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Development Of Face Recognition Based Attendance System

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ABSTRACT

In any kind of organization, it is impossible to overstate the significance of showing up to meetings regularly. When recording attendance manually, it is simple to overlook a person or to count them more than once. A face recognition-based attendance system provides a solution to the problem of recognizing faces in order to collect attendance data by employing face recognition technology that is based on high-definition monitor video in addition to other information technologies. This technology enables the system to collect attendance data. A computer's ability to identify human faces in real time is referred to as "facial recognition," and the phrase describes this ability. The human brain possesses the capacity to instantly and unconsciously differentiate between numbers of different people's faces. However, at the level of the human brain, it is almost impossible for a computer to mimic all of the tough activities. The ability to identify an individual based on his or her face is an essential component of biometrics. The most fundamental aspects of human anatomy are connected to the most recent data in the field of biometrics. A variety of time-saving methods are utilised in order to extract and apply facial features.

Key words: face recognition, human anatomy, automatic attendance-taking system.

1. INTRODUCTION

The conventional method of taking attendance in class seems to be tedious and time taking. Moreover, it also has chances of missing out on someone or taking attendance of the same person more than once as we are taking the attendance manually [1]. The manual method of taking attendance not only has these chances of errors and disadvantages but also makes it difficult to manage the hardware copies of the documents and keeping a track of all the details [2]. Therefore, a need of an automatic attendance-taking system was required to overcome all these difficulties. Face Recognition Based Attendance System provides a solution to our problem. The use of face-recognition technology to detect the face of the student and mark attendance based on that which makes it easy to record attendance and reduce the chances of errors. This strategy takes the place of conventional student identification procedures like calling students by name, verifying their identification cards, and keeping track of every employee within the organization. Students or employees must also register in the database in order to be recognized [3]. On-the-spot registration is made possible by the user-friendly interface. The organization's admin can email the day's attendance to the appropriate email address using an admin account and password [4]. The attendance details will not be altered, and only administrators of the organization will have access to them. Thus, in this research paper, we have proposed a system of attendance taking with the help of

face recognition. We have used OpenCV's LBPH Face Recognizer and Haarcascade Classifiers for face detection and recognition [5].

2. Methodology

This section has been divided into two further sub-sections. In the first section, we will discuss the algorithms and classifiers used to detect and recognize faces and in the next section, we will see how we implemented these algorithms and classifiers in our project to obtain results.

Algorithms and Classifiers used: The following results are anticipated to achieve the goals:

- Taking the recognized face's useful features into account.
- To categorize the traits in order to identify the observed face.
- To maintain a record of the identified person's attendance.

LBPH (stands for Local Binary Patterns Histogram): By limiting the area around each pixel and using the outcome in the form of a binary number, the Local Binary Pattern (LBP) texture operator labels the pixels in a picture. Additionally, it has been found that if we combine LBP [6] with the HOG [7] (which stands for Histograms of the oriented Gradients) descriptors significantly improve the recognition rate on some datasets. By the use of LBP and histograms, we can encode the facial photographs as straightforward vectored data. Because LBP is a perceptual classifier, it can be used in face recognition software [8].

The algorithm follows five steps for face detection:

Parameters: LBPH makes use of the following specifications:

- Radius
- Neighbours
- X Grid
- Y Grid

i. Training the algorithm: We will require a dataset with the people's faces whose identification we're attempting to make to train algorithm. Additionally, we should provide ID to each of the images (which could be numeric or alphabetical) for the algorithm to identify each image that is input and deliver results to you. The same ID must be assigned to each image of the same individual.

ii. The LBP Algorithm is applied: The LBPH's initial algorithmic phase is to generate an intermediate image that more accurately represents the original image by prioritizing the face features. To perform this, sliding window techniques is used by the algorithm concept based on the radius and neighbors' specifications.

iii. Histogram retrieval: Using the image obtained during the previous stage, we can now split the picture into numerous grids using the X Grid and Y Grid arguments.

iv. Performing face recognition: Considering the algorithm been already trained up to this mark, to get the photo that matches the image that has been input by us, we simply perform a comparison between the two histograms and the image having the closest histogram is returned. As an outcome of which, the ID of the image that has the closest histogram is returned by the method.

Haar Cascade Classifier: The Haar Cascade classifier [9] is an object identification method based on machine learning that performs tasks such as using a large number of positive and negative images to train a cascade function. Depending on the training of the function, it is then used to recognize objects in other photos as well. The large number of the photographs we come across are RGB channel images (Red, Green, Blue). As a consequence, whenever OpenCV reads an RGB image, it saves it in the BGR channel (Blue, Green, Red). This BGR channel should be turned to monochrome for image recognition.The reason for this is that the grey channel is simpler to comprehend and demands less work. After all, it just has a single monochrome channel [10]. Using the face cascade classifier, which is an item loaded using the haar cascade frontal face default.xml file, we employ an inherent function called detectMultiScale. This will aid us in locating the characteristics and places of the new image. It will use all of the features from the face cascade classifier object to detect the features of the new image. The function detectMultiScale returns four values: the discovered facial feature's height, width, x, and y coordinates. As a result of these, it will make a boundary in the shape of a rectangle around the face. It will detect and recognize the person's face in this manner, as well as identify the person's name and ID for the attendance.

3. Results and Discussion

It is one of the most used and most popular libraries of python used to create computer vision applications. It mainly emphasizes on image processing, video recording, and analysis, and has features like object identification. Because faces are so complicated, there is no simple way to detect if OpenCV has successfully identified a face in an image, video, or real-time webcam. Instead, it uses machine learning techniques. Instead, to correctly recognize a human face, numerous tiny patterns and traits must be matched. The algorithms break down the task of facial recognition into thousands of smaller, more doable tasks called Classifiers.

Face recognition can be broken down into two parts. The first and the foremost step is a classification task, which receives input as an image and produces a yes or no binary response indicating whether the image contains any faces. The second stage is the face localization task, which takes an image as input and outputs the position of any face or faces inside that image as a bounded box having dimensions (x, y, width, height). Following image capture, the system will compare the images in its database for equality and return the most appropriate result. The OpenCV Local Binary Patterns Histogram (LBPH) Algorithm and Haar Cascade Classifier are used for capturing face images, training images, face detection, and recognition in the preceding work.

The GUI Interface is so made that it can be managed by anyone very easily. We tested the attendance-based system with a range of users, and it was able to recognize the users' faces with their names and IDs, as well as successfully recorded their attendance.

The snapshots below demonstrate the GUI Interface of the attendance system, which is divided into several sections as mentioned below.

Main Window: It contains the options such as Admin, Member, and Quit. The user will choose the preferred option based on its accessibility.

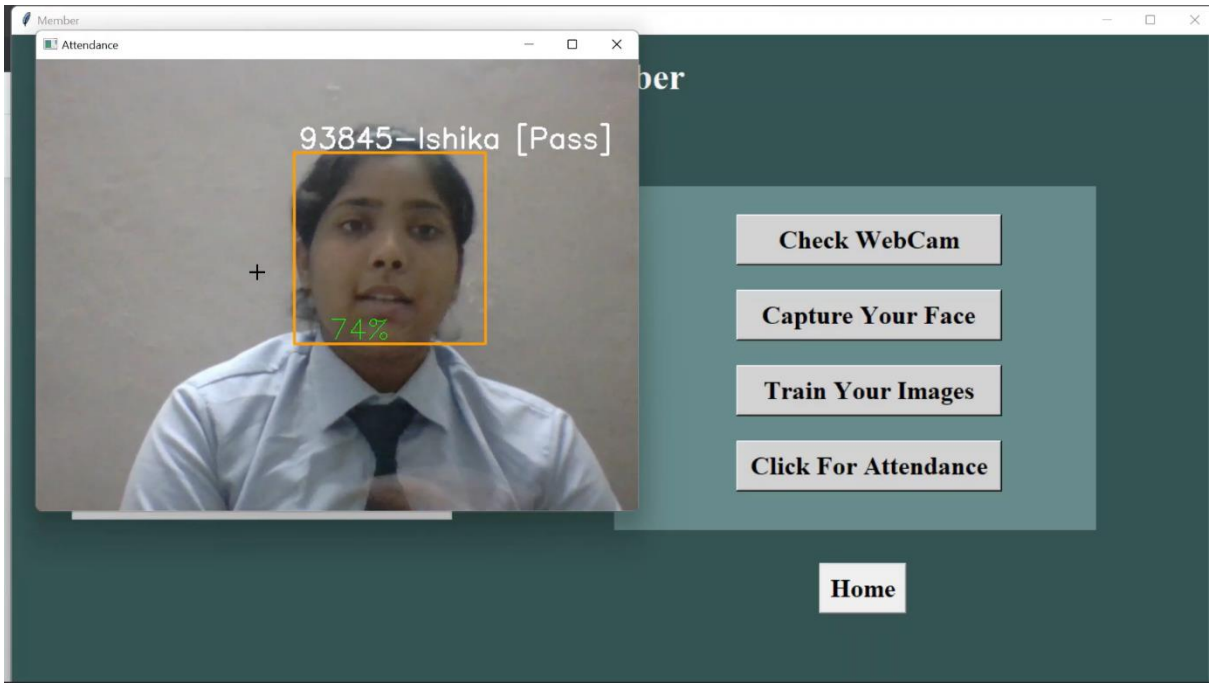
Admin Login Window: It is used to input the username and password of the admin account. If the username and password match with the admin account then it will log in to the next window otherwise it will prompt you to re-enter the username and password.

Auto Mail Window: This window allows the admin to mail the attendance report to the respective mail ID from the admin's account credentials. This window will log in only when the user will be able to provide the correct admin username and password.

Member Window: This window allows members of the organization to register themselves and record their attendance. It contains options such as Check Webcam, Captures Your Face, Train Your Images and Click for attendance capturing attendance.

Train Your Images: This option will train all the images present in the database for face recognition to record the attendance and will prompt the message when images are successfully trained.

Click for Attendance: This option will launch the webcam and capture the user's face for face detection and recognition to record the attendance, as well as display the member's ID and name.



We were able to obtain a level of accuracy of around 80%.

4. Conclusion:

We created a face recognition-based attendance system in this system for a school, institution, or other organization to track students' and employees' attendance. It will save time and effort, particularly if the firm has a large number of employees or students. The Automated Attendance Method aims to eliminate the flaws of the traditional (manual) system. This report goes into great depth about a face recognition-based attendance system. Individuals are identified using the proposed method by comparing their input image from a camera to the train image. This proposed approach could detect and localize a face based on an input facial image from a video frame being recorded. Face detection and identification are utilized by OpenCV's LBPH and HaarCascade Classifier to record attendance. This proposed approach is around 80% accurate. The project was successful in registering the user, recognizing the user's face, and documenting the user's attendance. Using the admin's username and password, it was able to successfully send an email

from the admin's account to the needed email address. This method makes keeping track of attendance easy. It also saves time by minimizing paperwork and automating the operation of the system. It is dependable and user-friendly, and it boosts productivity.

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