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Student Attendance System Using Face Recognition

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Abstract

In schools or colleges, we have two types of attendance systems, one is the teacher or professor calling student names and the second is in front of student names the student sign. We came up with a new attendance system model. It will detect the student's face and will send a WhatsApp message to the registered contact number of their parents and email to the teacher or professor. Humans can recognize faces and complexions. The computer is not intelligent. We must make it smart by creating and training the model. Video and Image are the core of computer vision. We must connect Python to a webcam, for creating images we need some drivers and a library. With the help of the OpenCV-python library, we can connect to a webcam. Every webcam has unique numbers. The internal webcam number is zero. The external webcam number is one. In this, we will use the Harras Cade model for face detection. Computers understand binary numbers and every binary number has unique pixels. It is consequently suggested that the article address each of these issues. Attendance reports will be generated and saved in Excel format following face recognition. The system is tested in a variety of settings including changes in lighting, head motions and the distance between the learner and the cameras.

Keywords: Computer vision, OpenCV, NumPy, Local Binary Pattern Histogram, Harr Cascade.

I. Introduction

Computer vision is a field of artificial intelligence that enables computers and systems to give information from images, and videos and give results as per that information. AI indicates computers to think, computer vision indicates to see, observe, and understand. Computer vision makes use of machine learning and neural networks to train computers to see results. It can recognize things and any creature in the form of images and videos. With the help of AI, computer vision works the same as human beings. It trains modules to perform the actions and needs a lot of data. CV2 connects with a webcam i.e., Internal webcam & External webcam.

OpenCV is an open-source computer vision library used in artificial intelligence, machine learning, and facial recognition. It is used for image processing and computer vision projects. It has different types of features such as object detection, tracking, and face recognition. It provides low-level operations for extracting images and matrices. Following extensive testing, total accuracy and complexity are computed. The suggested technique turned out to be a reliable and effective tool for recording attendance in a classroom without requiring any manual labour or time commitment. Local Binary Pattern Histogram is used for image recognition for low level & high-level images in real-time The LBPH algorithm is used to examine the texture patterns of an image and create a histogram of local binary patterns This action provides a powerful tool for facial recognition due to its simplicity, efficiency and high recognition rate. LBPH has an accuracy of 90.90% and the accuracy for deep

face is 91.95%. The deep face algorithm is well-organized and accurate in image classification. Restriction of the LBPH formula will take more time for execution and recognition as the size of the make feature increases exponentially based on the number of images [1].

Face recognition is of two types, one is Feature or Geometric and the second is template-based or photometric. In geometric or feature-based; eyes, nose, ears, mouth, and chin are detected. Relations and properties such as area, distance, and angle between the features are used as descriptors of the face. It doesn't require the cooperation of the test subject to work. Face recognition doesn't work in low-resolution images, poor lighting, or other objects partially covering the subject's face. Template matching and neural methods generally operate directly on an image-based representation of faces, and pixel intensity. The camera detects and locates the images of faces, either alone or in a crowd. The image may show the person looking straight ahead or in profile [2].

NumPy is a library in Python, which is used for working with arrays. It works in the domain of integrating linear algebra, Fourier transforms, and matrices. It brings the power of languages like Fortran and C to Python. It supports a wide range of hardware. It can be installed by using pip. For example, pip install NumPy. It allows functions analogous to the range that comes back to arrays in place of lists.

II. Related Work

This paper's main goal is to examine the various strategies offered by the authors and create a real-time attendance system that addresses the drawbacks of earlier systems while providing the best outcome.

Kawaguchi et al. Proposed a face recognition system based on continuous observation. The system with an active student detecting method (ASD) that the author proposed has two cameras mounted on the wall, one is sensing camera that measures student seating within the classroom and the other is capturing camera that detects faces. Their suggested shooting strategy involves estimating one seat based on the seating space that ASD provided, pointing the capturing camera in the direction of the seat and taking the picture. The backdrop subtraction and inters frame subtraction are used to estimate the number of students. The author has provided the relationship between students and seats by solving the linear sum assignment issue [3].

A convolutional neural network-based automated system was presented in a paper. The created attendance report was sent to an authorized person by the author using the GSM module. The updated convolutional neural network that the author suggests has two normalization procedures added to two of the layers. The network batch normalization acceleration is provided by this procedure. The SIFT algorithm is used in the creation of a facial recognition system. After taking a picture and cross-referencing it with the database, the approved number will receive an SMS. Key point localization, orientation, assignment, scale-space extreme detection and key point descriptor are the main processes in this feature generation approach [4].

Savitha et al. introduced a system in that uses a skin detection technique to identify faces. The remaining pixels in the image are turned black after the skin has been identified. Subsequently, these skin pixels will be utilized for facial recognition. The authors have employed two databases: one for student data storage and the other for student faces [5].

III. Proposed System

The architecture of the automated attendance management system is incredibly straightforward and simple to use. Two databases make up the system: one for students and the other for attendance. The purpose of the student database is to hold a student's specific class information. Conversely, the purpose of the attendance database, as its name implies, is to record and manage the attendance of students who attended a specific lecture [6].

This system will feature a high-definition camera mounted outside the classroom to successfully mark attendance. By scanning their faces in that camera, students will be able to attend the classroom. Every student in the class will be seen through the lens of a second camera that will be put within the classroom. Both cameras will be equipped with facial identification and recognition algorithms, so they'll scan the faces and record each person's attendance appropriately [7].

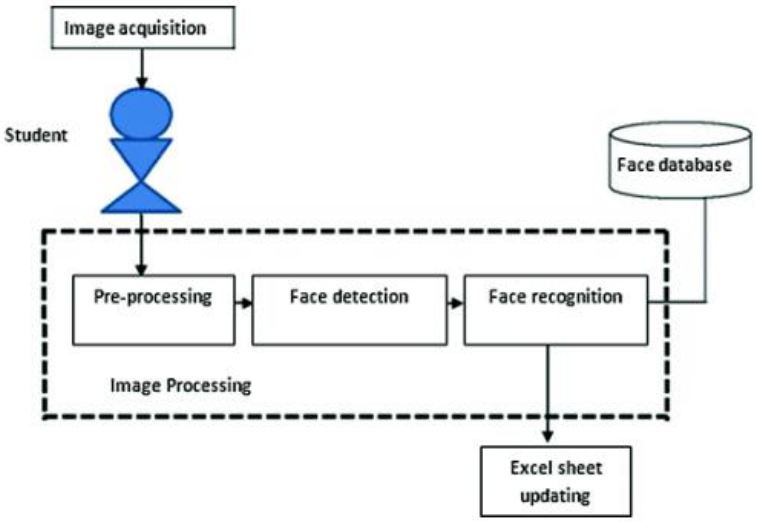

Figure 1: Block diagram of Student Face Recognition

IV. Method

We must install OpenCV-python using the pip command and then import the cv2 module in our model. LBPH stands for Local Binary Pattern Histogram is the most popular algorithm to create student face recognition. For training this model we must create multiple images of students to train the model as we know that one image consists of multiple pixels that have individual features, and one entire image is like one record. For creating training data, we captured multiple images with student faces detected and stored in one path. After creating a training dataset, we first created a model using the LBPH algorithm using a method called face LBPH Face Recognizer. Create () but to do so we had to install “pip install OpenCV-Contri-python”. Then use train () to train our model using the training dataset. We will run a student face recognition program by testing our model such that the confidence score is greater than 85% then it will recognize student faces and send SMS and email [8].

We will send a WhatsApp message to the mobile number that will be provided as input using “get pass' ' which comes with “get pass” module. To send WhatsApp messages to students' parents we have to install a library called py what kit using pip command and function called send whatapp instantly () which will open WhatsApp web and send message specified as an argument to the recipient instantly.

Then we will send an email to the recipient email ID and to do this we have to install the “email” library by using the pip command and then import the Email Message (). We have added other details like subject, to, from, body. For connecting with the SMTP mail server using an SSL connection that works on port no 465, we have to import a module named smptlib and then use the “SMTP_SSL” function and specify the email server which you want to connect along with port number as arguments to this function. After that send a message using the send message () function [9].

The camera may catch a blurry image due to a pupil movement. The sum of the pixels under the black region is subtracted from the sum of the pixels under the white area to create these classifiers. It was discovered that applying 6000 characteristics to every window frame was challenging. The features were arranged into what are referred to as classifier cascades, or steps. AdaBoost is used to eliminate unnecessary features and choose

only those that are necessary. Weak classifiers are the term for these characteristics. To detect faces, a weighted combination of weak classifiers is employed. A strong classifier is created by combining weak classifiers using the AdaBoost linear combination [10].

V. Result Discussion

This part explains the project's implementation, the necessary experimental setup, and some before and after work photos.

A. Experimental Setup

This system needs to take the following precautions into account. The central spot on the front wall of the classroom, above the chalkboard, is where the camera should be positioned. There should be no direct light on the camera and adequate lighting in the classroom.

Figure 2: Camera capturing the classroom

B. Experimental Results

Educational institution can profit greatly from an attendance management system that uses facial recognition. Face recognition-based clock systems can be influenced by teacher's presence or clock, and they are less prone to error than traditional approaches when it comes to identifying an individual's presence or absence. Facial recognition technology replaces labour-intensive manual time and attendance recording, which is particularly problematic. Attendance records can be automatically generated by the facial recognition system, which saves time and lessens the administrative strain. By limiting access to restricted areas to just authorized people, the system guards against theft, illegal entry, and other security lapses. During our process, we collected 100 pictures of each student faces in 4-5 second. Utilizing the gathered photos, train the model.

VI. Conclusion

The proposed automated attendance system using face recognition is a great model for marking the attendance of students in a classroom. One excellent example for recording student attendance in a classroom is the suggested automated attendance system that makes use of facial recognition technology. Additionally, this system helps to reduce the likelihood of proxies and phony attendance. There are many biometric systems accessible in the current world. But because facial recognition requires little in the way of human participation and has a high accuracy, it ends up being a practical solution. The goal of this system is to offer a high degree of security. Therefore, it is necessary to design a highly efficient system for tracking classroom attendance that

can recognize numerous faces at once. Furthermore, no specialized hardware is needed for its implementation. To build a smart attendance system, all you need is a camera, a PC, and database servers.

VII. Result

We successfully constructed the Attendance Management System using Face Recognition after studying the various techniques used in face recognition systems. The entire class will be captured in one picture using this system. At least 2.5 feet should separate a student's face from you. To prevent unintentional face recognition, this is done. For our system to correctly categorize the student photos, there must be adequate illumination. After being trained, our system recognizes faces during testing and assigns a name to each one.

We examined the generated algorithm's performance by putting it into practice and applying the method and algorithm utilized to create a face recognition system. and putting in place a mechanism that would produce student attendance reports. There is no need for human intervention with ours. The greatest benefit is this one. Additionally, teachers make good use of their attendance-taking time so they may engage with students more effectively and have more time. Our system will correctly identify the faces of the students and record their attendance in an excel spreadsheet. We have evaluated the accuracy of the CNN, and LBPH algorithms in our system. Because the Local Binary Patterns Histogram (LBPH) approach yields excellent accuracy during training, we can conclude that it is the most efficient technique for face identification from photos and testing phase.

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