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Face Recognition Based Attendance System

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ABSTRACT: In today's fast-paced technological era, it is imperative to modernize crucial educational processes like attendance tracking. Implementing an automated attendance monitoring system utilizing face recognition technology will not only save time and energy for students and teachers but also streamline the entire process. By pre-feeding the system with student images and leveraging the face recognition algorithm, the system will efficiently recognize and mark students as present, revolutionizing traditional attendance procedures.

KEYWORDS: Face detection, Face recognition, Feature extraction, Pre-processing, Classification, Machine learning, HOG, SVM, Haar Cascade, CLAHE.

I. INTRODUCTION

The face recognition attendance monitoring system's goal is to streamline the labor-intensive and time-consuming attendance procedure for both teachers and pupils. Using a face recognition algorithm, the device will take pictures of the pupils and record their attendance on the sheet. In this manner, the instructor of the class will be able to record attendance without having to spend time on more laborious methods. One of the regular security procedures nowadays is the identification process to find out if someone is in a room or building.

Any visitor to a room or building must first go through a series of verification procedures. subsequently, these details can be utilized to track every action in the space for security purposes. There are still differences in the authentication procedures used to determine who is in a room or building. The methods differ: signature and writing a name in the attendance book, utilizing an identity card, or certifying using biometric devices like a face or fingerprint scanner.

II. LITERATURE SURVEY

A model of an automatic attendance system has been offered by the authors in [1]. The model focuses on how approved learners are identified and counted as they enter and exit the classroom employing face recognition and Radio Frequency Identification (RFID). Every enrolled student's real record is saved by the system. Additionally, the system stores the attendance log's data for each student enrolled in a specific course and supplies the required information as requested database. The web functioned as the prototype.

The authors of this study [2] have created and put up with an attendance system which utilizes use of iris biometrics. The first request made of the attendees was to register their data as well as specific iris template. The technology generated attendance in class by taking a snapshot of each student's eye, distinguishing their iris, and looking for a match in the database that it had built. The web was utilized as the prototype.

The authors of [3] developed a facial recognition-based attendance system. The system was developed employing the Support Vector Machine (SVM) classifier alongside with strategies such as Viola-Jones and Histogram of Oriented Gradients (HOG) features. Various ,The writers taken consideration of actual-world circumstances like scaling, illumination occlusions, and attitude. MATLAB GUI was utilized to do quantitative analysis based on Peak Signal to Noise Ratio (PSNR) accurate measurements.

By comparing the Receiver Operating Characteristics (ROC) curve, the authors in [4] conducted research to find which facial recognition algorithm—Fisherface and Eigenface—was better compared to Open CV 2.4.8. They then integrated the results into the attendance system. The ROC curve showed how Eigenface outperforms Fisherface in the tests that were performed for this paper. The accuracy rate of the system, which employed the Eigenface algorithm, was within 70% and 90%.

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III. PROPOSED ALGORITHM

A. HAAR CASCADE ALGORITHM

The Haar-like features are the fundamental basis of the object detection process used by the Haar classifier. These features employ variations in contrast values between subsequent rectangular collections of pixels instead of the intensity values for every pixels. Relative light and dark areas have been identified using the contrast variances between the pixel groups. A Haar-like characteristic is made up of two or three groups within it that have a relative contrast variance. To detect an image, Haar-like features are applied, as illustrated in the figure. Extending Haar features is as simple as changing the size of the pixel group under study. This makes it possible to detect objects of different sizes using properties. Only the sub-images with the highest probability can be examined for all Haar-features that differentiate an object thanks to the classifiers' cascading effect. It also makes it possible to change a classifier's accuracy. Reducing the number of steps can result in an increase in both the false alarm rate and the positive hit rate. This also holds true in reverse. Using just 100 basic characteristics, Viola and Jones were able to distinguish faces with 90% accuracy. In order to identify facial characteristics like the lips, eyes, and nose on humans, Haar classifier cascades must first be trained. This moderate AdaBoost technique and Haar feature methods need to be used in order to train the classifiers. Thankfully, Intel created the Open Computer Vision toolkit (OpenCV), an open source toolkit designed to make computer vision-related applications easier to deploy. The OpenCV library provides an implementation of Haar classifier detection and training and is intended to be used with applications related to HCI, robotics, biometrics, image processing, and other fields where visualization is crucial. The system will thus be able to identify a person's face in the video with the aid of this algorithm. Green Square appears on the person's face as a signal that the detection procedure is underway.

image

B. The LBPH Algorithm Overview

The Local Binary Pattern (LBP) texture operator is a straightforward yet highly effective technique that assigns a binary number to each pixel in an image by thresholding its surrounding pixels.

The initial computational stage of the LBPH involves generating an intermediary image that enhances the original image's description by emphasizing the face features. The algorithm does this by using the idea of a sliding window, which is dependent on the neighbors and radius parameters.

Using the LBP procedure:

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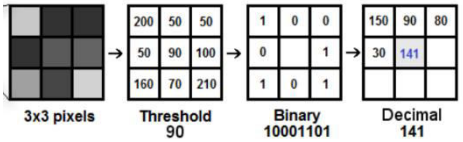

Applying the LBP operation

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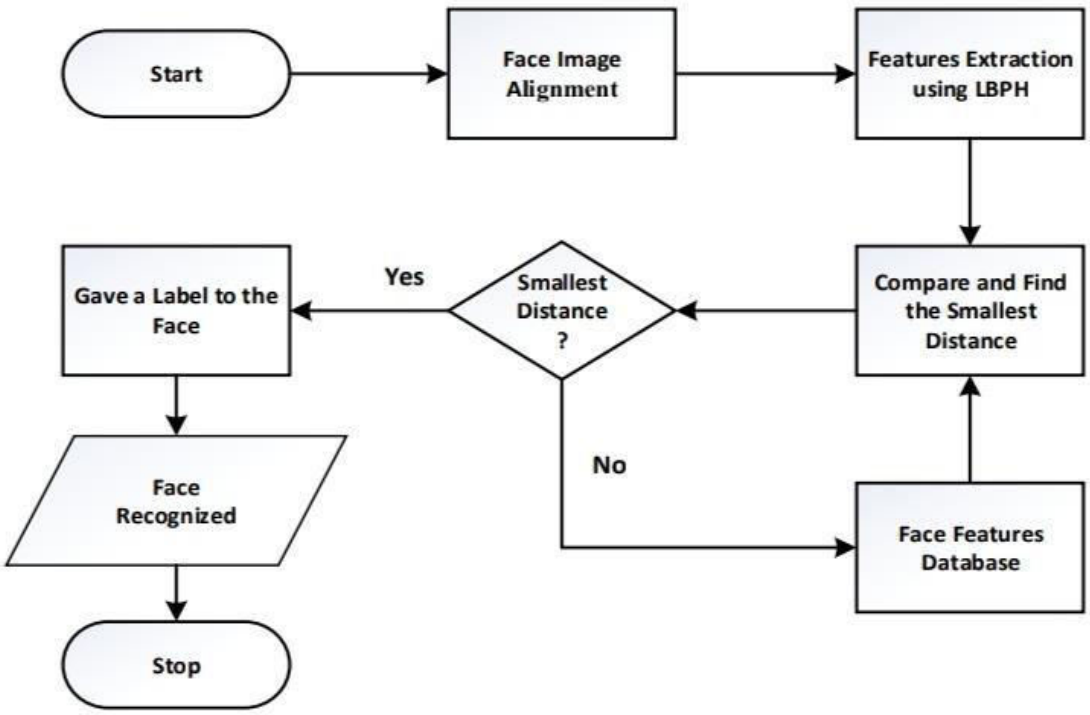
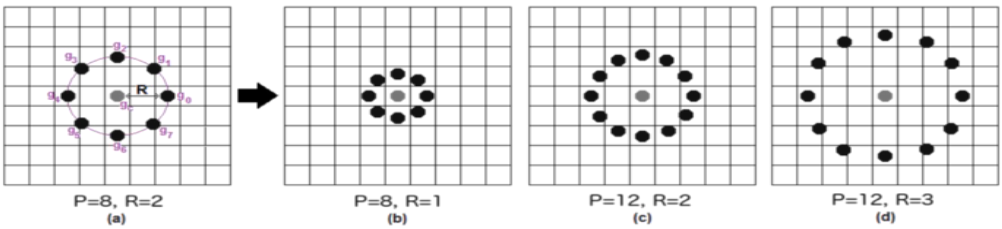
IV. FLOWCHART



V. PROPOSED SYSTEM

- Suppose we have a facial image in grayscale.
- We can get part of this image as a window of 3x3 pixels.
- It can also be represented as a 3x3 matrix containing the intensity of each pixel (0~255).
- Then, we need to take the central value of the matrix to be used as the threshold.
- This value will be used to define the new values from the 8 neighbors.

For each neighbor of the central value (threshold), we set a new binary value. We set 1 for values equal or higher than the threshold and 0 for values lower than the threshold.



Radius of central pixel

VI. CONCLUSION AND FUTURE WORK

The machine learning approach used in the development of the attendance management system satisfies the system's goals. Now that all of the bugs have been fixed, the system has stabilized. The system runs with a great degree of efficiency. The issue is resolved by the system.The system can recognize and identify the face well with an accuracy of 85%, at a face distance of 40 cm from the camera with sufficient lighting. This was the required specification that it was meant to address.

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