



Attendance Management System Using Face Recognition

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Abstract: In the present academic system, regular class attendance of students' plays a significant role in performance assessment and quality monitoring. The conventional methods are practiced in most of the institutions are by calling nadata reliability. The system is developed by the integration of ubiquitous components to make a portable device for managing the student's attendance using Face Recognition technology. An automated attendance system for human face recognition in real time background for a college to mark the attendance of their employees and students. So Smart Attendance using Face Recognition is a real world solution which comes with day to day activities of handling employees. Here multiple user faces are detected and recognized with the trained data base multiple texture-based features.

Key Words: Attendance Monitoring, Face Detection, Face Recognition, Haarcascade Algorithm, Opencv.

I.INTRODUCTION

Every organization requires a robust and stable An automated attendance system for system to record the attendance of their students and every organization have their own method to do so, some are taking attendance manually with a sheet of paperby calling their names during lecture hours and some have adopted biometrics system such as fingerprint, RFID card reader, Iris system to mark the attendance. Theconventional method of calling the names ofstudents manually is time consuming event. The RFID card system, each student assigns that is a person which is to be identifieddoes not to need to take any action for its identity. Face recognition involves two steps,first step involves the detection of faces and second step consist of identification of thosedetected face images with the existing database. There are number of face detectionand recognition methods introduced. Face recognition works either in form ofappearance based which covers the features of whole face or feature based which covers the geometric feature like eyes, nose, eyebrows, and cheeks to recognize the face. Our system uses face recognition approach to reduce the flaws of existing system with the help of machine learning, it requires a good quality camera to capture the images of students, the detection process is done by open cv The images capture by the camera issent to system for further analysis, the input image is then compared with a set of reference images of each of the student and mark their attendance. The paper is organized as follows: Introduction, Literature Review, Methodology, System Architecture and Result

II.LITERATURE REVIEW

In recent years, a number of face recognitionbased attendance management system have introduced in order to improve the performance of students in different organization. In Jomon Joseph, K. P. Zacharia proposed a system using image processing, PCA, Eigen faces, Microcontroller, based on Matlab. Their system works only with front face images and there is need of a suitable method whichworks with the orientation of the system.Ajinkya Patil with their fellows in proposeda face recognition approach for attendance marking using Viola jones algorithm, Haar cascades are used to detect faces in images and recognition performs through Eigen facemethod. Another approach of making attendance system easy and secure, the author proposed a system with the help of artificial neural networks, they used PCA to extract face images and testing and training were achieved by neural networks, their system performs in various orientations. A 3D face acknowledgment approach for participation the executive's framework was proposed by MuthuKalyani.K, VeeraMuthu.A has proposed, they marked attendance with monthly progress of each student. There is requirement for an elective calculation which can upgrade the acknowledgment on arrangedFaces..Efficient Attendance Management system is designed with the help of PCAalgorithm, the have achieved accuracy up to 83% but their system performance decreasesdue to slightly changes in light condition. An eigen face approach along with PCA algorithm for marking face recognition attendance system have introduced by author in, they mention comparison ofdifferent face recognition

III. METHODOLOGY

The proposed system is designed for automating the attendance of the different organization and reduces the flaws of existing manual system. The system calculates the attendance, which is the data of the students. the system automatically starts taking snaps and find whether human faces are appear in the given image or not Once faces are detected and recognize with the existing database, system calculate attendance for the recognize students with the respective names in real time. And an excel sheet generated and saved by the system automatically.

- **Image acquisition:** Image is acquire using a high definition camera which is placed in the classroom. This image is given as an input to the system.
- **Face Detection:** Face detection is the process of identifying and locating all the present faces in a single image or video regardless of their position, scale, orientation, age and expression. Moreover, the location ought to be regardless of incidental light conditions and the picture and video content.
- **Face Recognition:** Face Recognition is a visual example acknowledgment issue, where the face, spoke to as a three dimensional item that is liable to shifting in lightening, present and different components, should be recognized dependent on gained pictures. Face Recognition is in this manner basically the errand of recognizing a previously identified face as a known or obscure face and in further developed cases telling precisely whose face it is.

3.1 Parameters:

Pose estimation: Since people move around and look at different directions in front of the real-time camera, it is possible to have a wide range of head poses oriented at different angles. But for the sake of biometrics, it is important to have least rotated face as a standout in the entire face-log. Thus it is important to include this feature in face quality assessment. We determined the head pose using three angles: Roll, Yaw, and Pitch. All these angles are typically between 90 to +90. The roll and pitch are adjusted by aligning technique during face-log generation, so our only concern is yaw angle. Using face landmarks detection, we calculated the coordinates of nose tip and also the point between the eyebrows. If (x_1, y_1) and (x_2, y_2) are such points, then yaw angle is computed as:

$$\text{yaw} = \arctan 2(y_2 - y_1, x_2 - x_1) \dots \dots \dots (1)$$

Then Normalized head-pose parameter (NHP) is obtained as shown in table

TABLE I: Head-pose estimation

Range Of Yaw Angle	0 to 10	10 to 20	20 to 30	More than 30
NHP	1	0.5	0.33	0.25

Sharpness: It is very likely to have blurry images in real time video sequences because the faces are moving. Thus it is important to include this feature in face quality assessment. To compute the sharpness of an image, we utilized the variance of an image Laplacian. This can be defined as: $\sum_{(i,j) \in \mathbb{Y}(x,y)} (I(i,j) - \bar{I})^2$ where \bar{I} is the mean value of image Laplacian within $\mathbb{Y}(x, y)$. We took a grey-scale channel of an image and convolved it with the (3×3) kernel and took the variance of that result. If the variance falls below a pre-defined threshold, then the image is considered as a blur. This threshold depends on the working environment and can be set accordingly. We then normalized it with a pre-defined threshold.

Image size or resolution: Since we employed the face tracking technique, the camera tracks the face as long as the face is in the scene. But, as the face moves far away from the camera, there will be a large distance between the camera and the face. Thus, the size of the face becomes smaller. Thus, it is important to include this feature in face quality assessment. Using face landmark detection, we calculated the position of the eye corners in a face. Let (x_L, y_L) be the coordinates of the left eye corner and (x_R, y_R) be the coordinates of the right eye corner. The distance between them is given by:

$$\text{Resolution} = \sqrt{(x_L - x_R)^2 + (y_L - y_R)^2} \dots \dots \dots (2)$$

Final Score: In order to get the best quality image in the real-time video sequence, we need to assign weights to each of the normalized parameters (NHP, NS, NR, NB). We gave the highest priority to the head pose followed by other parameters as shown in Table II. So, we computed the Face Quality Assessment (FQA) as,

$$\text{FQA} = \text{NHP} \times 17 + \text{NS} \times 9 + \text{NB} \times 6 + \text{NR} \times 8 \dots \dots \dots (3)$$

Greater is the value of FQA, greater will be the quality of face which will be stored in Face-log. We can set the threshold

for these FQA values of generated images to prevent the bad quality images from being stored in face- log.

- 1. Representation:** Face representation is the core of the recognition algorithm used in this system. The face image captured after the quality assessment is needed to be represented in form of feature for further processing. The preprocessed images are too high-dimensional for a classifier to take directly on input. To obtain a low-dimensional distinct feature from the face images we used Convolution Neural Network (CNN), popularly known as deep learning. A deep network is a feed-forward network comprising of many function compositions, or layers. The network is provided with a loss function. The loss function measures how accurately the neural network classifies an image.
- 2. Haar CasCade Features:** Item Detection utilizing Haar include based coarse classifiers is a compelling article. Location technique proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection utilizing a Boosted Cascade of Simple Features" in 2001. It is an AI based methodology where a coarse work is prepared from a great deal of positive and negative pictures. It is then used to recognize questions in different pictures. Here we will work with face recognition. At first, the calculation needs a ton of positive (pictures of appearances) and negative (pictures without faces) to prepare the classifier. At that point we have to separate highlights from it. For this, Haar highlights appeared in the beneath picture are utilized. They are much the same as our convolutional portion. Each component is a solitary worth got by subtracting entirety of pixels under the white square shape from total of pixels under the dark square shape.
- 3. Haar-cascade Detection in OpenCV:** OpenCV accompanies a mentor just as finder. In the event that you need to prepare your own classifier for any article like vehicle, planes and so on you can utilize OpenCV to make one. Its full subtleties are given here: Cascade Classifier Training. Here we will manage recognition. OpenCV as of now contains numerous pre-prepared classifiers for face, eyes, grins, and so forth. Those XML records are put away in the `opencv/information/haarcascades/organizer`. How about we make a face and eye locator with OpenCV. First we have to stack the required XML classifiers. At that point load our info picture (or video) in grayscale mode.

IV. SYSTEM ARCHITECTURE

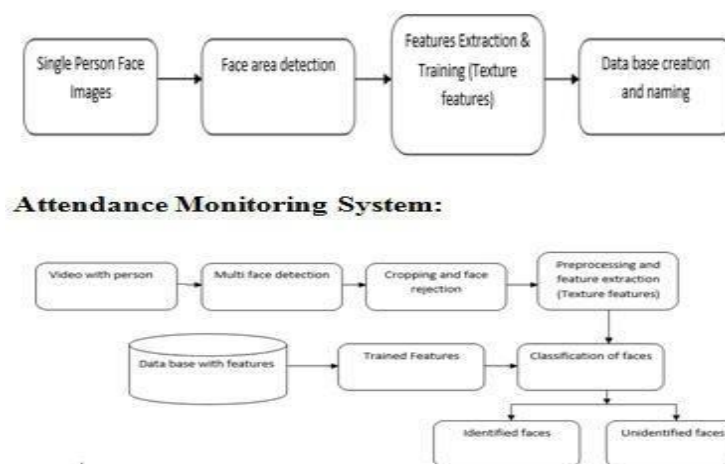
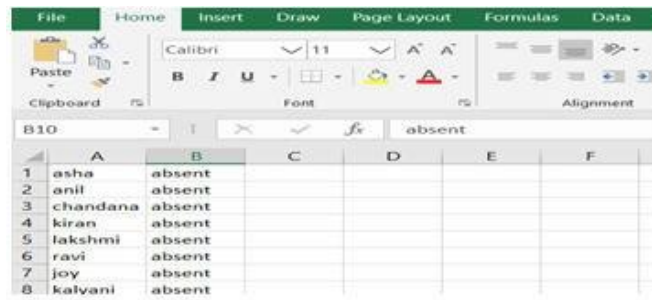


Figure 1 Data Base Creation

- a. Face Detection and Extraction:** Face detection is important as the image taken through the camera given to the system, face detection algorithm applies to identify the human faces in that image, the number of image processing algorithms are introduced to detect faces in an image and also the location of that detected faces. We have used HOG method to detect human faces in given image.
- b. Face Positioning:** There are 68 specific points in a human face. In other words we can say 68 face landmarks. The main function of this step is to detect landmarks of faces and to position the image. A python script is used to automatically detect the face landmarks and to position the face as much as possible without distorting the image.
- c. Face Encoding:** Once the faces are detected in the given image, the next step is to extract the unique identifying facial feature for each image. Basically whenever we get localization of face, the 128 key facial points are extracted for each image given input which are highly accurate and these 128-d facial points are stored in data file for face recognition.
- d. Face Matching:** This is the last step of face recognition process. We have used one of the best learning techniques that is deep metric learning which is highly accurate and capable of outputting a real value feature vector. Our system ratifies the faces, constructing the 128-d embedding (ratification) for each. Internally, a compare faces function is used to compute the Euclidean distance between face in image and all faces in the dataset. If the current image is matched with the 60% threshold with the existing dataset, it will move to attendance marking.

V. RESULTS

STEP 1: In this attendance sheet we can enter our names which are required to take the attendance. Here by default we can take it as absent.



	A	B	C	D	E	F
1	asha	absent				
2	anil	absent				
3	chandana	absent				
4	kiran	absent				
5	lakshmi	absent				
6	ravi	absent				
7	joy	absent				
8	kalyani	absent				

Figure 2 Attendance Sheet

STEP 2: In the dataset we should capture the image of the students using web camera. The face recognizer compares the input face in the image captured with the faces captured during enrollment. On the off chance that it is a match, it, at that point, recovers the name related with the information face.

STEP 3: Multiple images are captured and stored in dataset for more accuracy using web camera. In this data set all the images of data which we are captured through IP webcam are stored with different types of folders with different names which are mentioned in the attendance sheet for each folder it stored 30 images of single person which are helpful to detect the required face easily. We have to start training to the set of images that are stored in the database.

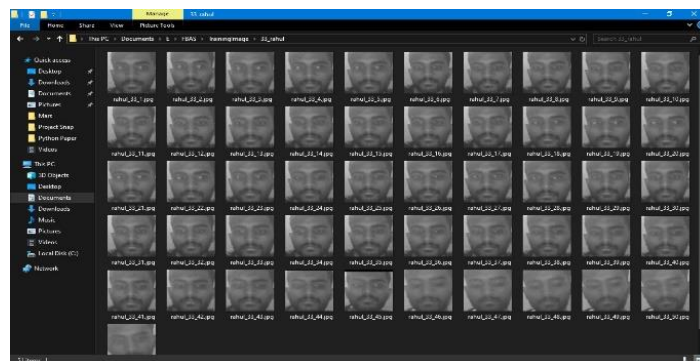
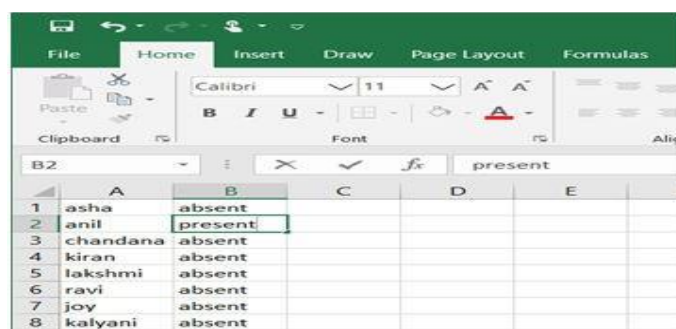


Figure 2 Multiple Images

STEP 4: On clicking RUN for attendance final file, the recognition process starts and the detected face is recognized along with student name.

OUTPUT: Final output can be seen in Excel sheet. Later by observing the attendance final they automatically printed as present when both captured image and data base image comparison are equal. When the face of the particular student is recognized, then the attendance is marked for that student for that particular day. If some students are absent then no attendance is marked for them.



	A	B	C	D	E	F
1	asha	absent				
2	anil	present				
3	chandana	absent				
4	kiran	absent				
5	lakshmi	absent				
6	ravi	absent				
7	joy	absent				
8	kalyani	absent				

Figure 3 Attendance of the Student

VI.CONCLUSION

Smart attendance management system is designed to solve the issues of existing manual systems. We have used face recognition concept to mark the attendance of student and make the system better. The system performs satisfactory in different poses and variations. In future this system need be improved because this systemsometimes fails to recognize students from some distance, also we have some processing limitation, working with a systemof high processing may result even better performance of this system.

REFERENCES

1. Kar, Nirmalya, et al. "Study of implementing automated attendance system using face recognition technique." *International Journal of computer and communication engineering* 1.2 (2012): 100.
2. RoshanTharanga, J. G., et al. "Smart attendance using real time face recognition (smart-fr)." *Department of Electronic and Computer Engineering, Sri Lanka Institute of Information Technology (SLIIT), Malabe, Sri Lanka* (2013)
3. Selvi, K. Senthamil, P. Chitrakala, and A. Antony Jenitha. "Face recognitiona attendance monitoring system." *Corresponding Author: S. Rajkumar*, Email: Rajkumar Rajkumar@gmail. com* (2014).
4. Joseph, Jomon, and K. P. Zacharia. "Automatic attendance management system using face recognition." *International Journal of Science and Research (IJSR) qwegvb,.* 2.11 (2013): 327- 330.
5. Patil, Ajinkya, and Mrudang Shukla. "Implementation of classroom attendance system based on face recognition in the class." *International Journal of Advances in Engineering & Technology* 7.3 (2014): 974.
6. Kanti, Jyotshana, and Shubha Sharm. "Mechanized Attendance utilizing Face Recognition dependent on PCA with Artificial Neural Network." *International journal of science and research IJSR* (2012).
7. MuthuKalyani, K., and A. VeeraMuthu, "Smart application for AMS using face recognition." *Computer Science & Engineering* 3.5 (2013): 13.
8. Deshmukh, Badal J., and Sudhir M. Kharad. "Efficient Attendance Management: A Face Recognition Approach." (2014).
9. Wagh, Priyanka, et al. "Participation framework dependent on face acknowledgment utilizing eigen face and PCA calculations." *2015 International Conference on Green Computing and Internet of Things (ICGCIoT). IEEE, 2015.*
10. Bhattacharya, Shubhobrata, et al. "Smart Attendance Monitoring System (SAMS): A Face Recognition Based Attendance System for Classroom Environment." *2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT). IEEE, 2018.*
11. Samet, Refik, and Muhammed Tanriverdi. "Face acknowledgment based versatile programmed homeroom participation the executive's framework." *2017 International Conference on Cyberworlds (CW). IEEE, 2017.*
12. Li, Xiang-Yu, and Zhen-Xian Lin. "Face acknowledgment dependent on HOG and quick PCA calculation." *The Euro-China Conference on Intelligent Data Analysis and Applications. Springer, Cham, 2017.*Based face recognition attendance system." *2017 IEEE 15th International Symposium on Intelligent Systems and Informatics (SISY). IEEE, 2017.*
13. Rekha, N., and M. Z. Kurian. "Face detection in real time based on HOG." *International Journal ofAdvanced Research in Computer Engineering & Technology (IJARCET)* 3.4 (2014): 1345-1352.
14. Kwolek, Bogdan. "Face recognition utilizing convolutional neural systems and channels." *International Conference on Artificial Neural Networks. Springer, Berlin, Heidelberg, 2005.*" *International Conference on Artificial Neural Networks. Springer, Berlin, Heidelberg, 2005.*
15. Ashwini, C., et al. "An Efficient Attendance System Using Local Binary Pattern and Local Directional Pattern." *Journal of Network Communications Emerging Technologies (JNCET) www. jncet. organization* 8.4 (2018).
16. Karnalim, Oscar, et al. "Face- face at study hall condition: Dataset and investigation." *2018 Eighth International Conference on Image Processing Theory, Tools and Applications (IPTA). IEEE, 2018.*