A Mini Project Report on

Face recognition based attendance system

Submitted in partial fulfillment of the requirements for the award of the
degree of

Bachelor of Engineering

in

Department of Computer Engineering

by

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Approval Sheet

This Mini Project Report entitled *"Face recognition based attendance system"* Submitted by *"Toshna Rane (19102058)"*, *"Shreya Godbole"(19102034)*, *"Aditi Sangale"(19102023)*, *"Zeal Punamiya"(19102031)* is approved for the partial fulfillment of the requirement for the award of the degree of *Bachelor of Engineering* in *Department of Computer Engineering* from *University of Mumbai*.

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Date:

CERTIFICATE

This is to certify that the mini project entitled **"Face recognition based attendance system"** Submitted by **"Toshna Rane (19102058)"**, *"Shreya Godbole"(19102034)*, **"Aditi Sangale"(19102023)**, **"Zeal Punamiya"(19102031)** for the partial fulfillment of the requirement for award of a degree **Bachelor of Engineering** in **Department of Computer Engineering.**, to the University of Mumbai, is a bonafide work carried out during the academic year 2020-2021.

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Project Report Approval for TE

This Mini project report entitled *(Title)* by *(Author Name)* is approved for the degree of ***Bachelor of Engineering*** in ***Computer Engineering***, ***2021-22***.

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2._____

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

In this digital era, the face recognition system plays a vital role in almost every sector. Face recognition is one of the mostly used biometrics. It can be used for security, authentication, identification, and has many more advantages. As compared to iris recognition and fingerprint recognition, it is being widely used due to its contactless and non-invasive process. The existing classroom attendance system is manual. It is time consuming and cumbersome to maintain. Also there are chances of proxy attendance. Therefore there is a need for a simple and user friendly attendance system that is a personal authentication system. Out of various solutions such as iris recognition, fingerprint detection and face recognition etc. The face recognition is proven more effective and secure. The proposed system is a class attendance system using face recognition. This system consists of four phases- database creation, face detection, face recognition, attendance updation. Database is created by the images of the students in class. Face detection and recognition is performed using the Haar-Cascade classifier and Local Binary Pattern Histogram algorithm respectively. Faces are detected and recognized from live streaming video of the classroom. This proposed system is more efficient and user friendly than the manual attendance system.

Content

1. Introduction

Biometrics such as fingerprint recognition, facial recognition, iris scanning recognition, voice recognition, signature recognition etc are used for many purposes like attendance and security. One of these biometric categories is face detection and recognition which Nowadays, is gaining more popularity and has been widely used mainly for attendance . A facial recognition system is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image. Face recognition has set an important biometric feature, which can be easily acquirable and is non-intrusive. Face recognition based systems are relatively oblivious to various facial expression.It is an 1:1 matching process, it compares face image against the template face images.We mostly see the nose, hair, ears, mouth, eyes and also different pose of faces in images. After applying face detection techniques we detect the faces or objects in the image and crop that image and apply Face Recognition technique.Face detection includes detecting the face location and presence of face in images. If the image is not in the database then we store that image as a new person in the database.

As a result the proposed face recognition system is supposed to provide a smart e-attendance system having silent features like user friendly operation, time saving zero maintenance and error free operation etc.

2. Literature Survey

In[1], the authors proposed a system which detects the faces of students from live streaming video of the classroom and attendance will be marked if the detected face is found in the database. This new system will consume less time compared to traditional methods. Face detection here is performed using Haar-Cascade Classifier with OpenCV. The Haar Cascade algorithm is trained to detect human faces before performing the face detection. For performing face recognition the recognizer used is the 'Local Binary Pattern Histogram'. After the recognition process, the recognized faces are marked present in the excel sheet.

In[2], Video of the students is being captured from a camera fixed at a specific distance inside a classroom and it's getting converted into frames, Face Detection is the process where the image, given as an input (picture) is searched to find any face, after finding the face the image processing cleans up the facial image for easier recognition of the face. 'CNN algorithm' is implemented to detect the faces, relate it with the database to ensure their presence or absence, then mark attendance to the particular student to maintain the record. The Automated Attendance System helps in increasing the accuracy and saving time with high speed attendance to meet the need for automatic classroom evaluation.

In [3],The process began by capturing the face image using the camera. Afterward, the face detection process using skin color detection and face motion tracking was performed.This process also carried out a localization process of eyes, lips, and face borders positions. Furthermore, the face alignment process was performed, including the face size normalization process and variations of lighting on the face. The face extraction for face recognition is performed using the 'LBPH algorithm'. The feature extraction results could detect the user's eye position, marked with a blue circle symbol. Later, by using the distance between the center of the circle combined with the position of the user's nose and mouth position, the identification and matching process would be performed. The detected face would be compared to all faces in the database to find the most similar face to the detected face. The database was stored using 'CSV file' format to show the names and directories of the faces that exist in the database.

In [4], Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detect the student face when a person enters the class and the system is capable of marking the attendance by recognizing. Viola-Jones Algorithm has been used for face detection which detect human faces using a cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves time and also helps to monitor the students.

In [5], Problems and drawbacks in face detection method are the heavy computation during the classifier training. This problem was overcome by Pham and Cham who conducted research to reduce the time required for training using statistical principles. The results obtained were quite significant in reducing the required computational time.

In [6], With a machine learning approach the idea of two technologies namely Student Attendance and Feedback system has been implemented. On recognizing the face of the student , the attendance details and about the obtained marks details as feedback automatically.

In [7], Automatic attendance system by integrating two deep learning algorithms Faster R-CNN face detection algorithm and SeetaFace face recognition algorithm. Here it's proved that the resolution of the camera should be at least 1080P to detect the classroom-wide faces and the face recognition system SeetaFace is successfully applied to classroom evaluation, which combined with Faster R-CNN face detection can achieve classroom automatic attendance. To address the problem of low resolution, we

use 4K HD video for face detection and face recognition. This paper applies Faster R-CNN and SeetaFace to class attendance, and to achieve satisfactory results.

3. Problem Statement

Attendance is a compulsory requirement of every organization. Maintaining attendance register daily is a difficult and time consuming task. There are many automated methods for the same available like Biometric, RFID, eye detection, voice recognition, and many more. Face recognition provides an accurate system which overcomes the ambiguities like fake attendance,impersonations, high cost, and time consumption. Our project provides an efficient and smart method for marking attendance using face recognition.

4. Objective

The main objective of this work is to make the attendance marking and management system efficient, time saving, simple and easy.

Here faces will be recognized using face recognition algorithms. The processed image will then be compared against the existing stored record and then attendance is marked in the database accordingly.

Compared to the existing system's traditional attendance marking system, this system reduces the workload of people.

This proposed system will be implemented with 4 phases such as Image Capturing, Segmentation of group image and Face Detection, Face comparison and Recognition, Updating of Attendance in an Excel sheet.

Scope

To improve the functionality and reliability of the system in the future we can add some of the following enhancements:

1. Add a self-generating defaulter list, that is created after a certain amount of fixed time has passed for any student whose attendance is below seventy fivepercent.
2. The System will have to separate between recognised and unrecognized faces, faces that go unrecognized can be stored in a secondary database.

5. Experimental Setup :-

Software Requirements: windows7 or higher OS, VS Code or any python IDE, MS Excel.

Hardware Requirements: PC or laptop with x86-64 (64-bit) compatible processors, A camera or webcam.

OpenCV: (Open Source Computer Vision Library) is an open source computer vision and machine learning library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products.

VS Code: Visual Studio Code is a free source code editor that fully supports Python and useful features such as real-time collaboration.

MS Excel: Microsoft Excel is powerful data visualization and analysis software, which uses spreadsheets to store, organize, and track data sets with formulas and functions.
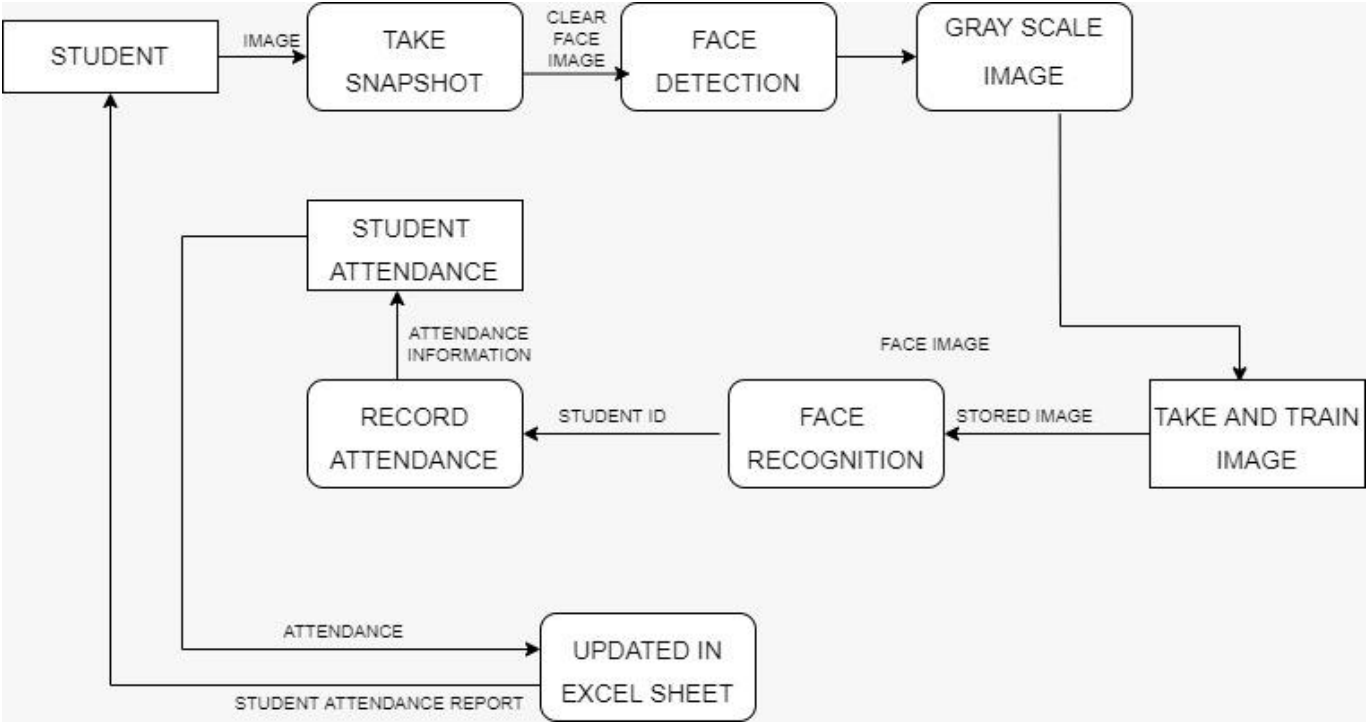
6. System Design

6.1 UML Diagram -

Figure No. 1

6.2 Algorithm -

The architecture for the proposed system has been designed to keep it pretty straightforward and easy to understand. The steps that have to be undertaken to reach the final end step of the system which is making sure the attendance of the student is updated correctly and timely. The system can easily be accessed by anyone, where attendance of the students can easily be checked and maintained by the faculty as when required..

OpenCV-Python will be used to access the Haar Cascade and LBPH algorithms and their libraries that are required for training, recognition and matching of the captured images against the stored images available in the previously acquired data sets.

Algorithms being used:

Haar Cascade The Haar Cascade algorithm is a set of classifiers used for object detection. Haar Cascade is a machine learning based approach where a lot of positive and negative images are used to train the classifier. The images which we would like to be classified by the classifier are known as positive images and the images we would not want our classifier to classify are known as negative images.

Local Binary Pattern Histogram The Local Binary Pattern is used for face recognition, which means identifying the captured image against the image already stored in the database. The algorithm makes use of four main parameters to recognise a face. The Local Binary Pattern is applied to the image and compared against the central pixel of the image, then we calculate the histogram value for the said lbp image. The value of the newly calculated histogram is then compared against the already pre-processed histogram value of the already stored image in the database. This is how the Local Binary Pattern Histogram carries out facial identification of images.

The following stages are how the whole process is divided into:

1. **Database Creation and Training** - The original database containing the images of the students is created by taking a live real time video of the students, and splitting the video into thirty frames, converting them to gray scale and storing only the faces of the students as images, then we will be training the respective images using the LBPH algorithm all the while storing their respective histogram value's and then comparing the stored and trained images against the captured images to mark the attendance. The software used for splitting the video into frames in Open-CV.

2. **Image Capturing and Face Detection** - Face detection here is performed using Haar-Cascade Classifier with OpenCV. The Haar Cascade algorithm needs to be trained to detect human faces before it can be used for face detection.Here we are using detectMultiScale module from OpenCV. This is required to create a rectangle around the faces in an image. It has got three parameters to consider- scaleFactor, minNeighbors, minSize. scaleFactor is used to indicate how much an image must be reduced in each image scale. minNeighbors specifies how many neighbors each candidate rectangle must have. Higher values usually detect less faces but detect high quality in image. minSize specifies the minimum object size.

3. **Image Matching or Face Recognition** - In this third and most crucial phase of recognising the student, that is comparing captured image against the stored images in the database, this method is done by making use of the LBPH algorithm(Local Binary Pattern Histogram), each image stored in the database has it's histogram value calculated and is cross checked against the calculated Histogram value of the images extracted from the captured video feed. At the end, one histogram will be formed for each image in the training data. Later, during the recognition process histogram of the face to be recognized is calculated and then compared with the already computed histograms and returns the best matched label associated with the student it belongs to.

4. **Attendance Marking Phase -** After face recognition process, the recognized faces will be marked as present in the excel sheet and the rest will be marked as absent and the list of absentees will be mailed to the respective faculties. Faculties will be updated with a monthly attendance sheet at the end of every month.
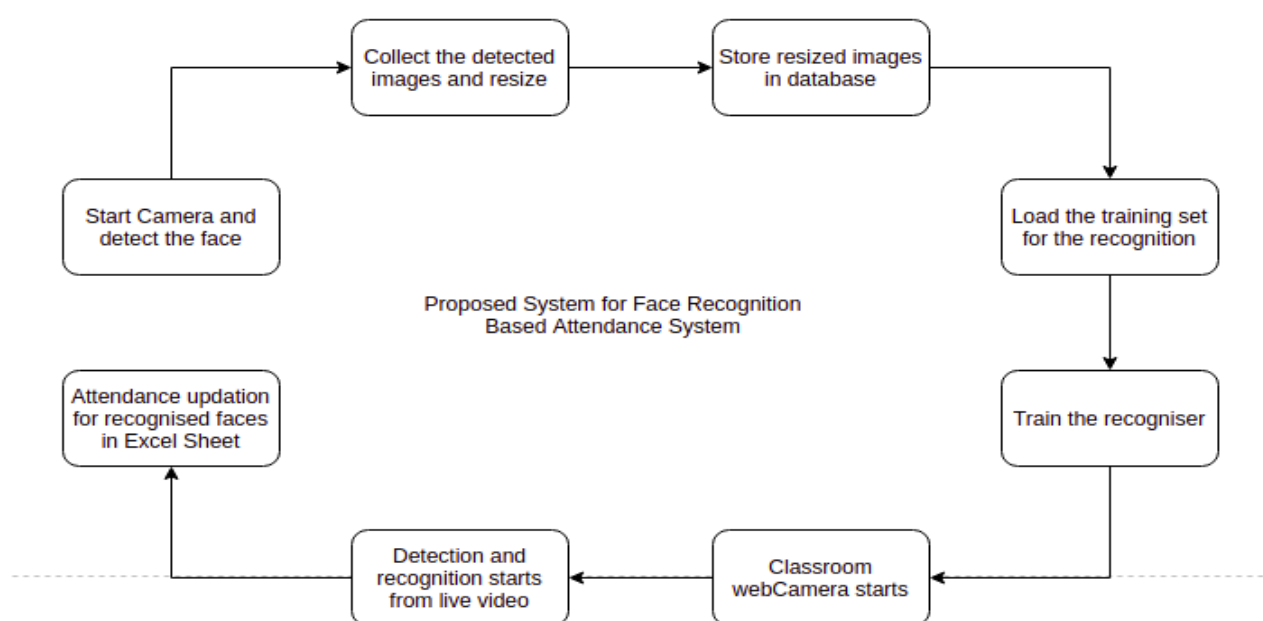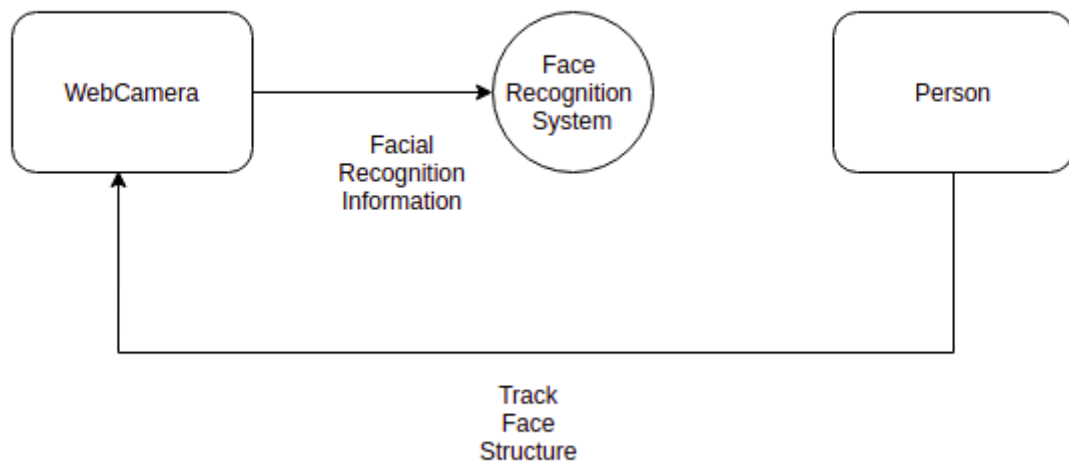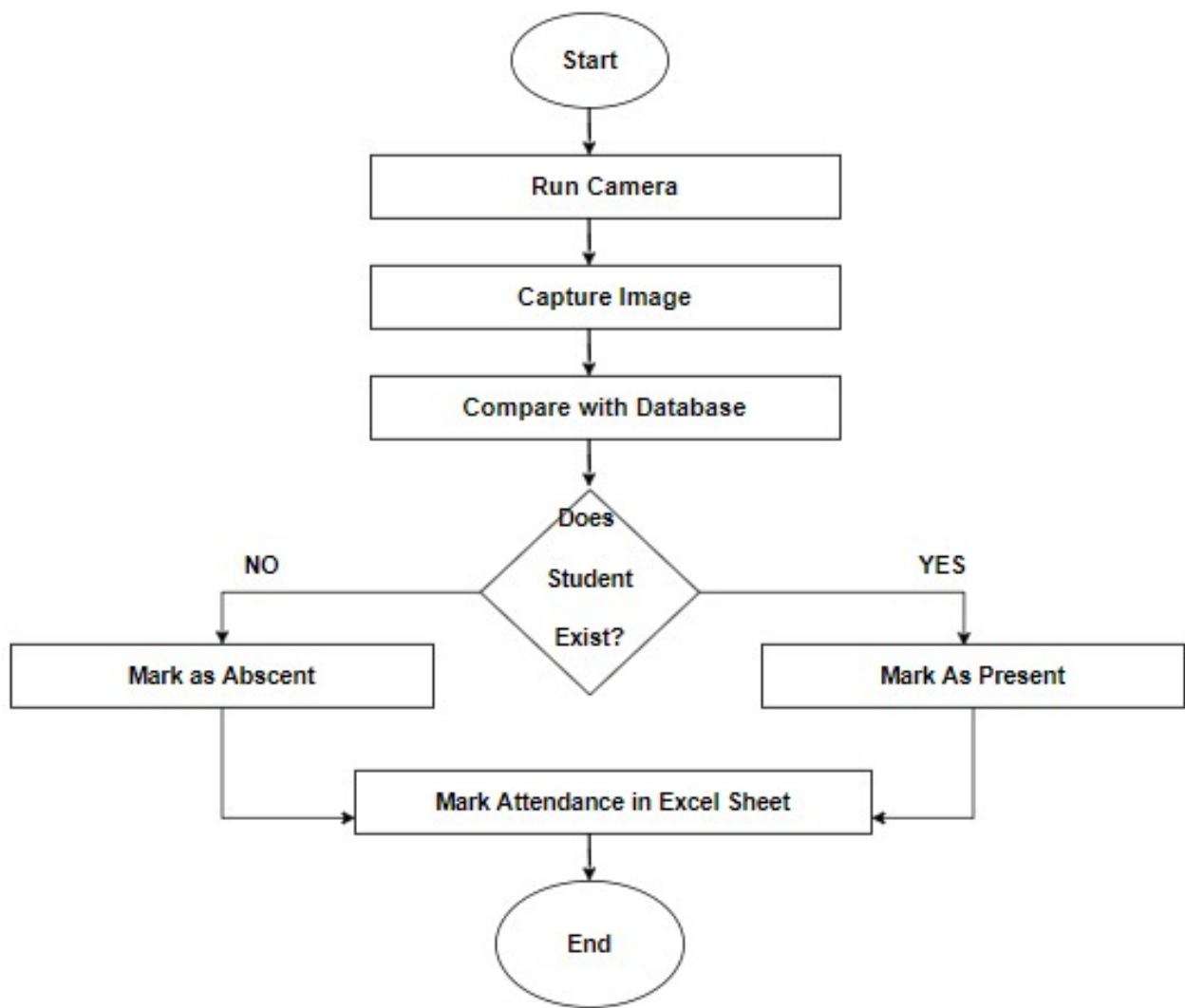

Figure No. 2

Data Flow Diagram

Level 0
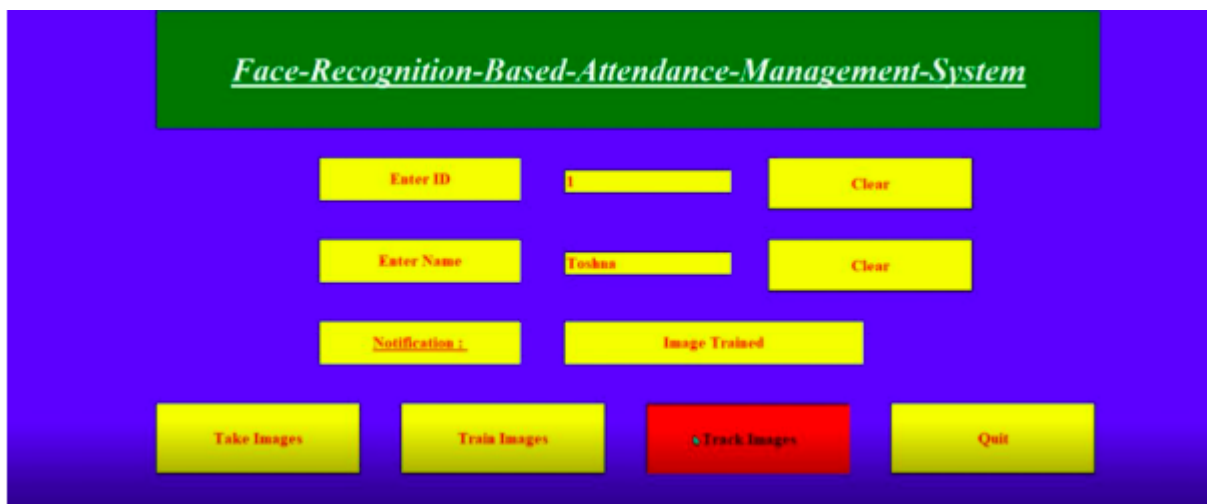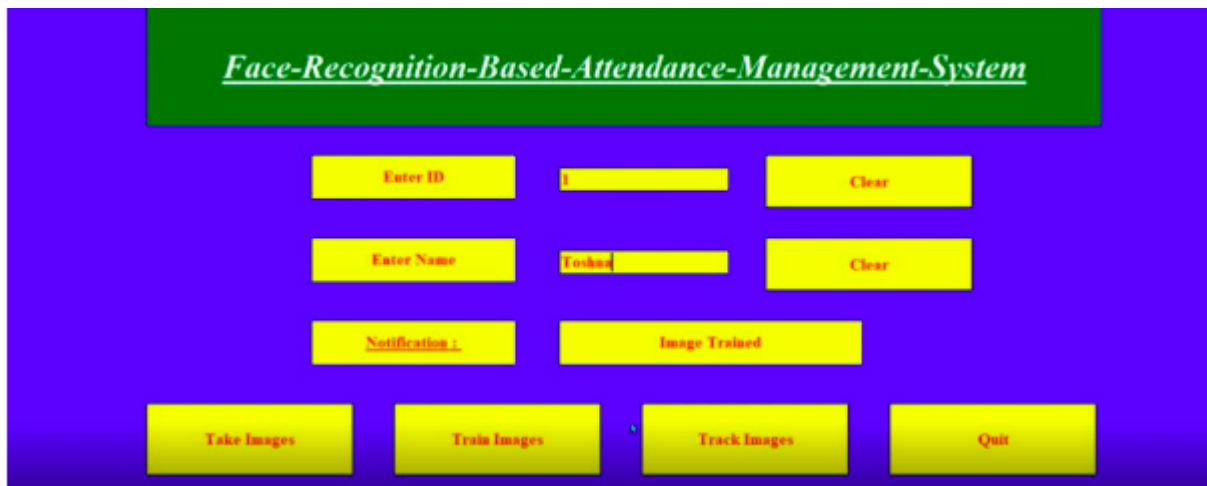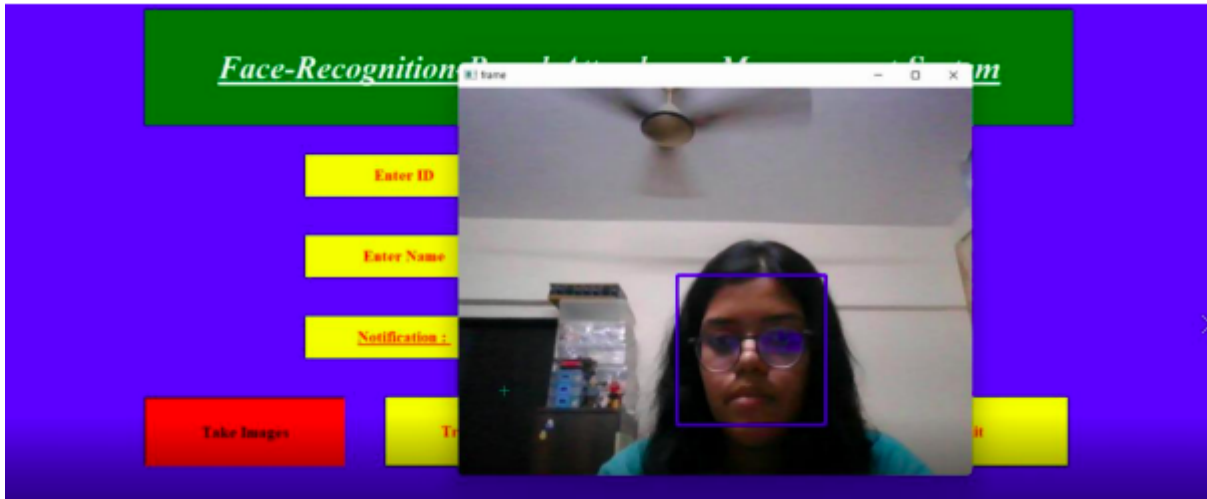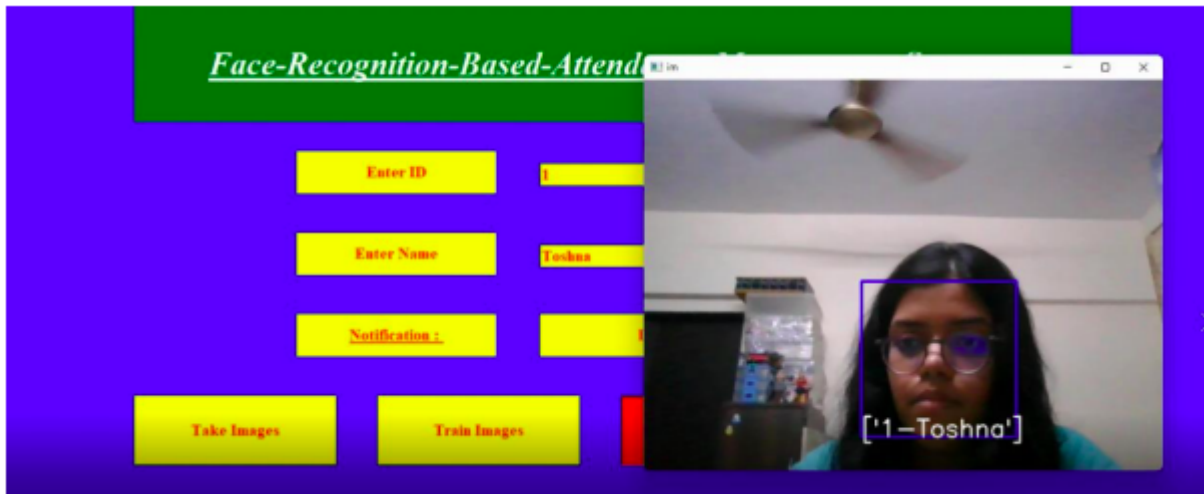
Figure No. 3

Level 1

Figure No. 4

7. Implementation :-

7.1 Code:

https://github.com/RaneToshna15/Face-Recognition-Based-Attendance-System-master.git

7.2 ScreenShots:

8.Conclusion :-

Thus, the aim of this paper is to capture the video of the students, convert it into frames, relate it with the database to ensure their presence or absence, and mark attendance to the particular student to maintain the record. The Automated Classroom Attendance System helps in increasing the accuracy and speed ultimately achieve the high-precision real-time attendance to meet the need for automatic classroom evaluation. Automated Attendance System can be implemented in larger areas like in a seminar hall where it helps in sensing the presence of many people. Sometimes the poor lighting condition of the classroom may affect image quality which indirectly degrades system performance, this can be overcome in the latter stage by improving the quality of the video or by using some algorithms

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