PYTHON GUI INTEGRATED ATTENDANCE SYSTEM USING FACE RECOGNITION

SACHIN WAKURDEKAR[1], UTKARSH NAGPURE[2], ESHIKA KOTHARI[3], DIVYANSH GUPTA[4]

[1]Assistant Professor, [2,3,4]Students
Department of Computer Engineering, Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune, Maharashtra, India.

***Abstract*: Maintaining the attendance record while engaging in daily activities is a difficult undertaking. In order to maintain discipline and allow students to properly absorb all of the information offered, the attendance system was employed in schools, colleges, and universities. To record a student's attendance in a particular class, there are two traditional methods. The first one is calling the roll number, and the second one entails bringing pupils in to sign a piece of paper next to their roll number. Traditional Methods Hampers the Integrity of the attendance records. The system's goal is to create an automated system that, instead of using traditional techniques, uses facial recognition technology to track student attendance. Making the attendance marking and management system Secure, effective, time-saving, straightforward, and simple is the major goal of this effort. The system below uses face recognition as its foundation. Student's daily attendance is tracked by subject and Roll number is already saved by the administrator. The system automatically begins capturing pictures as the time for the related subject is scheduled. It then uses facial detection and identification technology to identify students in the photograph, marking them as present and updating their attendance with the corresponding time and subject id. The system uses python language and its various libraries like OpenCV, NumPy etc and Har-cascade classifiers and Local binary patterns histograms (LBPH).**

***Keywords*: Face detection, face recognition, Haar cascade, OpenCV, LBPH Algorithm.**

1. INTRODUCTION: -

In our daily lives, people routinely and meticulously perform the function of facial recognition. The automatic processing of digital images is of tremendous importance in many systems, such as biometric authentication, surveillance, personal computer interface, and multimedia management. Due of the widespread availability of robust and reasonably priced desktops and embedded computer programmes. It makes sense to conduct research and develop automatic facial recognition. Compared to fingerprinting and iris scanning, facial recognition offers fewer advantages: The most crucial facial benefit is that it may be removed subtly, in addition to being natural and non-abrasive. Based on a variety of test items, including registration, renewal, machine requirements, and community, face features outperformed the other six biometric parameters taken into account by Hietmeyer in the Machine Readable Travel Documents (MRTD) system. Face recognition, one of the key biometric technologies, has grown in significance as a result of the quick advancement of photographic technology (surveillance cameras, mobile phone cameras), the accessibility of numerous facial photos online, and the rise in the need for high security.

1.1 SYSTEM REQUIREMENTS:

- Software Requirements: -
- Front-End – Python Tkinter GUI.
- Operating system – Windows, Linux, Mac.
- Coding Language - Python. 3.6
- Python Libraries:- OpenCV, Tkinter, Numpy, Pandas.

- Hardware Requirements:-

- Camera Module with good mega pixels

- Processor – intel Processor i3
- Mouse
- Monitor – SVGA/USB
- RAM - 8 GB (min)
- Hard Disk - 256 GB
- Keyboard - Standard Keyboard

2. LITERATURE REVIEW:

This paper's main goal is to examine the various strategies put forth by authors in order to create a real-time attendance system that addresses the drawbacks of earlier approaches and offers the most effective solution.

In [5] Yohie Kawaguchi et al. proposed a system that relies on face recognition in addition to continuous observation. The author described a system that uses an active student detecting method (ASD) and two cameras mounted on the wall, one of which is a sensing camera used to estimate where students are seated inside the class and the other of which is a capturing camera used to detect faces. They have suggested a shooting strategy in which one seat is predicted from the seating area obtained by ASD, and the capturing camera is then pointed at the seat to take a picture. Inters frame and background subtraction are used to estimate the number of students. The author has provided the correspondence of students and seats by solving the linear sum assignment problem.

The author of [6] described a system that employed the Eigenfaces method for face recognition. They have worked on background subtraction for binary and greyscale images after performing face detection, face cropping, and background subtraction. The Eigenface method was employed by the author because of its efficiency, speed, and capacity for learning.

Savitha et al. proposed a system in [7] that uses a skin detection technique to identify faces. Following the detection of skin, skin pixels are extracted from images, turning the remaining pixels black. The authors used two databases, the first for storing student faces and the second for storing student data, to store these skin pixels, which will then be used for face detection.

3. PROPOSED SYSTEM:

The faculty hand calling out the roll call for attendance marking as part of the current system has more than adequately served the goal. The old method of taking attendance may no longer be practical given the changes in the educational system and the advent of new technology in the classroom, such as virtual classrooms. Even though institutions are offering more and more study options, manually processing attendance may take some time. As a result, the goal of our project is to develop a system for taking attendance in classrooms using facial recognition technology and to establish a useful database to store the results.

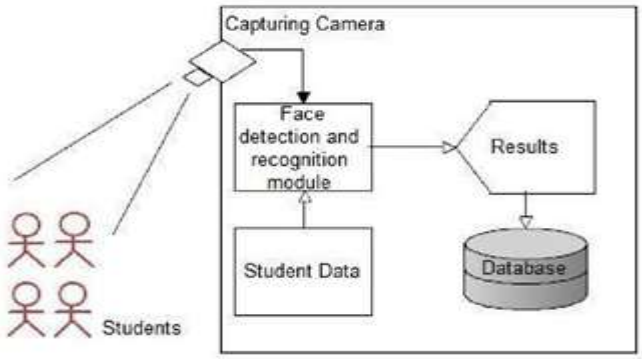


Figure: 1

The suggested system for a Face Recognition-based Classroom Attendance System is shown as a block diagram. The system's setup requires for placing a camera in the room so that it can efficiently collect all of the students' photographs by capturing all of the students in the room.

4. METHODOLOGY:

The system is built using the Python and its GUI features and Opencv library.

The program calculates the school-going course, i.e. student data and lessons are added manually by the administrator, and whenever the corresponding lesson time comes the program automatically starts taking abstracts and determines whether people's faces appear from a given image or not.

Using Haarcascade classifier and LBPH Algorithm.

Once the face has been detected and detected by an existing website, the system counts to alert students with the appropriate subject id in real time. And the excel sheet built and saved system automatically.

Steps we have taken to make the project a success:

· Creating a Database

· Image adjustment

· Face detection

· Feature domain

· Facial recognition

· Redundancy Removal

· Report production

- **Database Creation:**

We will build a database of student information. The excel sheet (CSV) will be created at the time of registration. The Database will contain the name, photo, number and other required information of the students.

- **Image amelioration**

As a result of the student's movements in class, the image captured by the camera may be blurred. image can be enhanced using Generative Adversarial Networks. GANs are known for their ability to store textual information in images, create similar solutions with the actual scope of features, and look visually appealing.

$$I_B = k(M) * I_s + N$$

When I B is a distorted image, k (M) is referred to as an unknown blurring character identified by the motion of the M.Is a subtle sharp image and * symbolizes flexibility while N means additional sound.

- **Removal of redundancy**

As the system includes multiple cameras. there may be an opportunity for the presence of one student's face in different pictures. Unnecessary faces will be removed and one face will be considered to mark the presence of one student during the presentation.

- **Report production**

Subsequent facial recognition reports are made by marking the presence of the student's name and enrolment number in the excel format during the lesson.

- **Feature extraction**

It is a very critical step as it is believed that an effective feature extractor selects a function that is not normally closed, illuminated, contextual, and varied. 2D Gabor filters are used for resolving spatial distortions caused by spatial and light variations.

$$W(x, y, \theta, \lambda, \varphi, \sigma, \gamma) = e^{\left(-\frac{x^2+\gamma^2 y^2}{2\sigma^2}\right)} \cos\left(2\prod\frac{x^2}{\lambda} + \varphi\right)$$

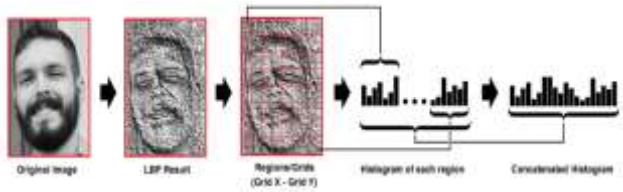
$$x' = x\cos\theta + y\sin\theta$$

$$y' = -x\sin\theta + y\cos\theta$$

here (x, y) defines the state of light intensity and μ, ϕ, γ, λ, σ sinusoidal wavelet parameters.

- **Local Binary Pattern Histograms (LBPH) Algorithm**

Each pixel in a picture is given a label by the Local Binary Pattern (LBP) texture operator, which thresholds its immediate surroundings and treats the output as a binary number. Using the LBP combined with histograms of oriented gradients (HOG),we can represent the face images with a simple data vector or feature vectors. The algorithm bases its sliding window concept on the radius and neighbours inputs. The algorithm outputs the face ID from the image with the closest histogram.



Comparison Of Histograms Can be Calculated Using Various Methods, Commonly used is Euclidean Distance Formula.

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

4.1 FACE RECOGNITION PROCESS:

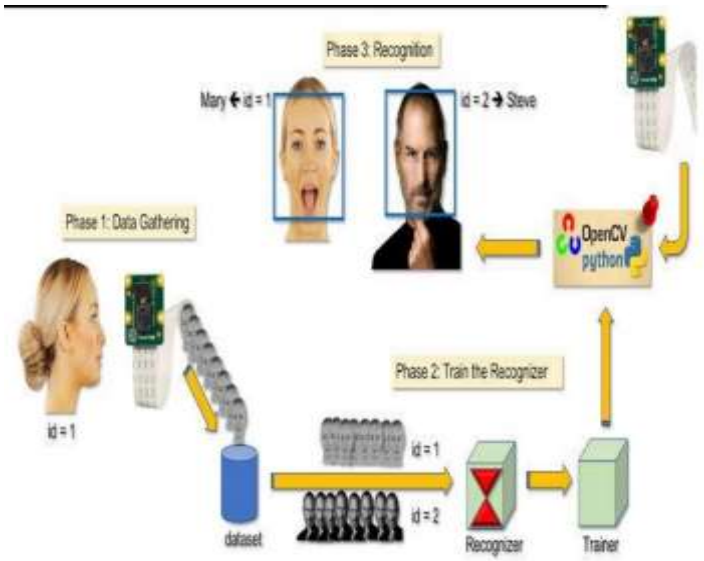


Figure 2

1. Face Detection and Extraction: Face detection is important as the camera image provided by the system, the face detection algorithm is used to identify the person's face in that image, introducing the number of image processing algorithms for face detection and the location of the detected face. We used the HOG method to find a person's face in a given image.

2. Facial expression: There are 68 specific points on a person's face. In other words we can say 68 landmarks. The main function of this step is to place a photo and to locate facial features. The python script is used to automatically detect facial features and position faces as much as possible without distorting the image.

3. Face Code Text: Once the face has been detected in a given image, the next step is to remove the unique face feature that identifies each image. Basically whenever we get a facial expression, 68 key face area is extracted from each given image very accurate and these 68 face points are stored in a data file for face recognition.

4. Facial matching: It is the final step in the process of facial recognition. We have used the best learning method to learn the deepest metrics that are more accurate and capable of extracting the vector of the real value feature. Our system authenticates the face, creating 68-point embedding (verification) for each To determine the Euclidean distance between the face in the image and all the faces in the database, use the comparison function inner face. If the current image is compared to the 60% limit with the existing database, we will go to the presence marker.

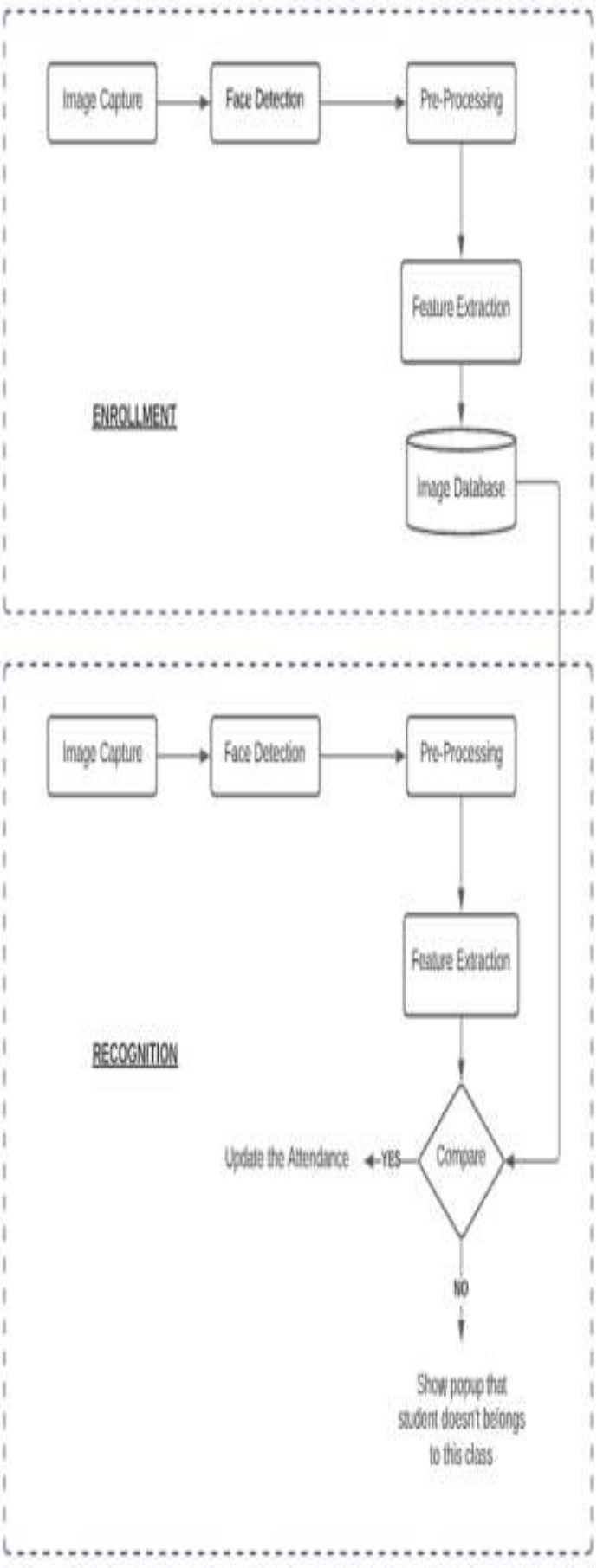
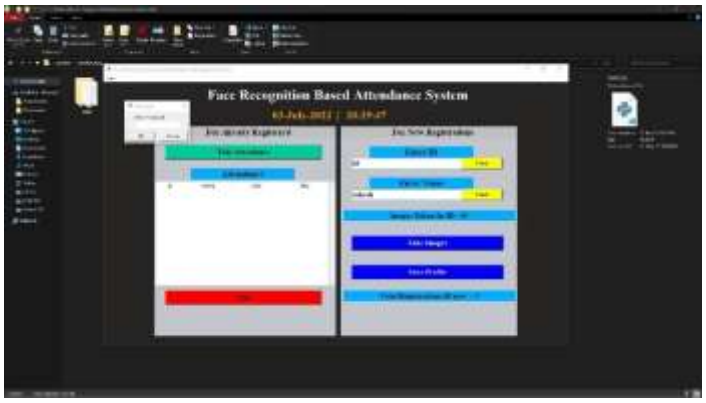


Image Capture
Face Detection
Pre-Processing
Feature Extraction
ENROLLMENT
Image Database
Image Capture
Face Detection
Pre-Processing
Feature Extraction
RECOGNITION
Update the Attendance
YES
Compare
NO
Show popup that student doesn't belongs to this class

Figure 3

5. RESULT:-

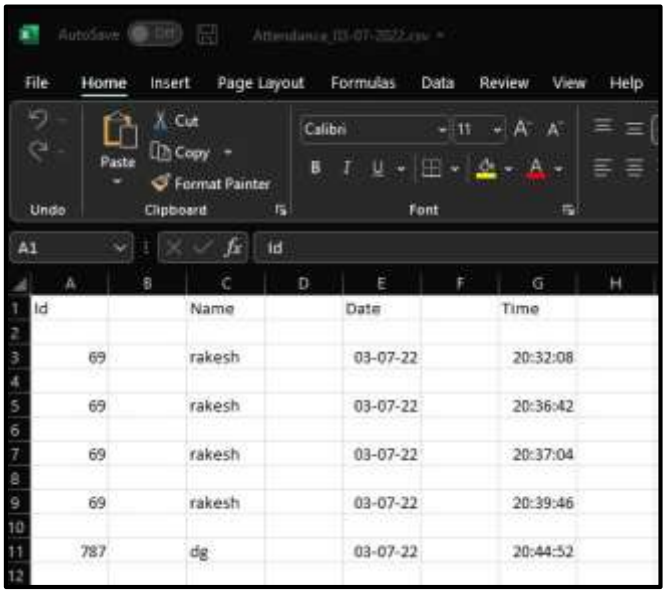


a.While training our model

b.Face detection after registartion

c.unknown face detected

d.Attendance shown in GUI



e. Attendance Stored in CSV File

6. CONCLUSION:

In this Paper student attendance system using Python GUI Integrated facial recognition is proposed. We have used facial recognition to mark the attendance of students and to save time and effort of the teacher. Proposed system also records the entry and exit time of students. System is cost-efficient and less manual work is needed in it. We used Har Cascades to detect the objects in images quickly and in real time. We have also used Local Binary Pattern Histogram (LBPH), it labels the pixels of an image. We have also integrated the password protection in the system. Only admin can access the system and system's database and daily attendance will be sent to administrator in .CSV format.

Our preliminary experiment's findings indicate that our method performs better at estimating attendance than the conventional black-and-white attendance methods. The face detection algorithms from photos or video frames are the focus of the current work.

By utilising the interaction between our system, the users, and the administrators, we hope to increase the effectiveness of face recognition in future work. On the other hand, our technology can be utilised in a completely new face recognition application—mobile based face recognition—which can let the general public learn about any individual being captured by a cell phone camera and provide the necessary authorisation for access to a centralised database.

Future Scope includes:-

1. Sentiment analysis – We can also check the sentiments of the students present in the class.

2. For military Use – Face Recognition can be used for surveillance purposes and for tracking an enemy.

3. In Traffic system – It can be used in tracking the vehicles by their registration number. And for violation of traffic rules.

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