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Face Recogniiton Based Attendance System

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ABSTRACT- ***Online connectivity and automation are everywhere in our world. Several technological advancements are occurring every day, including the Internet of Things, image processing, and machine learning. To achieve more accurate results, many systems have undergone this evolution. A typical example of this transition is the attendance system, which moved from a traditional marking system to facial recognition. This project proposes to create a complete embedded attendance system that utilizes facial recognition to ascertain whether the individual's face belongs to a particular class. The system will be implemented in Python using a machine learning algorithm. An external camera (computer/laptop camera) will be used to input the students' input image. The system can also be programmed with a normal external camera. The Local Binary Pattern algorithm (LBP) will be implemented in the system to identify faces.***

1. INTRODUCTION

In many educational institutions, the traditional approach to attendance tracking is a challenging one. Faculty must personally call out the name of each student, which can take a considerable amount of time to complete. There is also a risk of a proxy showing up. As a result, many institutions have adopted a range of additional methods for attendance tracking, such as RFID [3], Iris recognition [4], and fingerprint recognition. However, these technologies operate on a queue which can take longer and be more intrusive. Face recognition has become a key biometric feature that is both easy to acquire and inconspicuous. Systems that rely on face recognition are usually unaware of various facial expressions. The two categories of face recognition systems are face verification and face comparison. The objective of the system is to establish an attendance system utilizing face recognition techniques. Face verification works by correlating a face image to a template face image.The primary purpose of face comparison is to compare a query face image to a face image. This system is designed to construct an attendance system utilizing face recognition techniques. In such a system, a person's face will be taken into account when recording attendance. Facial recognition is a rapidly developing technology. In this research, we designed a system that monitors student faces in real-time classroom video and registers attendance when a face is found in the database. This new method will be significantly faster than the previous methods.

2. LITERATURE SURVEY

An automatic attendance system design was proposed by [3]. This model focuses on the interaction between face recognition and RFID in identifying and counting authorised students entering and exiting the classroom. Each registered student keeps an authentic record of their registration with the system. The system also stores information about each registered student for a particular course in an attendance log and provides the necessary data as required.

In this study, the authors of [4] developed and implemented an iris-based attendance system. Participants were asked to register personal information and a unique iris template at the start of the system. The technology automatically took attendance for a class by taking a photo of each student's eye, identifying the iris and

searching in the built in database for a match. The prototype was run on the web.

In [5], authors proposed the development of an attendance system based on facial recognition. This system was implemented with the help of support vector machine classifiers (SVM), as well as facial recognition algorithms (such as Eigenface) and HOG features. Various real-time conditions were taken into account, such as scaling and illumination, as well as occlusions and position. PSNR measurements were then used as the baseline for quantitative analysis. This analysis was conducted in MATLAB GUI format.

In [6], authors compared the ROC (Return on Conventional Occlusion) curve to the two facial recognition algorithms (Fisherface and Eigenface) available in the Open CV (2.4.1.8) and then incorporated them into an attendance system. According to the studies conducted in this regard, Eigenface was found to be more accurate than Fisherface, with an accuracy rate of 70% to 90%.

[7] describes a method that combines DWT (Discrete Wavelet Transformation) and DCT (Discrete Cosine Transformation) were used to extract the learner's facial features. Then, RBF (Radial Basis Function) was used to classify the facial objects. The accuracy of the face recognition technique based student attendance system was 80%.

Facial recognition is the process of identifying a person based on their facial traits. This is commonly referred to as facial recognition. Computer-based vision algorithms can be used to identify faces, detect emotions, and create multi-camera surveillance systems. This face recognition system is attracting attention from academics. This paper discusses various techniques, such as face detection, machine learning, and CNN. Face detection is done using Deep Learning (DNN). Features such as PCA, LDA, and other features are extracted using extraction techniques for the SVM approach and the MLP approach. Images are sent to the CNN Module as a CNN feature. CNN-based techniques have a high detection accuracy percentage, while SVM, MLM, and CNN-based techniques achieve test accuracy of 87, 86.5, and 98% respectively. [8]

[9] The author's main focus was to switch from a manual attendance system to a digital one that used facial recognition. They used MATLAB software to make the PCA algorithm work for the facial recognition module. Once the facial authentication was done, the code was sent to an embedded hardware system using a Microcontroller PCI, which was also connected to a servo to open the door. The study showed that the sensitivity of the system got stronger as the environment changed and the person's head moved.

3. METHODOLOGY

The implementation of a face recognition attendance system involves a series of methodologies and steps to ensure accurate and efficient recognition. This section outlines the key aspects of the methodology, including hardware requirements, image acquisition, preprocessing, feature extraction, and model training.

i. Hardware Requirements:

The primary hardware requirement is a built-in or external camera capable of capturing clear and detailed facial images. Most of the modern laptops come equipped with integrated webcams that can fulfill this requirement. However, it is important to ensure that the camera resolution is sufficient to capture facial details accurately. The resolution of the camera determines the level of detail in the captured images. Higher resolutions, such as 720p (1280x720 pixels) or 1080p (1920x1080 pixels), are preferable for better recognition accuracy. However, lower resolutions can still be used if they provide clear and recognizable facial images.

ii. The Image Acquisition:

The process of image acquisition involves capturing facial images or videos of individuals to be enrolled in the attendance system. The captured images should cover different variations in poses, facial expressions, and lighting conditions to ensure robust recognition. It is important to ensure that individuals are well-positioned within the camera frame and that their faces are clearly visible and not obstructed by accessories, such as glasses or hats.

iii. Preprocessing:

In order to improve recognition accuracy, preprocessing techniques are used to improve the quality and consistency of facial images. Common preprocessing steps include image resizing, normalization, and noise reduction. Image resizing ensures a consistent image size, facilitating efficient processing and feature extraction. Normalization techniques, such as histogram equalization, can be used to standardize the lighting conditions across different images. Noise reduction filters, such as Gaussian filters, help to reduce noise or artifacts present in the captured images.

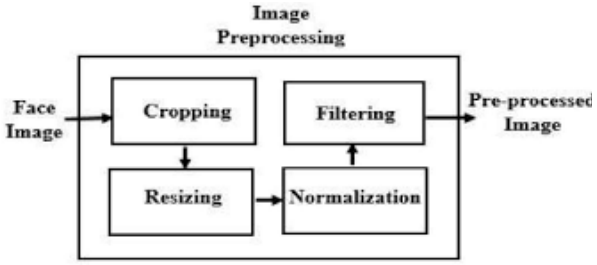

Fig.1 Block Diagram of preprocessing

iv. Feature Extraction:

A crucial step in face recognition is feature extraction. By extracting discriminative facial features from preprocessed images, accurate identification and verification can be achieved. Various techniques can be employed, including traditional methods like eigenfaces and Fisherfaces, as well as deep learning-based approaches. Traditional techniques utilize linear algebra and statistical methods to extract facial features, while deep learning methods leverage convolutional neural networks (CNNs) or other deep architectures to automatically learn hierarchical representations of facial features. Facial feature points are the coordinates of these points. There are a total of 66 facial feature points. A different method for finding feature points yields different results.

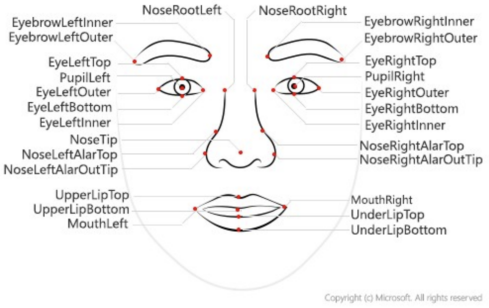

Fig.2. Facial feature points

v. Model Training:

The face recognition model is trained using a labeled dataset of facial images. The dataset consists of images of individuals enrolled in the attendance system, with corresponding labels or identities. The training process involves feeding the facial images in the chosen deep learning architecture or traditional algorithm, adjusting the model's parameters to minimize the recognition error. The trained model learns to map the input facial features to the corresponding identities, enabling accurate recognition during the attendance process.

vi. System Integration:

Once the model is trained, it needs to be integrated into the face recognition attendance system. This involves developing software components that interface with the hardware, enabling real-time face detection, feature extraction, and recognition. The integration also includes designing a user-friendly interface for system administration and interaction, allowing for the enrollment of individuals, tracking

attendance, and generating attendance reports.

vii. Evaluation and Performance Metrics:

In order to evaluate the performance of the face recognition attendance system, various evaluation metrics can be employed. A system's ability to identify and verify individuals is measured by accuracy, precision, recall, and F1 score. A system's performance should also be evaluated in terms of its computational efficiency, robustness to environmental variations, and scalability.

Fig.3.(Block Diag. of General Framework)

By following these methodologies, a face recognition attendance system can be implemented effectively, ensuring accurate and efficient attendance tracking in diverse settings.

4. EXPERIMENTAL RESULTS

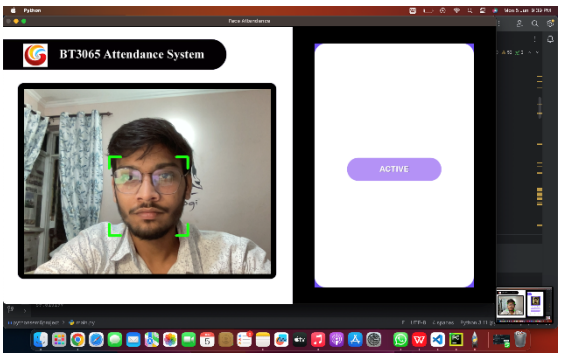

Fig.4. Capture the Student Image

The GUI can be used by the users to interact with the system. When a student enters the classroom, they must show their face to the camera which captures the image and link it to the database. After linking, it shows Active as shown in Fig.4.

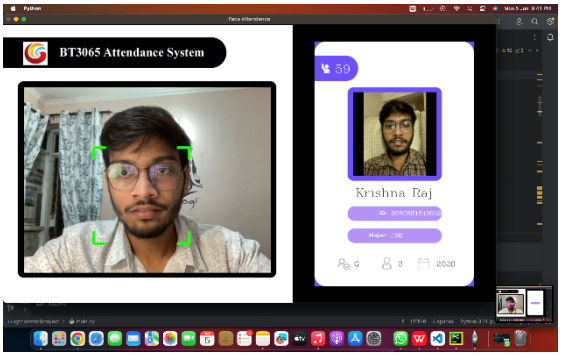

Fig.5.Face recognition

In Fig.5, you can see that the registered student has been identified by the system and you can see all the details about the student that you need.

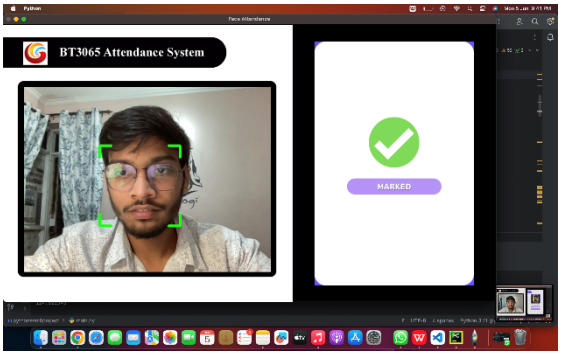

Fig.6. Attendance marked

In Fig.6, the system shows that the registered student is marked present.

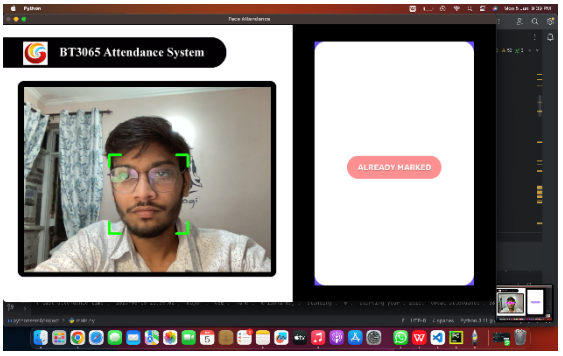

Fig. 7. Already marked

If, in Fig.7, the student has already been marked by the system as present, and then

the student appears again in front of the camera, it indicates that the student has been marked.

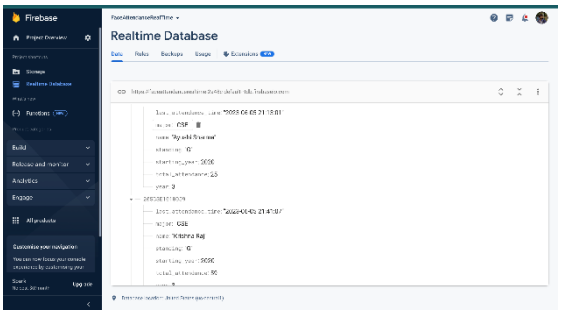

Fig. 8. Updation in Database

In Fig.8, all updates will be updated in the real-time database.

5. CONCLUSION

The goal of this system is to create an efficient class attendance system by using face recognition techniques. Basically, it uses a webcam to detect faces and recognize them. It then takes an image of the student and stores it in the database. This way, it can confirm if the student is present or not and update the database in real time.

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