorithmic procedure.



Dark pixels:lower values
Bright Pixels:higher values

Haar features only at certain locations are activated

Fig 2.Face detection Example Kernal

Calculation of Haar Feature:

98	110	121	125	122	129
99	110	120	116	116	129
97	109	124	111	123	134
98	112	132	108	123	133
97	113	147	108	125	142
95	111	168	122	130	137
96	104	172	130	126	130

Image I

98	208	329	454	576	705
197	417	658	899	1137	1395
294	623	988	1340	1701	2093
392	833	1330	1790	2274	2799
489	1043	1687	2255	2864	3531
584	1249	2061	2751	3490	4294
680	1449	2433	3253	4118	5052

Integral Image II

Fig 3.Converting Input Image to Integral Image

V_A= Σ(pixel intensities in white area)

– Σ (pixels intensities in black area)

V_A=(2061-329+98-584)-(3490-576+329-2061)

V_A=64

During Face Recognition for each user it follows these steps:

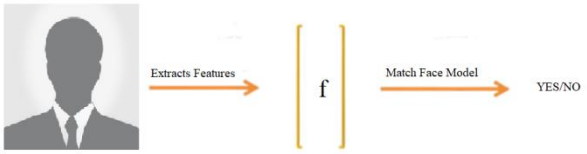


Fig 4.Comparing the Extracted Harfeatures with the Existing Harfeatures

LBPH Algorithm:

It was initially described in 1994 (LBP), and since then, it has been discovered to be an useful characteristic for texture classification. On some datasets, it has also been found that the detection performance is significantly enhanced when LBP and the histograms of oriented gradients (HOG) descriptor are combined. Our ability to represent the facial photos using a straightforward data vector using the LBP and histograms. As a visual descriptor, LBP can be utilized for tasks involving face identification, as demonstrated in the explanation that follows in detail.

The LBPH uses the following four parameters:

1. **Radius**: The circular binary pattern serves as a representation of the area surrounding the center pixel.It could be 0 or 1

2. **Neighbors**: The total number of sample points is what is used to construct the circular binary pattern. The computational cost increases along with the sample point count. Thus, it is typically set to 8.

3. **Grid X**: The total number of cells running horizontally. The grid will function better as there are more cells, and the dimensionality of the generated vector will rise as well. It is typically set to 8 as well.

4. **Grid Y**: This refers to the total number of cells arranged vertically. The grid will function better as there are more cells, and the dimensionality of the generated vector will rise as well. Typically, it is also set to 8.

We need to collect all of the faces whose faces we wish to recognize in order to train the algorithm. In order to use these identifying codes to recognize a new image, we also need a special number or name for each image. The same identifying number should appear on all photos of the same face.

To produce an intermediate image, the LBPHalgorithm goes through a number of computational phases. By emphasising a few characteristics, the intermediate

image will more formally describe the original image. The technique uses a concept known as sliding window, which is based on the parameters, radius, and neighbors, to obtain the characters of the face.

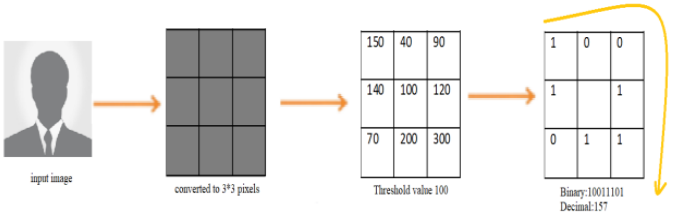


Fig 5.Calculating the LBPH Threshold Value

Let's break the process down into a few steps in order to comprehend the image above.

a. Assume we have a grayscale image.

b. In order to extract a portion of the image, we partition it into 3x3 pixels.

c. It can alternatively be shown as a 3x3 matrix, with each pixel carrying an intensity that ranges from 0-255.

d. The centre value will be taken into account as a threshold value.

e. By taking into account this threshold value, we can choose a new binary value for each neighbour. The binary value will be set to 1 if the neighbor's value is greater than or equal to the threshold value; otherwise, it will be set to 0.

f. With the exception of the threshold value, the new matrix will now be a binary matrix. Now, we'll focus on each binary value in the matrix line by line, according to its position. For instance, if we take into account the image above, the binary number is 10011101. Line by line approach is not required. Although some authors may employ either a clockwise or an anticlockwise strategy, the end result will be the same.

g. We will now translate this binary number into decimal form, where 157 represents the decimal equivalent of 10011101. Then, we set this decimal value to the image's centre value, which is a pixel.

h. We shall obtain a fresh image at the conclusion of this process that will specify better qualities of it.

Using this updated image now, we can divide an image using the parameters Grid X and Grid Y into multiple grids

The histogram of each image may now be extracted using the techniques below.

Now, just 256 locations (i.e., 0-255) in each histogram of each grid will indicate the occurrences of each pixel's intensity.

We are going to make a new, larger histogram at this point. If we use 8x8 grids, there will be 16,384 possible spots. The final histogram that will depict the features of an original image is this one.

For each image, we have now constructed the histogram. Each image in the training dataset is now represented by one of these histograms. We will now provide a fresh input image and repeat the process to produce a new histogram for this input image.

We will now compare this new image's histogram to all the histograms of the photos in the dataset.

We can compare histograms in many different ways (by comparing the differences between two histograms), Examples include absolute value, chi-square value, and others.

V. IMPLEMENTATION

The system marks a employee as present when it recognizes their face and determines that they match the image in the database.

The employee's attendance status remains absent if that doesn't match the photograph.

Algorithm:

INPUT: Employee's faces at the entrance.

OUTPUT: Automatic attendance marking.

Identification of faces and recording the attendance as necessary.

Step I: Start

Step II:Entering employee information into the database of employee's.

Step III:Setup the camara at the entrance gate.Employye's faces will appear in the camera

Step IV:Haar Cascade face detection.

Step V:Face Recognition utilizing the Local Binary Pattern Algorithm by contrasting the employee's faces with pictures in the employee's database.

Step VI:IF emplyee’s face is present in the database,

THEN Go to Step 7.

ELSE: Go back to Step 2.

Step VII:IF Faces are recognized and matched THEN Mark them as present.

ELSE: Mark as absent.

Step VIII:Mark the attendance in the attendance database.

Step IX: End.

Dataset:

Our dataset, which includes 50 images of each employee, was developed. A real-time web camera is used to test our technology, capturing the faces of the employee . After preprocessing, some sample photos are shown in Fig. 6.

Fig.6 Dataset

This is the initial page of our project which contains tabs to check registered employees and to fill the automatic attendance.

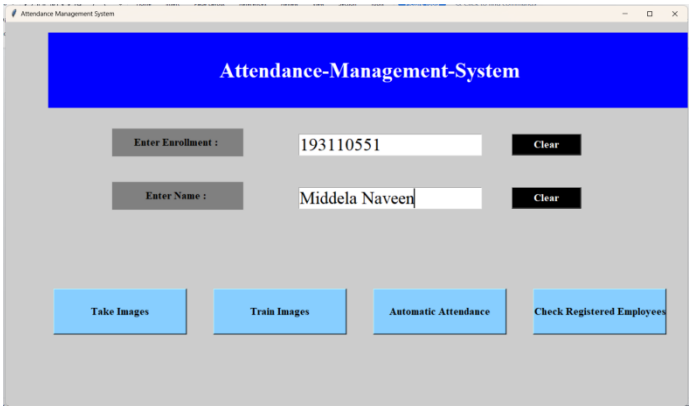


Fig. 7 Initial Page

After filling the details of employee(i.e Employee ID and Name).it automatically captures the images for haar feature Extraction and stores the images in Training database.

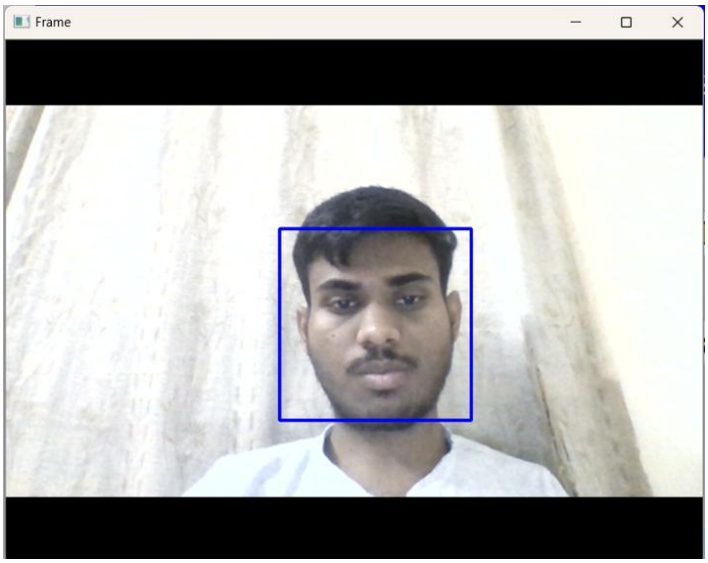


Fig 8 Capturing the images during Registration

After Successful of previous step when the images are stored to database then it displays the successful message as shown below.

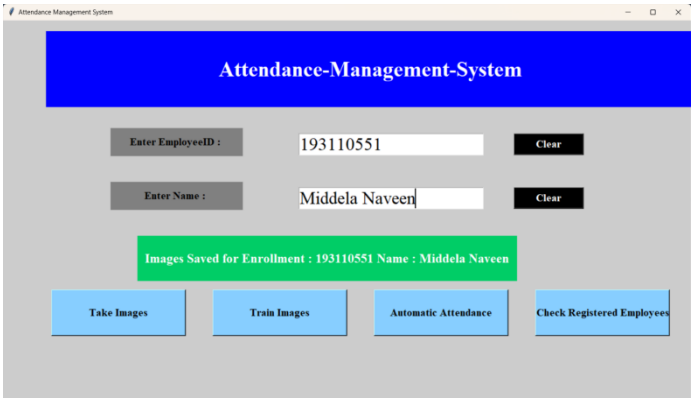


Fig. 9 Images are stored to database

We need to train the model if any new employee is registered in order to maintain his haar features too.

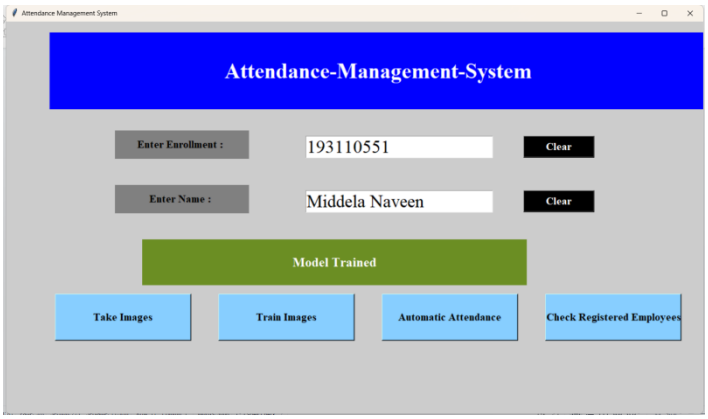


Fig.10 Training the model

When we want to take attendance then we have to give the shift name accordingly in my case it is Night Shift you have to give based on your shift.

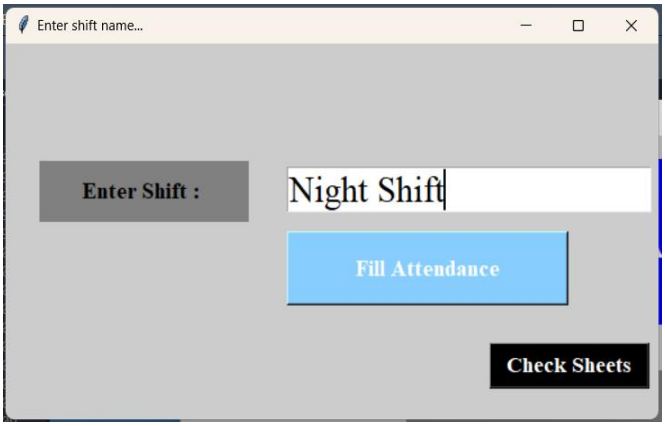


Fig. 11 Automatic attendance filing for night shift

It captures the images and displays the empoloyee ID and name once it is detected and whose are undetected they are displayed as unknown.

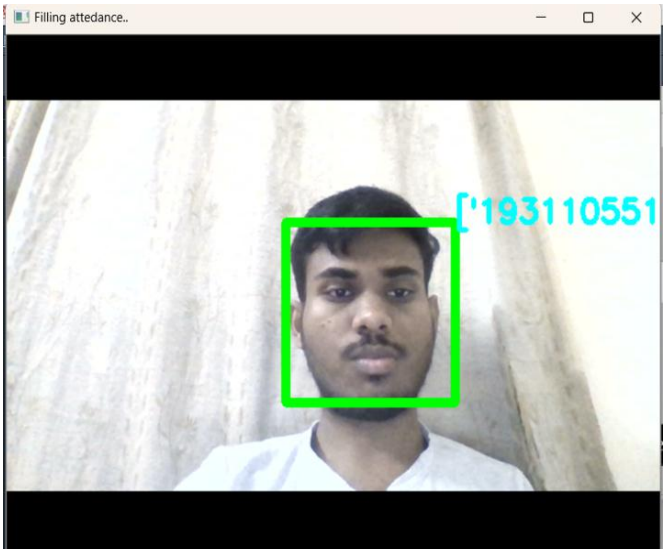


Fig. 12 Capturing the images for marking attendance

After completion of taking attendance it displays the name and Employee ID, Name, Date and Time on screen and at the same time it is added to database in excel format for future reference.

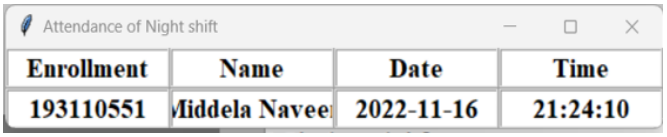


Fig.13 Name and details of presentees

These is the excel format of presentees on various shifts.

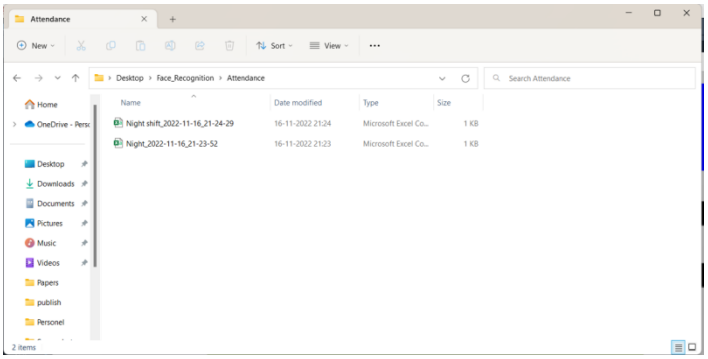


Fig. 14 Attendance of Presentees in Excel Format

This panel is for admin on successful login admin can see the details of all registered employees.

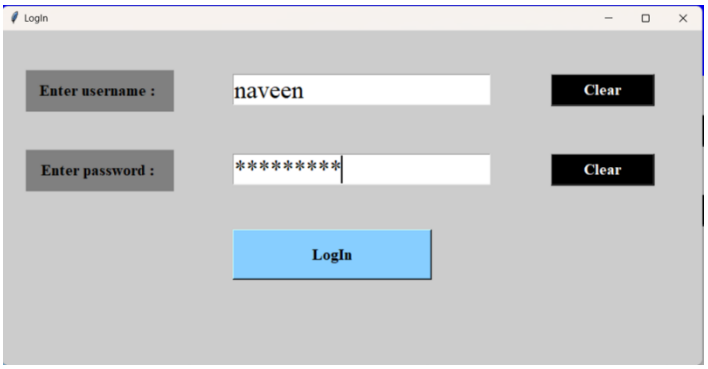


Fig. 15 Panel for Admin login

After Successful login of admin following details of each employee is seen as shown below.

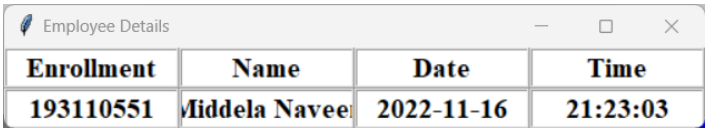


Table.1 Registered Employee Details

VI. UML DIAGRAMS

Use-case diagrams assist in capturing system requirements and describe a system's behaviour in UML. The scope and high-level functions of a system are described in use-case diagrams. The interactions between the system and its actors are also represented in these diagrams.

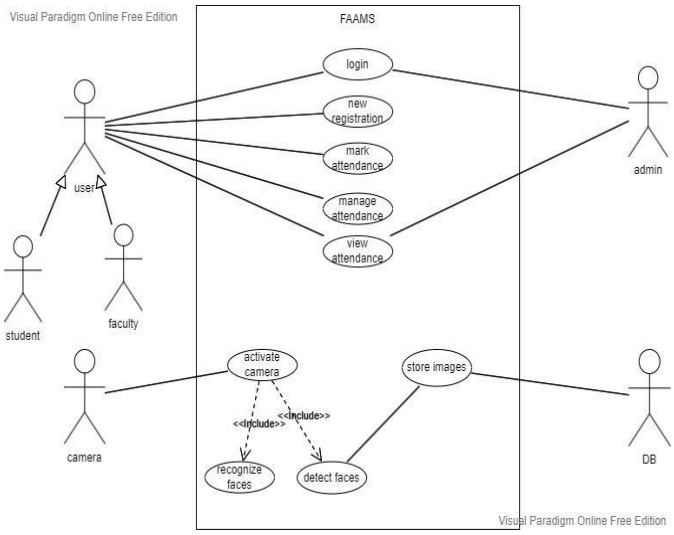


Fig. 17 Use Case Diagram

A sequence diagram (UML) is a visual representation of the flow of messages between objects during an interaction. A group of objects connected by lifelines and the messages they exchange throughout the course of an interaction make up a sequence diagram.

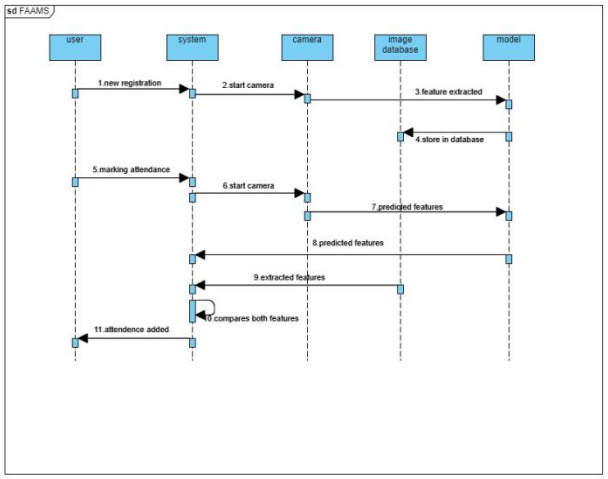


Fig. 16 Sequence Diagram

VII. RESULTS AND ANALYSIS

In our system, three feet is the minimum distance needed for an image to be recognized. our system have an 90% accuracy rate for facial recognition . The employees are identified by this system even if they are wearing glasses or grown a beard.

The accuracy also depends on the system configuration and computation speed.as we know these project runs on machine learning algorithms so it requires high configuration system to process it.high configuration gives higher results.

VIII. ADVANTAGES OF THE SYSTEM

The suggested system uses a much more straightforward and effective method. The usage of an easy-to-use Framework makes the system simpler. It has fewer complicated database setups and a more effective algorithm. Due to its platform independence, the system is more effective.

IX. CONCLUSION

This system is being used in order to decrease the number of employees and extend the working time. This system demonstrates improved algorithmic usage and demonstrates strength in accurately identifying users. The outcome demonstrates the system's ability to handle variations in facial projection, position, and distance.

The problem of environment change is resolved during face detection since the original image is converted into a HOG representation, which captures the key elements of the image regardless of image brightness, according to research on face recognition with machine learning.

The whole project is implemented using the python programming language.

X. FUTURE ENHANCEMENT

On this project, there are still some tasks to complete in order to notify the employee about his or her attendance by SMS.and creating login for employee's in order to check their payment info and their schedules.

XI. ACKNOWLDEMENT

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