Attendance System using Face Recognition

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Abstract—In the current educational system, student's frequent attendance in class is very important for performance evaluation and the quality control. Most institutions still use insecure, time-consuming traditional methods like calling people by the name or having them sign documents. Face recognition technology based on high-definition monitor video and other information technologies is used to solve the problem of the recognizing face for taking attendance. A facial recognition attendance system uses facial technology to automatically record attendance while identifying and verifying a person based on their facial features. This research focusing on a face recognition-based attendance system with getting a less false-positive rate using a threshold to confidence i.e., Euclidean distance value while detecting unknown persons and save their images. Compare to other Euclidean distance-based algorithms like Eigenfaces and Fisher faces, Local Binary Pattern Histogram (LBPH) algorithm is better. We used Haar cascade for face detection because of their robustness and LBPH algorithm for face recognition. It is robust against monotonic grayscale transformations. Scenarios such as face recognition rate, false-positive rate for that and false-positive rate with and without using a threshold in detecting unknown persons are considered to evaluate our system. We got face recognition rate of students is 77% and its false-positive rate is 28%. This system is recognizing students even when students are wearing glasses or grown a beard. Face Recognition of unknown persons is nearly 60% for both with and without applying threshold value. Its false-positive rate is 14% and 30% with and without applying threshold respectively.

Keywords—Face recognition, face detection, machine learning, Haar Cascade Algorithm, Local Binary Pattens Histograms (LBPH).

I. INTRODUCTION

Control of machines and their process with various technologies based on computer software is called automation. In this modern age, these advancements have proven to increase accuracy and also helping us to improve our livelihood. Innovations such as these save lots of labor work. One advancement in the field of automation is the Automated.

The proposed system aims to create a face recognition-based attendance system with a less false-positive rate. It uses Haar cascade and LBPH algorithm, which are robust against monotonic grayscale transformations. It also detects and saves the images of any unknown person in the class whose Information is not in the database.

In [2] the authors projected an attendance System utilizing RFID cards. In this approach, the projected RFID tag uses strength from the tag reciter. The question at this moment approach is that an person who is unfamiliar can use a genuine ID card and come the University. There are more documents including utilizing biometrics for attendance. In [3] mark is secondhand for designating the attendance of scholars. There is a biometric sensor that will take the mark, feature distillation approved at which point dossier. If it is for admission therefore that dossier is stocked in the table else if it is for confirmation therefore that dossier is begun corresponding accompanying the dossier in the table. The question at this moment procedure is that for attendance graduates concede possibility make use of the place this fittings design is situated or pass the fittings device about the juniors all the while class that maybe a confusion to the pupils. And in [4] and [12] iris located attendance structure is secondhand. The question at this moment approach is that it is alert incidental determinants. In [1] authors projected a face acknowledgment located attendance system established Eigenface acknowledgment. Images are con verted into eigenfaces, Recognition is acted by equating eigenface took from the recommendation countenance and eigenfaces in the table. The question at this moment approach is that this plan is very awake face backdrop, head orientations and it doesn't acknowledge the face of one if the customer is tiring pince-nez or a mature beard, etc. But in the approach proposed in this place paper, our structure is not alert face education, head orientations and it perceives one's face even though he evolves a beard or wears cheaters, etc.

II.   PROPOSED SYSTEM

The proposed automated attendance management system is based on haar cascade for face detection and the LBPH algorithm for face recognition. Fig 1

This system provides functionalities such as taking images of students, training the images in the database and on the camera, and tracking people entering the classroom. When students enter the classroom, the system detects their faces from the camera and pre-processes them for further processing. The implementation of each stage is detailed in the next section.
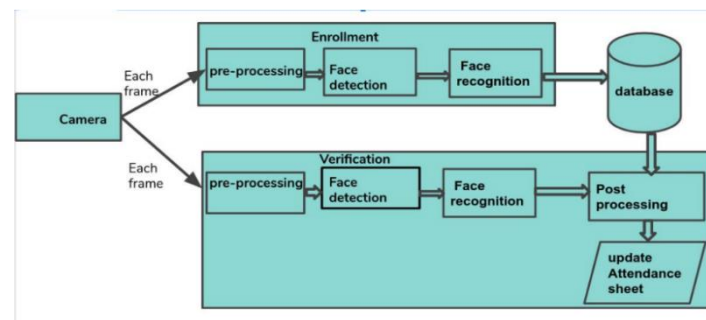

Fig. 1. Overview of Proposed System
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III.   Experiments

We created a database of 18+ individuals with 60 images of each for this project, and 10 individuals are considered for testing recognition of unknown persons. There are 18 individuals with 60 images and 10 individuals are considered for testing recognition.

We tested our system using a live real-time video in which students and unknown persons come and stand in front of the camera. Fig. 3 shows a few images after the pre-processing stage.

Algorithm 1:
Pseudocode for the proposed system

Input: Live video with student face visible.

Output: Attendance Excel sheet.

1. Transform each frame from RGB to grayscale.

2. Apply the Haar Cascade classifier for face detection and get the Region Of Interest (ROI).

3. Now apply the LBPH algorithm on the ROI to get the features.

4. **if** *for enrollment* **then**
   features are stored in the database
   else if *for verification* **then**
   do post-processing

Fig. 3 Extracted and pre-processed faces of students

A. Preprocessing and Face Detection

First, we convert the frame from color to grayscale. To detect the faces, we used a haar cascade classifier which is proposed in [8] where a cascade function is trained and detect features in other images. For this, we use haar features like edge, line, and four-rectangle.

For a large image or variable size of an image, it takes a lot of computations and features and most of them will be irrelevant. But AdaBoost manages to select the best out of many as shown in Fig.4.[9] Then Region of Interest (ROI) i.e containing faces is extracted and sent to next stage.

B. Face Recognition

The LBPH algorithm is used for face recognition due to its robustness, capability to recognize both front and side faces, and better compared to Eigenfaces and Fisherfaces[6]. It is easier to use as it characterizes the image locally and compares the result to each of the pictures within the dataset. It works better in different environments and light conditions than other algorithms.

Local Binary Pattern (LBP) [5] operation creates an image which highlights the characteristics of a image in a better way. It uses the concept of the sliding window and the parameters, radius and neighbors [7]. It is showed in Fig. 4.[10]

The most important details in this text are the steps involved in converting a frame into matrices of 3X3 pixels. If a neighbor pixel in a matrix is greater than the median pixel of that matrix, a binary number is set and replaced with the median pixel value. As the image is now converted into LBP form, extract histograms from each grid and concatenate to form a new and larger histogram. These histograms indicate the characteristics of the original image and represent the facial image from the database. For the new image, it performs the same steps and gets a new histogram for the image.

C. Post processing

The most important details in this text are that the system compares the new histogram with the histograms from the training dataset and chooses the histogram with the lowest confidence. If confidence is less than 50, details belong to the extracted ID are shown on the frame [11] and the names are

updated into an excel sheet if the student's name is not in the excel sheet. If confidence is greater than 95, the person's image is saved in a separate folder. This helps in identifying any intruders in the class and reduces the wrong classification of students to an unknown person.
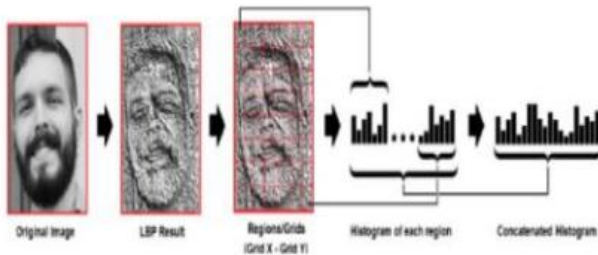

Fig. 4. process of LBPH algorithm on an image

Table 1

TABLE. 1: PERFORMANCE EVALUATION OF THE SYSTEM

Performance Evaluation	%
Students Recognition Rate (Live video)	77%
false-positive rate (Students)	28%
Unknown person Recognition Rate (existing model)	60%
Unknown person false-positive rate (existing model)	30%
Unknown person Recognition Rate (proposed model)	60%
Unknown person false-positive rate (proposed model)	14%

D. Calculation of Defaulters

The defaulters' part of the attendance report is responsible for identifying students who have missed more than a certain number of classes and marking them as "defaulters" in the attendance report. A threshold value is set and the attendance percentage for each week is calculated using the formula (number of classes attended in the week / total number of classes in the week) * 100. If the attendance percentage for any week is below the threshold value, that student is marked as a defaulter for that week. The

list of defaulters is added to the attendance report by creating a new column called "Defaulters" and marking each student who has missed more than the threshold number of classes as a defaulter.

IV.   RESULT AND ANALYSIS

The Face Recognition rate of students is 77% and its false-positive rate is 28%. Face Recognition of unknown persons is 60% and its false-positive rate is 14% and 30% respectively refer to Table 1. The threshold value only affects the false positive rate of an unknown person. In the existing system, when the person in the video turns his head greater slightly then confidence value for that frame may get greater than favorable filter value then the person in the frame is considered as an unknown person. In the proposed system, if confidence is greater than 50 and 95 then only a person is considered as an unknown person and that person's image is saved as an unknown person.

VI. CONCLUSION

LBPH is one of the prominent techniques for face recognition. Our system successfully recognizes a student with unintentional changes like wearing glasses or growing beard. Here the problem is the dataset is small. In future, An effort could be made to build a better dataset, that might practically give a more accurate result. We can Improve haar cascade classifiers through the synthesis of new training examples which can improve the recognition rate of unknown persons. A system alert (voice and visual) can be included if an intruder is detected in the class.

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