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Impressing Attendance using the OpenCV Method for Face Recognition

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ABSTRACT- Many institutions and universities place a high priority on students' attendance. Attendance is necessary to get final grades or to give students the opportunity to take examinations. The existing attendance procedure is laborious, slow, and prone to errors. It is simple to alter records that are already in the system. This report suggests the following in order to address all the issues and digitise our current system: a system that uses face recognition technology to identify and confirm individuals using their facial features in order to automatically record attendance in schools and universities. For face recognition and object identification, the system uses LBPH OpenCV and Haarcascade OpenCV, two variants of the OpenCV machine learning library. This document presents the specifics of the system.

***Key Words*:** face recognition, LBPH technology, attendance, openCV, and haarcascade

1. INTRODUCTION

1.1 CONTEXT

A person can be verified in the firm's attendance management system by the recognition of a human face. Students are identified using a high-definition surveillance system with facial biometric authentication. A part of biometric authentication is biometric recognition. It is an advanced method for figuring out a person's biological and behavioural traits. This system wastes time both for the student and the teacher by using the names of the pupils to digitalize the antiquated attendance system.

1.2 MOTIVATION

The project's primary goal is to reduce waiting times and improve attendance. The current attendance mechanism is not quick or effective. There aren't many pupils who fake their attendance in the organisation. We feel more secure and protected in the case of a pandemic (such as COVID-19) and will be on the safe side during the period of such diseases' spread thanks to the implementation of the face recognition attendance system, even though students only need to show their faces to mark their attendance.

1.3 RESEARCH PROBLEM

Attendance plays an important role on a daily basis in any organization or the educational system and it is difficult to verify the student that the authenticated person is responding or not. As it will be a more complex task when the strength of students in a class is more. It may be the case that the teacher may miss someone or any student any answer multiple times during the attendance session in the class. Maintaining the records of the student are quite a difficult and time-consuming task and it acquires human effort hence the calculation of attendance may have some errors. Hence, there is a need for an automated system for marking and maintaining the attendance of the students. As it is an automated system so it does not allow false/wrong inputs to be entered.

1.4 PROPOSED SOLUTION

To overcome such problems, the face recognition-based attendance system is proposed. To reduce the manual work and to get efficient and error-free attendance records. It also saves the valuable time of the students and the teacher as well as reduces the paperwork. It provides a better user interface. It is the better way for attendance with high precision and less computation. It is an automated system that works on biometric authentication. In this system, the face of the individual is considered or the attendance. In this project, we have proposed a system that detects the face and recognizes the data stored in the database if the detected face is found in the database the attendance of the individual will be marked.

2. LITERATURE REVIEW

In [1], presents a Smart Attendance Management System Based on Face Recognition Using CNN which is a web-based application to provide attendance of students using face recognition, in real-time. It is developed using flask framework and python. The practical implementation of the technique is trained and tested using large data .but this also may pose a challenge when capturing a large number of individuals in real time.

In this review paper [2], the implementation of the face recognition algorithm to detect and recognize faces accurately is on MATLAB software. Here Face recognition is divided into geometrical features and template matching. The advantage of using geometrical features as a basis for face recognition is that recognition is possible even at very low resolutions and with noisy images (photos with a lot of randomly spaced pixel intensities). Although the face cannot be viewed with clarity. The basis of the template matching strategy is to extract whole facial regions (matrix of pixels) and compare these with the stored images of known individuals.

This paper [3], describes the concept of how to design and develop a face recognition system through deep learning using OpenCV in python. In recent years artificial intelligence is developing rapidly manner. Deep learning is an approach to performing face recognition and seems to be an adequate method to carry out face recognition due to its high accuracy and growth of AI.

In [4], present a paper for face recognition where the face recognition problem is treated as two- dimensional (2-D) rather than three-dimensional (3-D), taking advantage of the fact that the faces of people are normally upright and thus it can be easily described by a small set of 2-D characteristic views. This system projects face images onto a feature space that spans the significant variations among known face images. The significant features are known as 'eigenfaces'.it is easy to implement using a neural network architecture.

Authors in [5] proposed a model for an automated attendance system. Where they focus on how face recognition incorporated with Frequency Identification (RFID) detects the students and keeps the count as they get in and out of the classroom. This system keeps the authentic record of every registered. The system also keeps data of particular students and can provide information or we can say data as per the use and need.

In [6], a model was proposed by authors for an attendance system in the classroom using a recognition technique by combining Discrete Wavelet transform (DWT) and Discrete Cosine Transform (DCT). In the proposed model algorithms are used to extract features of a student's face by applying the Radial Basis Function (RBF) for classifying the facial Objects. This system reached an accuracy of 82%.

Paper [7] on Attendance Systems using NFC Technology with Embedded Cameras on Mobile Devices presents near-field communication technology to get the attendance of students in schools and colleges. The system is based on NFC Technology and runs on mobile as an application. Here In server-side program will check for validation and component analysis algorithm compare the temporary image with the original image of the student. If the data are valid then programmed updates the database of a student, otherwise closes the application by showing an error message.

In [8] the face detection algorithm suggested by authors in this system is built employing a skin-splitting approach to improve the accuracy of the face detection process. When the result is located on the face website, the taken image is compared individually with the face mask to display the employee's face, where presence is noted in the data. The key benefit of this method is that the presence is recorded on a highly secure server that no one else can access easily.

Authors in [9] propose a method for a Face recognition attendance system using Local Binary Pattern (LBP) in which they use two methods in this paper one for face detection using the viola-jones algorithm and the other face recognition part will be carried on by using local binary pattern (LBP) method and then the system will automatically save students into the database using face recognition method.

In [10] a model is proposed which an integrative system of human faces recognition is built up, and human faces recognition is carried out. Human face recognition experiments are carried out, and the Least Square Support Vector Machine is adopted during recognition. The smooth filter can restrain and eliminate yawp sources, and gain images of high quality.

Authors [11] proposed an automated attendance system model. This model focuses on how the face is recognized with Radio Frequency Identification (RFID). This model detects the students and counts they go in and out of the class. It maintains the records of the student and updates the data in the database.

Different [12] approaches to the attendance system based on face recognition were given by Dwi Sunaryono. He explained how different sectors like schools, colleges, companies, etc can use the system for attendance purposes to avoid mistakes.

[13] is a cloud-based intelligent attendance system through video streaming. This system is based on face recognition relatively on a large scale. thus, when compared with the other alternatives for marking attendance, this system proves to be more reliable and accurate. it is integrated into a private cloud which makes it easier to access easily from anywhere only via the internet also makes the system more secure and more reliable than any other traditional systems.

[14] presents a model in which Implementation of face detection and tracking by combining the Viola-Jones method, CamShift tracking, and the Kalman filter tracking. The main objective was to increase the rate of face detection but decrease the computation cost. This experiment result shows that an average detection rate of 98.3% is achieved and this method is superior to existing techniques.

3. METHODOLOGY

1. LBPH

The face-recognition algorithm LBPH (Local Binary Pattern Histogram) is used to identify a person's face. It is renowned for its effectiveness and for being able to recognize a person's face from both the front and the side views.

Four parameters are commonly used by the LBPH algorithm:

- Radius: Usually takes a value of 1, it is the distance of a circular local binary pattern from its center pixel to its perimeter.
- Neighbors: A number of data points that make up a circular local binary pattern. Typically, the number 8.
- Grid X: There are typically 8 cells in the horizontal plane of a grid.
- Grid Y: There are typically 8 cells in the vertical plane of the grid.

The steps involved in facial recognition with LBPH

The LBPH algorithm follows various steps for face recognition. These actions can be completed in the following two stages:

The algorithm's education: The learning of the algorithm is the initial phase. It makes use of a data set with pictures of the persons who will be recognized. To enable the algorithm to recognize each image and export the output, each image is given a distinct ID that can either be a number or a name. The same person's photos are consistently listed under the same ID.

i. The first step in the computational process is the application of the LBP operation. Here, a sliding window concept has been used to construct an intermediate image that more accurately

represents the original image while accounting for two parameters: the neighbor and the radius. By comparing the 8 neighbor values to the threshold value, new binary values are formed.

The value is set to 1 for any neighbor value larger than the threshold value and to 0 for any neighbor value less than the threshold value. A binary number matrix is created by this, but does not include the threshold. The binary number is converted to a decimal value that represents the pixels of the original image to produce the center value of the matrix. to more accurately convey the qualities of the source picture.

ii. With the aid of the Grid parameters X and Y, the image generated in step is divided into numerous grids in order to extract histograms. Each histogram on each grid in this grayscale image represents the intensity of the occurrences of each pixel. The qualities of the original image are then represented by a new histogram that is produced by combining each histogram.

iii. Accurate face recognition: For each image in the training data set, each created a histogram. To determine which image best represents the input image's histogram, two histograms are compared. This output contains the image's ID or name. A confidence measurement, which is the calculated distance, is also returned by this procedure. The confidence and threshold automatically estimate how accurately the system recognized the image. A confidence value that is below the specified threshold indicates correctness.

2. Haarcascade

It functions in four steps:

i. Haar-feature choice Dark and light sections make up a Haar-like characteristic. By comparing the difference between the sum of the intensities of the bright and dark zones, it yields a single value. In order to identify an object, valuable elements must be extracted.

ii. Making an Integral Image: A particular integral picture pixel is made up of all the pixels to its left and all the pixels to its right. Integral Pictures greatly shorten the time required to accomplish the operation of extracting Haar-like features, which requires computing the difference between rectangular dark and bright patches.

iii. AdaBoost Training: This algorithm picks the top features from each category of features. It creates a "strong classifier" by combining many "weak classifiers" (best characteristics). The "strong classifier" that is formed is just a linear combination of all "weak classifiers."

iv. Cascade Classifier: This technique combines classifiers that are progressively more complicated, such as AdaBoost, in a cascade, allowing negative input (non-face) to be swiftly discarded while devoting more processing power to promising or positive face-like regions. It greatly shortens the computation time and improves the effectiveness of the procedure.

4. CONCLUSIONS

The goal of the automated attendance system is to decrease the errors that are made by the current (manual) attendance-taking system. The goal is to automate and create a system that is beneficial to the institution or other organization. The modern, accurate method of taking attendance in offices can replace the traditional, manual ones. This approach is workable, trustworthy, and sufficiently safe. The system can be installed in the office without the use of specific hardware. A camera and computer can be used to create it. In this method, a lecturer or teaching assistant can record students' attendance by using an attendance system for a lecture, section, or lab.

It saves time and effort, especially if there are a lot of pupils in the lecture. The goal of the automated attendance system is to minimize the shortcomings of the conventional (manual) approach. This attendance system serves as an example of how image-processing methods are applied in the classroom. This technique can enhance an institution's reputation in addition to simply assisting with the attendance system.

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