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SMART ATTENDANCE MONITORING SYSTEM (SAMS): A FACE RECOGNITION BASED ATTENDANCE SYSTEM FOR CLASSROOM ENVIRONMENT

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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 names or signing on papers, which is highly time-consuming and insecure. This article presents the automatic attendance management system for convenience or data 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, Open cv.

1.INTRODUCTION

Every organization requires a robust and stable 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 paper by calling their names during lecture hours and some have adopted biometrics system such as fingerprint, RFID card reader, Iris system to mark the attendance. The conventional method of calling the names of students manually is time consuming event. The RFID card system, each student assigns a card with their corresponding identity but there is chance of card loss or unauthorized person may misuse the card for fake attendance. While in other biometrics such as finger print, iris or voice recognition, they all have their own flaws and also they are not accurate. Marking is the smart way of attendance management system. Face recognition is more accurate and faster technique among other techniques and reduces chance of proxy attendance. Face recognition provide passive identification

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that is a person which is to be identified does 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 those detected face images with the existing database. There are number of face detection and recognition methods introduced. Face recognition works either in form of appearance based which covers the features of whole face or feature based which covers the geometric feature like eyes, nose, eye brows, 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 is sent 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:

I. Section –Introduction
II. Section-Literature Review
III. Section-Methodology
IV. Section-System Architecture
V. Section-Result

2.LITERATURE REVIEW

In recent years, a number of face recognition based 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 which works with the orientation of the system. Ajinkya Patil with their fellows in proposed a face recognition approach for attendance marking using Viola jones algorithm, Haar cascades are used to detect faces in images and recognition performs through Eigen face method. 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 executives 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 arranged Faces..Efficient Attendance Management system is designed with the help of PCA algorithm, the have achieved accuracy up to 83% but their system performance decreases due 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 of different face recognition algorithm in their paper. Overall it was good approach to maintain record of attendance.

3.METHODOLOGY

The proposed system is designed for automating the attendance of the different

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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 enlightenment, 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.

- Parameters:

1. 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 (x1, y1) and (x2, y2) are such points, then yaw angle is computed as:

$$yaw = abs(\arctan 2(y2 - y1, x2 - x1))$$

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

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

2. 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:

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∑ Sharpness = (i,j)∈¥(x,y) (×I(i, j) − ×I)2 where I is the mean value of image Laplacian within ¥(x, y). We took a grey-scale channel of an image and convolved it with the (3x3) 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.

3. 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 (xL, yL) be the coordinates of the left eye corner and (xR, yR) be the coordinates of the right eye corner. The distance between them is given by:

Resolutuion=√(XL-XR)2+(YL-YR)2

4. 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,

FQA = NHP × 17 + NS × 9+ NB × 6+ NR × 8 (9)

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.

5. 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 net work classifies an image

 Haar CasCade Features:

Item Detection utilizing Haar include based course 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&quote in 2001. It is an AI based methodology where a course 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

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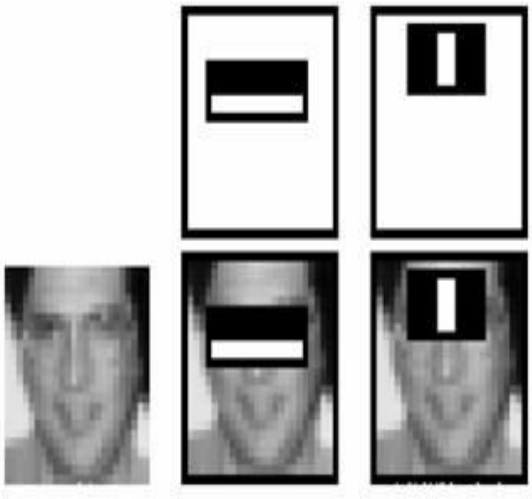
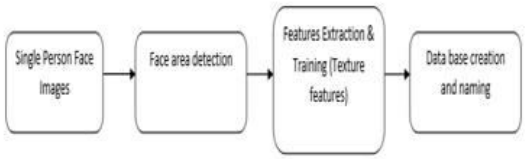
classifier. At that point we have to separate highlights from it. For this, Haar highlights appeared in the beneath picture are utilized. They are much the same as our convolutional portion. Each component is a solitary worth got by subtracting entirety of pixels under the white square shape from total of pixels under the dark square shape.



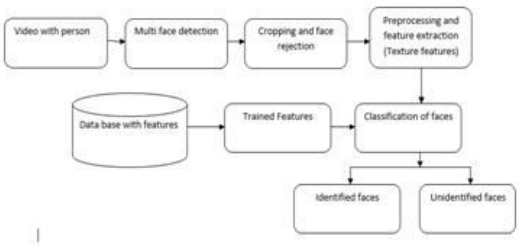
 Haar-cascade Detection in OpenCV: OpenCV accompanies a mentor just as finder. In the event that you need to prepare your own classifier for any article like vehicle, planes and so on you can utilize OpenCV to make one. Its full subtleties are given here: Cascade Classifier Training Here we will manage 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.

4. SYSTEM ARCHITECTURE

Data Base Creation:



Attendance Monitoring System:



1.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 introduce to detect faces in an images and also the location of that detected faces. We have used HOG method to detect human faces in given image.

2.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.

3.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

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we get localization of face, the 128 key facial point 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

4. Face matching: This is last step of face recognition process. We have used the one of the best learning technique that is deep metric learning which is highly accurate and capable of outputting real value feature vector. Our system ratifies the faces, constructing the 128- d embedding (ratification) for each. Internally 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.

5.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.

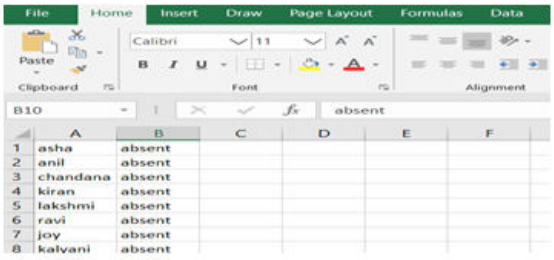

Fig 5.1: Attendance Sheet

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.

Fig 5.2: Capturing an Image

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.

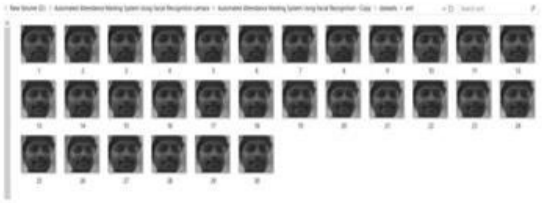

Fig 5.3: Images in a Dataset

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

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Fig 5.4: Recognizing a Image with 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.

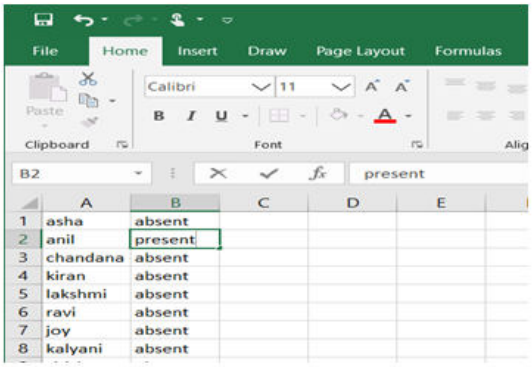

Fig 5.5: Attendance of an Student

6.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 system sometimes fails to recognize students from some distance, also we have some processing limitation, working with a system of high processing may result even better performance of this system.

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