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FACIAL ATTENDANCE MANAGEMENT SYSTEM IN WINDOW APPLICATION WITH EMAIL UPDATION

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Abstract : A facial attendance management system in window application using deep learning is a computer vision technology that provides an automated solution for attendance management. The system utilizes the OpenCV library to detect and recognize faces from images or live video feeds. The system's algorithm captures facial features and matches them with pre-existing data, such as a database of students or employees, to identify and record attendance. This technology eliminates the need for manual attendance-taking, making it more efficient and accurate. This abstract discusses the benefits and features of a facial attendance management system in window application using deep learning, including its reliability, accuracy, and ease of integration with existing systems. We will also explore the challenges that need to be addressed, such as privacy concerns and system security, to ensure the widespread adoption of this technology. Overall, a facial attendance management system in window application using deep learning has the potential to streamline attendance management processes and provide valuable data to help improve institutional or organizational efficiency.

IndexTerms - **Attendance management system, camera, face, face dataset, face recognition, Infrared, NFC.**

I. INTRODUCTION

Facial attendance management system in window application with email updating are becoming increasingly popular in various industries and organizations as they offer a convenient, efficient, and accurate method for recording attendance. These systems use advanced image processing techniques, specifically face recognition algorithms, to identify and verify the identity of individuals in real-time. OpenCV (Open Source Computer Vision) is a popular open-source computer vision library that provides tools and algorithms for analysing images and video streams. It is commonly used for developing face recognition systems, as it provides an extensive set of libraries and functions for processing and analysing images and videos.

By leveraging OpenCV's face recognition algorithms, systems can identify individuals by capturing images of their faces and comparing them to pre-existing images in a database. This approach is much faster and more accurate than traditional manual methods of recording attendance, making it an ideal solution for organizations looking to streamline their attendance tracking processes. Overall, a facial attendance management system in window application with email updating using deep learning offers a highly efficient and reliable way to manage attendance and enhance security measures in various industries and organizations.
Implementation of classroom attendance system based on face recognition in class:

The system comprises of a camera that records photos of the classroom and transmits them to the module for image enhancement. The methods of median filtering and skin classification are employed to improve the histogram normalization of the acquired image. Face detection is done using Viola- Jones algorithm. Initially face detection algorithm was tested on variety of images with different face positions and lighting conditions and then algorithm was applied to detect facesin real time video.

Face Recognition-based Lecture Attendance System:
The system consists of two cameras, one fixed to the ceiling for seating position determination and the other fixed in front of the seats for student face capture. Student Detection (ASD) approach is used to gauge whether a student is present on the target seat. The camera is pointed at one seat in order to take the picture. The face image capture is enhanced and recognized and are recoded into the database. Each seat is represented by a vector of values that show the connection between the student and the seat.

Study of Implementing Automated Attendance System Using FaceRecognition Technique:

Three fundamental steps have been taken to implement the suggested system. Face extraction and detection come first. When the user is in front of the camera, an image is taken and used as input. The frontal face is captured by using the OpenCV Haar Cascade

method. The face is then recognized and turned into a 50x50 pixel grayscale picture. The second step is to learn and train face images. A collection of training photos of faces must be fed into the system to initialize it.

Face Recognition Based Attendance Marking System:

The system comprises of a camera that needs to be placed in the workplace space in order to take pictures of it. These photos are then transferred to a module for enhancement, where Histogram Normalization is used to improve the contrast of the image and a Median Filter is used to reduce noise. To avoid false detection skin classification technique is used.This process first classifies the skin and then retains only the skin pixels and the other pixels are set to black. The enhanced image is then sent to a face detection and recognition module.

Attendance Management System Using Face Recognition:

In this system, the CCTV is permanently installed at the classroom entrance and is utilised to take a picture of each student as they arrive. Using the Eigen faces technology, the discovered faces are compared with the already-existing photos and saved in a database. Utilising a 3D face recognition algorithm, it is possible to determine whether the student image matches.

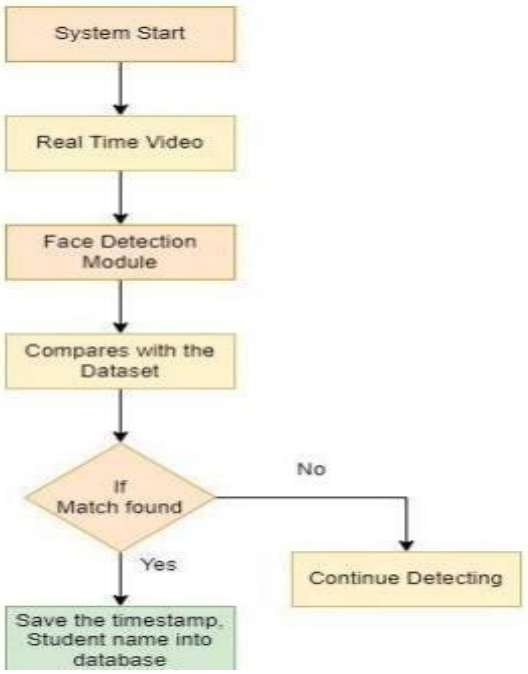
Attendance System Using NFC Technology with Embedded Camera onMobile Device:

A mobile application and NFC technologies improve the attendance system. According to the research report, each student is given an NFC tag with a special ID when they enroll at the faculty. The travelling instructor will then touch or distribute these tags to take attendance at each lesson. The student's face will then be captured by the built-in camera before the data is sent to the college server for validation.

II.PROPOSED SYSTEM:

2.1 Pre-Processing and Feature Extraction:

Pre-processing steps are used in face identification systems to minimise false positives and hasten the detection process. Our local system already contains our dataset. Pre-processing ought to eliminate enough non-face windows. Frontal face encodings employing Haar cascades are what we use for pre-processing. It is an object detection algorithm that finds faces in still photos and moving pictures. In their 2001 study "Rapid Object Detection using a Boosted Cascade of Simple Features," Viola and Jones developed edge or line detection features. The algorithm is given a lot of positive shots with faces and a lot of negative photos without faces to train on.



2.3. Dataset creation:

Creating a dataset involves collecting and organizing data for use in training, testing, or validating a machine learning model. Creating your own dataset of the students. Capture the images of the student with their name. The dataset is for comparing the individual student to the attending student. Encoding process:

This encoding process contains Pre- processing and feature extraction.Preprocessing: Data may contain errors, missing values, or inconsistencies that canimpact the performance of a machine learning model. Clean and preprocess the data byremoving duplicates, filling missing values, and normalizing or standardizing the data.

2.4 Capture the live video:

In this process the live video stream is captured.so the face is detected. The faces of the students are detected by face detection techniques.

Face detection: This module detects the presence of faces in an image or video stream using OpenCV's Haar cascades, HOG or deep learning-based models such as OpenCV's DNN module. The detected faces are then passed on to the next module foralignment and feature extraction.

The face-recognition model, which is heavily based on dlib, is used for face detection.The color and size of the slant eyes, the gap between the eyebrows, the distance between the lips and the chin, and other details are noted in this model. When all of these values are added together, a face encoding is created, which is a vector array with 128 values.

Feature extraction is a crucial step in face recognition that involves transforming the face image into a numerical representation that can be used for comparison with otherface images. Here are some commonly used feature extraction techniques for face recognition:

Local Binary Patterns (LBP): LBP is a texture descriptor that encodes the localstructure of the face image by computing the binary pattern of the intensities of the pixels in a circular neighbourhood around each pixel. The resulting binary patterns are concatenated into a feature vector that can be used for face recognition.

Histogram of Oriented Gradients (HOG): HOG is a gradient-based descriptor that computes the histogram of the gradient orientations of the face image pixels in a rectangular grid. The resulting histograms are concatenated into a feature vector that can be used for face recognition.

2.5Compare the images from video:

In this the images from the live video stream is compared with the dataset and recognize the face.

Face Recognition: Real-time image processing and detection are involved in this step. The student's face is detected and the student is recognized using a webcam to record live videoof the student. Because the image is captured in real time, image distortion can occur if a student is not fully facing the camera.

Mark the Attendance:

This module manages the attendance record of recognized individuals, such as theirname, time of entry, and duration of stay. It updates the attendance database with the recognized individuals' information and generates reports or alerts based on the attendance data. The csv/excel file is created. The attendance is automatically marked. The csv file is saves as theparticular date. Each and every day the new csv file is automatically created and the attendance is updated.

Send Email notification:

At last the email notification is sent automatically to the students and the faculty. Theattendance sheet is sent to the faculty through gmail. And the late coming students also thenotification will be sent.

LBPH algorithm

LBPH (Local Binary Patterns Histograms) is a popular algorithm used in face recognition applications, including in OpenCV. It is a simple yet effective method for feature extractionfrom facial images.

The LBPH algorithm then converts each binary number in the grid to a decimal value, resulting in a sequence of decimal numbers. These decimal numbers are then used to create ahistogram, which represents the distribution of the local binary patterns in the image. This histogram is a compact and robust representation of the facial features in the image.

Facial Recognition based attendance:

Facial recognition-based attendance is a system that uses facial recognition technology to automatically record attendance. It works by capturing an image of a person's face using a camera, and then comparing it to a database of known faces to determine the person's identity. If the person's face matches a known face in the database,their attendance is recorded automatically.

The system requires a camera or webcam that can capture high-quality images, as well asfacial recognition software that can process the images and compare them to a databaseof known faces. The software can use a variety of algorithms, such as Eigenfaces, Fisher faces, LBPH, or deep learning-based algorithms, to extract features from the facial images and identify the person.

Facial recognition-based attendance systems have several advantages over traditional attendance systems. They are faster and more accurate than manual attendance systems, as they can record Performance Measures attendance automatically without the need for manual input. They are also more secure, as it is difficult for someone to impersonate another person's face.

Open cv:

OpenCV (Open Source Computer Vision Library) is an open-source computer vision and machine learning software library. It was developed initially by Intel and is now maintained by a community of developers.

For processing images and videos, OpenCV offers a wide range of functions, including:

Image and video I/O: OpenCV can read and write images and videos in various formats, including BMP, JPEG, PNG, and MPEG.

Image and video processing: OpenCV provides functions for image filtering, feature detection, object detection and tracking, and image segmentation.

Stereo vision: OpenCV provides functions for stereo vision, which is the process of creating 3D images from two or more 2D images.

Numpy:

Numpy is a Python library used for scientific computing and numerical operations. It provides powerful tools for working with multi-dimensional arrays and matrices, making it a fundamental library for scientific computing with Python.

Broadcasting: NumPy provides a broadcasting mechanism, which allows for element- wise operations between arrays with

different shapes and sizes. This feature makes it easy to perform operations on arrays of different sizes.

Pandas:

Pandas is an open-source Python library used for data manipulation and analysis. It provides powerful tools for working with structured data, making it a fundamental library for data science and analytics with Python.

Data cleaning and preparation: Pandas provides functions to handle missing data,remove duplicates, and transform data. It also allows for the merging and joining of datasets.

Input/output: Pandas can read data from a variety of file formats, including CSV,Excel, SQL databases, and JSON.

* *	Images in Face Dataset Accuracy	(%)
1	9	55
2	20	60
3	50	75
4	75	85
5	100	92

III Results and Discussion

According to the implementation setup, the match index is the smallest difference between the face encodings of the student's face in the live video capture and those in the database. Figure 13 depicts the system's implementation as it is being worked on using real- time video capture. The matchindex's confidence threshold is set to 0.6 by default. If the match index value is less than this confidence threshold, the face will be recognized and identified as the same. (i.e. match index) of the images in the dataset. After that, the student's attendance is recorded in a CSV file. On the attendance sheet, only the names of students whose faces were scanned and recognized will be written. Any app that supports CSV files, such as Excel, Google Sheets, or Numbers, can then be used to evaluate this file.

IV Conclusion

Facial attendance management system in window application with email updation are becoming increasingly popular in many fields, including education and workplaces. OpenCV,an open-source computer vision library, is a powerful tool for building such systems. By utilizing OpenCV's face recognition algorithms, a system can accurately identify individuals and record their attendance automatically, making attendance tracking more efficient and reliable. Additionally, such systems can provide real-time monitoring of attendance, allowing for immediate intervention when attendance is not meeting expectations. However, it is important to consider ethical and privacy concerns related to facial recognition technology. Adequate measures should be taken to protect individuals' personal data and ensure that the technology is used in a fair and unbiased manner. Facial attendance management system in window application with email updation using deep learning have the potential to revolutionize attendance tracking in various settings, but caution should be taken to ensure ethical and responsible use.

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