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Face Recognition Attendance System

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***Abstract*:** *An image or video that was captured using a digital camera can be used to discover, track, identify, or verify human faces using a computer program called face recognition. The time-consuming, inaccurate, and traditional attendance techniques are to be replaced by this system. The suggested system uses a camera to take pictures of people, then uses an artificial neural network to recognize and compare facial characteristics. Administrators and teachers can easily watch student attendance records anywhere because the system generates attendance reports in real-time. Here, we introduce a novel approach that combines the Local Binary Pattern (LBP) algorithm with cutting-edge image processing methods like Contrast Adjustment, Bilateral Filter, and addressing some of the problems affecting the accuracy of face recognition, such as histogram equalization and image blending, the LBP codes are improved, which raises the accuracy of the facerecognition system. Our test findings demonstrate that our approach is highly accurate, dependable, and robust for a face recognition system that can be used as a Face Recognition Attendance System in a real-world setting.*

Key Word: *Face Recognition, Attendance Management, Local Binary Pattern (LBP), Image Enhancements.*

I.INTRODUCTION

The human face is essential in our daily lives, especially for identifying people. Face recognition is a type of biometric identification that extracts facial characteristics from a face and stores them as a unique face print to individually identify a person. Because of its broad range of applications, biometric face recognition technology has piqued the interest of many researchers. Because of its non-contact nature, face recognition technology outperforms other biometric-based identification techniques such as fingerprint, palm print, and iris recognition. Face recognition techniques can also recognize a person from a distance, without any contact or interaction with the individual.

We all know that attendance, while an important aspect of management, can quickly become a tedious, redundant task, leading to inaccuracies. The traditional method of making ro11 calls proves to be a statute of limitations because it is extremely difficult to call names and keep a record, particularly when the student-to-teacher ratio is high. Every organization has its own method of tracking pupil attendance. Some organizations take a document-oriented approach, while others have adopted digital methods such as biometric fingerprinting and card swapping. These techniques, however, prove to be a statute of limitations because they require students to wait in a time-consuming queue. If the student fails to carry his identification card, then he will not be able to get attendance, evolving technologies have made many improvements in the changing world.

To ensure that attendance is noted with accurate information about the student and his activity throughout the academic year, our Attendance system has a period mapping to corresponding instructors and lecture halls. We keep the details of the recorded attendance and student image in an advanced relational database (MYSQL), which we use to train our model to create an accurate encoding for the face.

II.LITERATURE REVIEW

2.1. Image Acquisition

The initial step is the image will be captured from a camera that is positioned in the classroom. The camera used must be a high- quality camera as it is said that a high-quality camera can produce much more features when being compared to a low quality camera, a 1080p 4k camera is recommended. The camera can be positioned at the front of the class where it can capture the image of the whole class.

2.2. Face Detection

The image will be captured from a camera placed in the classroom as the first stage. A high-quality camera must be used because it is said that a high-quality camera can create many more features than a low-quality camera; a 1080p 4k camera is recommended. The camera can be placed in front of the class to record an image of the entire class.

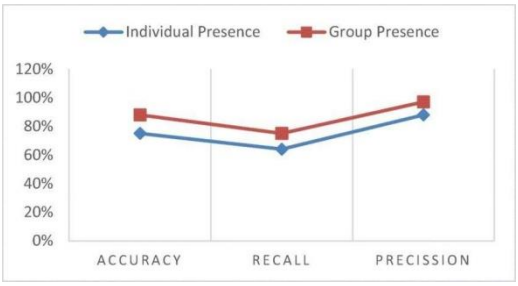

Figure 1. Individual vs Group Presence

The above Figure 1. Provides a better understanding of the precision that the detection technique gives when the image acquisitionis in a group. When in comparison the accuracy is also high and this is the better face detection algorithm to be used to provide the desired output.

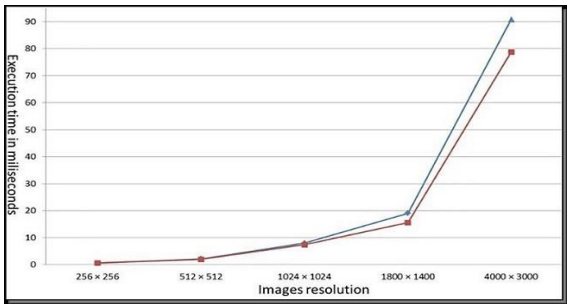

Figure 2. Face detection Accuracy

The above Figure 2. states that the detection accuracy is directly proportional to the image resolution and the execution time as well. When the quality of the frame from the camera is high, the model is able to produce a better face encoding and locations.

2.3. LBPH Algorithm Analysis

We have a face picture here, and the algorithm will generate several squares, as shown here. And each of these squares contains a representation of the prior light. For example, this square does not depict a single pixel but is made up of three rows and four columns of pixels. Three by four equals twelve pixels in total in each of these twelve-pixel rectangles here. Then we apply those criteria to each one individually. Considering the center pixel. The next stage is to make a histogram, which is a statistical concept that counts how many times each color appears in each square. This is the representation of the histogram.

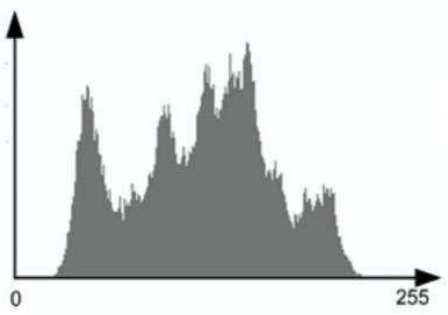

Figure 3. Histogram Analysis

For example, if the value 110 appears 50 times a bar like this will be created with this size equal to 50, if 201 appears 110 times and the other bar will be created in this histogram with this size equal to 100. Based on the comparison of the histograms, the algorithm will be able to identify the edges and the corners of the images. For example, in this first square here, we don't have information about the person's face. So, the histogram will be different from this other square that has the border of the face. In short, the algorithm knows which histograms represent borders and which histograms represent the person's main features, such as the color of the eye, the shape of the mouth, and so on.

2.4. Face Recognition

For face recognition, the algorithm takes note of certain essential measurements on the face, such as the color, size, and slant of the eyes, the gap between the brows, and so on. All of these determine the face encoding — the information obtained from the image — that is used to identify the specific face. visage Recognition is a method of identifying or verifying an individual's identity by using their visage. Face identification algorithms are available, but their accuracy varies. I'm going to

show you how we can use deep learning to do face identification.

Let us now look at how deep learning can be used to recognize features. Face embeddings are used here, and each face is transformed into an LBP. Deep metric learning is the process of turning the face into an LBP. We divided the discovered data into two categories: test data and training data. When we train the model with images, the time it takes the model to handle the output is solely determined by the number of images we provide for training. Diagram 3. Describes the relationship in depth using the graph.

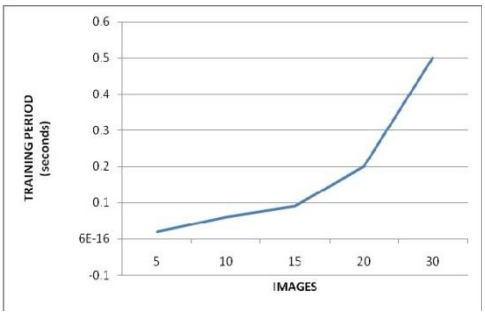

Figure 4. Training Data time complexity

The test-based data are generated by the predefined library known as "Open CV" and those sets of data are tested based on the adjustments made on the bias values and weights to provide the accurate output.

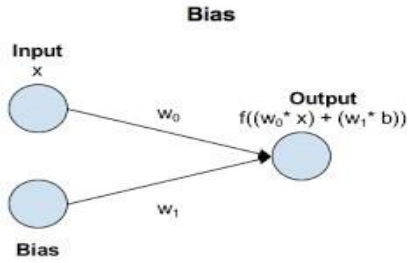

Figure 5.Bias and Weights

In figure 5. The W is the weight and B is bias, these values are adjusted accordingly to provide an output that matches the nearby value and it is considered as the best biassed value.

III.EXISTING SYSTEM

Numerous robust algorithms have been created and claimed to be accurate in tackling face detection and recognition problems. These are the most successful and commonly used algorithms or methods for face detection and recognition applications. The existing system of face recognition uses a raw image to find faces, and the accuracy of those models is very low. Additionally, the system fails to monitor more than one face at a time, making it a time-consuming process with non-contact technology. Because the system needs big data sets to recognise a single image or live stream video in this case, memory consumption is high. A good result needs at least 25 face data images for each individual. For an image to identify the encodings and locations in the predefined image, it must be at least 3.5 MB in size. A rough calculation for 25 images for an individual needs 90 MB of space to provide a 65% accurate attendance. When we consider the storage space for many people, such as 4000 students, it takes 350 GB to keep the face data, which is extremely large.

The live video stream from the camera is saved, and then the faces from the frame are captured with the encodings and locations of the faces visible in the video; this adds time to the model's processing time. As a result, this contributes to the system's poor efficiency. However, only one request will be processed at a time to process the face data; if the model fails to return the answer, it returns NO CONTENT due to the long processing time. This model necessitates the installation of a specialized digital camera as well as a module to process the faces and match them using an algorithm. This model has a high temporal and space complexity, which results in a low performance of the application.

IV.PROPOSED WORK

Face Recognition Attendance System's suggested work includes an image enhancer, an efficient database, and a customized Artificial Neural Networks algorithm. The model is designed to transmit the digital camera feed to the object as frames, and then each frame is enhanced using the Local Binary Pattern (LBP) algorithm to produce an accurate and usable picture for processing the request. A database capable of managing student attendance, class schedules, teachers, student information, lecture hall mappings, and so on. The database is intended to provide a comprehensive solution for attendance. Face detection has a variety of applications. The two methods mentioned are the efficient libraries that Python uses to detect faces. First, using Python's built-in face detection library, built into Python, and second, using the OpenCV computer vision library.

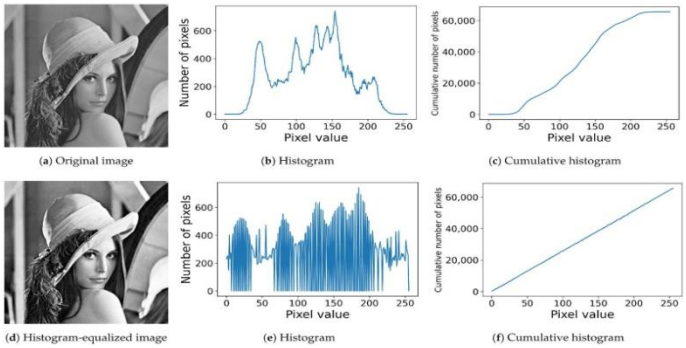

Figure 6. Output of Histogram Equalized Image

Mail servers use the Simple Mail Transfer Protocol (SMTP) to transmit, receive, and relay outgoing emails between senders and receivers. SMTP is the protocol that enables us to send and receive emails as the technology behind email communication. When the class is over, the attendance record of the students is emailed to the various teachers using this technology. This enables the next degree of upgrade and helps teachers to manage student attendance with ease whenever necessary. Our software provides numerous options for managing attendance records, which students can easily access via their distinct login.

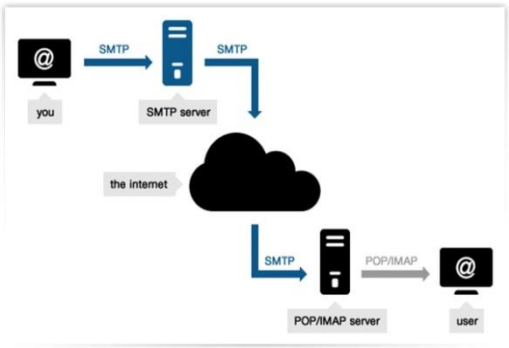

Figure 5. SMTP Architecture

Training data is the information used to teach a machine learning algorithm or model. To analyse or handle training data for machine learning, some human intervention is required. The characteristics of our training data, as well as the quality of labelled training data, will determine how precisely the machine learns to identify the result, or the answer you want your machine learning model to predict. The model is customised to the company needs and developed to generate the model with 99.9% accuracy using ML and advanced libraries.

The below Figure 6. Briefs the better information about why we use the LBP Algorithm for the face detection technique. As the result the LBP always provides the better accuracy even when the training Images differ from each other

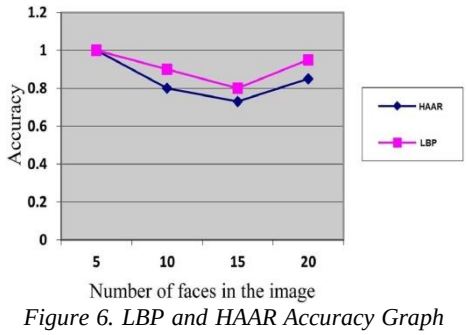

Figure 6. LBP and HAAR Accuracy Graph

V.RESULT

In the current situation, Contactless attendance systems are an effective preventive strategy in the current situation because they provide a secure and efficient method of marking employee entrance and exit. Facial recognition technology, in its most recent iteration, has made recording employee attendance easier than ever before. While on the go, field workers can update their daily attendance.

Based on face detection, a face recognition attendance system automatically identifies and verifies an individual and records attendance. Face recognition attendance systems are gaining popularity among small and large companies alike. It's no surprise that such systems are becoming more popular in the workplace due to their numerous benefits for both teachers and management.

Facial recognition, as an automated attendance-management system, offers precise time records, reducing costly errors. As a result, accurate data helps teachers provide topics throughout the class. As a result, instructors' workload is reduced, and their capacity and efficiency are increased by freeing up energy and time for other important activities.

VI.CONCLUSION

Student attendance tracking daily is a critical practice for any organization. However, manual attendance management can be time- consuming and vulnerable to human errors.

This solution is both cost-effective and efficient when contrasted to other biometric solutions. The cost and time saved are even larger because the data acquired from the face recognition attendance system is accurate in real-time. Because the overall process is automated, human intervention is limited.

You can scroll back and retrieve details of any employee, anytime with just a few clicks. It also provides solution checks for face liveliness and avoids the risk of face authentication happening through static photos or running videos. It also offers customizable workflows and analytics for anomaly detection and reporting.

A facial recognition attendance system can be employed to recognize students and confirm or refuse access upon entry. As a result, other students, or persons outside of your class cannot access your class details.

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