Automated Attendance Using Face Recognition

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Abstract - **In a world progressing towards a digital age, even today in classrooms manual attendance systems are still used on a macro scale. Instead of using this time-consuming and laborious method, we can instead design an automated attendance system to save time. The proposed system will make use of OpenCV Module in python which uses Haar Cascade Classifier for face detection and Local Binary Patterns Histograms (LBPH) for face recognition. The proposed system will contain stored images of student's faces in the system's database for which attendance records are to be maintained. On successful recognition of students' faces present in the classroom, they will be matched with the database of the system and for those students registered in the database, an excel sheet will be created to record their attendance.**

Index Terms - **OpenCV, Python, Face detection, Haar Cascade Classifier, Face recognition, Local Binary Patterns Histograms (LBPH).**

I.INTRODUCTION

In the last few decades technology has revolutionized and reached new heights. But still, in the education department, we are making use of the laborious manual attendance system to record the attendance of a particular class. Not only is this method slow but also provides a chance for the students to manipulate the records. With the advent of Deep Learning, many algorithms have surfaced which can be used for automated attendance, to keep records of the attendance in a class. An automated attendance system can be used to overcome the drawbacks of a manual attendance system. Already many existing systems make use of automated attendance via fingerprint scanners, iris detection, etc. These automated attendance systems are highly accurate but are also expensive. Instead of installing these infrastructures we can create a system with face detection and face recognition to facilitate automated attendance.

II.LITERATURE SURVEY

1. Face Recognition Based Attendance System:
This paper was published in the International Journal of Engineering and Advanced Technology (IJEAT). This paper aims to capture the video of the students in the classroom, and convert it into images with faces of students, match it with the database to ensure whether the student is present or absent, and thus mark attendance to that particular student and maintain their attendance record. It makes use of the Convolution Neural Network (CNN) for the detection and recognition of faces and shows how cameras installed in the classroom can be used for face recognition.

2. Face Recognition Using Haar Cascade Classifier
The paper "Face Recognition Using Haar Cascade " shows how to recognize face using deep learning technologies. Haar Cascade provided by OpenCV is used for Face Detection, more specifically haar cascade frontal face default.xml is used for detecting the facial region from an image by discarding noise from the image. After the face is extracted, it is used for training the recognizer. LBPH provided by OpenCV is used for face recognition which segregates an image into several smaller regions, the features from this smaller region are used to estimate the similarity between the images which eventually facilitates the task of face recognition. It proposes an on-door face verification system where the camera is to be installed and makes use of Raspberry pi's CPU as the hardware system. Those verified will be given access and on the other hand, those students who fail the face recognition will not be given access and these records are to be sent to Google Drive.

3. Automated Student Attendance Management System using Face Recognition:

This article was published in the International Research Journal of Engineering and Technology (IRJET). It makes use of video-based face recognition. From the video, the faces are extracted using Haar cascade features, and face recognition is done using, local binary pattern histogram (LBPH). It makes use of 500 images for training the data so that accuracy of face recognition is high and precise. It also requires a high-resolution webcam or camera to capture the images to be tested against the images stored in a database. It also generates an excel file to indicate records of faces successfully recognized.

4.Face Recognition-based Lecture Attendance System:
In this work, it is shown how the system automatically receives assistance through facial recognition, which is obtained through continuous observation. This continuous observation helps in calculating and enhancing attendance performance. To record the attendance, positions, and images containing the faces of the student present in the classroom are taken. With the help of continuous observation and recording the system calculates, seating position i.e location of each student which is then for attendance marking. It focuses to obtain different weights of each focused seat with respect to its location.

III. PROPOSED SYSTEM

We propose making use a of mobile camera/webcam for taking the picture, as it provides with higher resolution picture quality, and it can be done simultaneously by each student on their respective mobile devices. While taking the picture students can form a group of 5-8, so that their faces are captured in the same picture and thereby reducing the number of images in the face detection and face recognition phase of the system.
Once the picture is taken the next phases of the system are:
- Face Detection
- Face Recognition
- Database and Report maintenance

2.1 Face Detection Phase:
Face detection problem deals with the problem of identifying facial regions in a given image. The facial region in the image will be bounded by a rectangular/square box to highlight the facial region in the image. We make use of the Haar Cascade Classifier by OpenCV module for face detection. It uses Haar features for extracting the facial region in the image. Each feature is basically a single value which is calculated by deducting the pixel's sum under the white rectangle from the pixel's sum under the black rectangle.

2.2 Face Recognition Phase:
Face recognition problem tells whether the facial region already detected is a familiar face or not. Before the face verification, the face detected is converted into grayscale. Local Binary Patterns Histograms (LBPH) are used for face recognition. It marks the pixels of an image by thresholding the adjoining area of each pixel and considers the result as a binary number. The binary values are converted into decimal values. The decimal values represent the image with better characteristics. The image is then divided into regions and histograms are computed for it. Lastly, the histograms of all the regions are concatenated together. Each face has a unique histogram. The test image histogram is contrasted with the train image histogram for calculating the similarities, Euclidean Distance method is used for that.

2.3 Database and Report maintenance:
As we are using the OpenCV module in python in our proposed system, thus for easier integration we will make use of the MYSQL database.

IV. IMPLEMENTATION

4.1Registering the students and storing them in the database:
In order for the model to learn, we will first have to train the data. First, we need to register the students, which is done by entering the student details and then using the Take Images button which will lead to capturing of the image. After that, the facial region from the images is cropped, resized, and converted into grayscale, and stored in the database. Around 60-80 images are stored in the database after the face region detection from the image. Train image button then can be used for training the model on the images of students stored in the database.

4.2Automated Attendance

Once the model is trained, we can then use the system for automated attendance by using the Automatic Attendance button. It will then lead to the window for capturing the image via the take image button. After the face is detected, if the face is recognized successfully then it will lead to the window for entering the subject name. We can then use the fill attendance button to record the attendance for the successfully recognized faces of students which is facilitated by creating an excel sheet indicating the attendance report.

V. FUTURE SCOPE

We had tested using both webcam and mobile camera in our proposed system and found that mobile camera provides more flexibility, and it also provides higher accuracy because of the higher resolution of pictures taken by them. In order to build a more seamless system, multiple cameras installed in the classroom covering the entire area of the classroom can be used to reduce human involvement and thereby making it more seamless.

VI. CONCLUSION

By making use of Haar Cascade Classifier for face detection and Local Binary Patterns Histograms (LBPH) by OpenCV module in Python, we can design an automated attendance system to maintain the attendance report for the classroom. For the students registered in the database of the automated attendance system, if their faces are successfully recognized during the lecture then an excel sheet is automatically created to maintain these records.

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