International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 4 April 2023, pp: 675-679 www.ijaem.net ISSN: 2395-5252

Face Recognition Based Attendance System

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Date of Submission: 05-04-2023 Date of Acceptance: 15-04-2023

ABSTRACT:
Attendance is something that is very important to every organization; for recording student attendance, various methods are used like taking it manually, by fingerprint, bar- code scanner, etc., but they have many shortcomings where the time taken to take the attendance is more, and there is a chance of proxy which has been a huge challenge to face while taking attendance. In a class of 50 minutes, nearly 10 minutes are used in taking attendance which is a major area of concern. To make the process of taking attendance easy and not time-consuming, we use a machine learning algorithm for face detection, feature identification, and face recognition. In Face detection, we recognize a face from an image; feature extraction is where we extract the features of the face like the distance between eyes and nose, length of nose, the color of eyes, etc. Face recognition; we see if the face matches the person in the database by using a feature-based, holistic- based, or hybrid-based approach. By using this project, we can automate the attendance process by saving much time for the universities; we can use a camera in the classroom and detect who is present in the class and match it with the database and automatically post the attendance, and if a student is absent, we can send mail to the parent email address.

I. INTRODUCTION:

We all know how vital taking attendance in an organization can be, as most of the tasks in the organization depend on attendance from writing exams criteria to know the regularity of a student and also lets parents see the attentiveness of a child. Many things changed in the recent past in an organization, from taking notes to the teaching methods used, etc. but the way in which attendance is taken is not changed, as most the schools colleges, even high-class universities, still use the traditional method where they use registers or papers to take attendance, so in this project, we are trying to change this approach as it is cumbersome and takes much time to do it. In this project, we try to take the attendance of a student by using their facial features and recognize them and record their attendance in a spreadsheet which can be used later used for reference as the spreadsheet is stored in the computer servers, we try to achieve this by using the HOG algorithm, which gives us a greater advantage of using viola-jones. By using this, we save the time of many people who try to take the attendance manually, then using those registers or papers to store the recorded attendance in a database etc., we have various stages in this so that there is an optimal recognition of the face, we use HOG to detect the face and then use various datasets like multi-pie/ibug to extract features, then use CNN to encode faces and lastly, use a classifier to classify the face to match the data in the database to know the name.

II. LITERATURE SURVEY:

[1]In the research paper titled "Automatic Attendance System for University Student Using Face Recognition Based on Deep Learning" by Tata Sutabri, Pamungkur, Ade Kurniawan, and Raymond Erz Saragih, published in the year 2019, and the techniques used are viola jones. The project's future scope included using cloud-based techniques to capture attendance. In order to compare performance, the usage of a different,more advanced face recognition technique is planned. This technique, the Convolutional Neural network, in this case, should perform better in terms of speed and accuracy.

[2]. In the research paper titled "Face Recognition Based Attendance System management system" by Smitha, Pavithra S Hegde, Afshin, year of publication 2022. Here the authors designed and implemented iris biometrics in an attendance system. The participants were initially required to

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register their personal information and distinctive iris template. The technology automatically took attendance for the class by taking a picture of each student's eye, comparing that iris with the data they have, and finding a match. They suggested a facial recognition-based attendance system. The system was implemented using a support vector machine (SVM).

[3]. In the research paper titled "Face Recognition Based Attendance System" by Mekala V, Vibin Mammen Vinod, Manimegalai M, Nandhini K, The project was published in the year of 2019, And the technique used is PCA(principal component analysis). The project's future scope is 95.61% accurate and can be improved by using wide-angle cameras and raising the image resolution.

III. PROBLEM IDENTIFICATION

3.1 Project Definition:

This project aims to construct, maintain, and update a subsystem for recording attendance that uses facial features as the biometric key.

3.1.1 Systems that are already in use:

• Traditional attendance registers: In this, the teacher or person responsible for taking attendance uses a register containing a list of all the students' names; a tick mark is used for present, and a cross mark is used if they are absent. This method is very cumbersome and takes a long time

• Qr code or forms: At the end of the class, a QR code or google form is shared for a certain time where the students can fill in their details to mark them as a present. This method is not trustworthy as other students can mark attendance for those not in class, and the form or QR can be shareable.

3.1.2 PROPOSED SYSTEM AND SOLUTION:

The proposed solution is that by using the camera in the class, we can take a snapshot or a video for some time so that every face in the class is recorded. The attendance is given to the recognized faces; this helps with also finding those who do not belong to that class as well as giving attendance to those who are present for more than half the time in the class.

3.2 Project Specifications:

a. Uses classifiers like SVM or knn to find similarities between the features of the face we want to recognize and the features of faces in the database to find the similarity.

b. Ten users are fixed for the prototype; however, the design is scalable.

c. Metric: Camera Resolution.

d. It requires good lighting conditions so the photo can be taken properly.

e. Attendance is maintained in .xlsx format so that it can be digitally available and formatted.

3.3 Scope of the Project:

•By using this project, we can automatically take the attendance.

• High-quality cameras can be installed in every class so that attendance can be recorded properly.

• Certain methods can be implemented such that the photo can be taken every 5 mins and can be compared to giving attendance, as some students tend to leave the class after marking of the attendance is complete.

•The attendance recorded is directly stored on the university server.

IV. SYSTEM METHODOLOGY.

To record attendance, we need to first recognize the person and mark the attendance, before recognizing we need to detect the faces in a picture, extract various features of this face, and compare those features to the ones which we have in the database so that they can be recognized and attendance can be given.

4.1 Proposal model:

In this project, we use hog(histogram of gradient) for identifying various faces in an image; then we use the face landmark estimation algorithm to identify 68 points of a face and rotate the face so that it is straight, then we use convolution neural network to get 128 features of the face which then can be mapped with the database using SVM so that we can recognize the face and give the attendance.

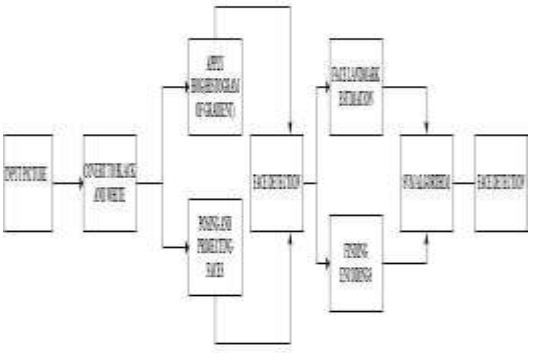

Figure 1:Block diagram of the processes involved

4.2 Steps involved :

Step 1: detection of faces.

Step 2: rotating the face in a straight direction.

Step3:Finding the encoding.

Step4:matching the encoding with the encodings in the database.

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4.2.1 detection of faces(HOG-histogram of gradients)

• The first step is to convert the image into black and white images, as we don't require color image for face detection.

•Next, for each pixel, we will be getting a gradient from the darker region to the lighter region based on the gradient value in x direction and y direction and tan inverse of x gradient by y-gradient gives us the direction of the gradient.

• After every pixel gets its gradient value, we match the image with a pre- configured image so that we can tell whether there is a face or not

• The above steps are repeated for all the faces in an image so that all the faces are identified

• This step is only for detecting the faces in the image.

Figure-2: Histogram of oriented gradients

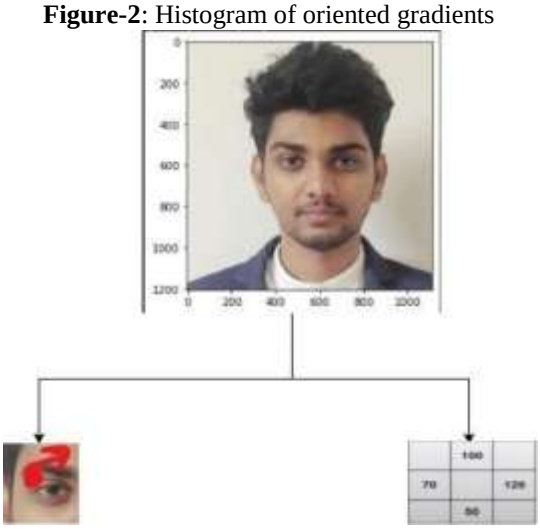

Figure3. How each pixel gradient is obtained

Gradient in x-direction=120-70=50
Gradient in y-direction=100-50=50
Gradient magnitude=square root((50)^2+(50)^2))=70.1 Gradient angle=tan inverse(50/50)=45 degrees

4.2.2 rotating the face in straight direction

• A computer cannot understand the features of a face if it is not straight, so before finding the encoding of the face, we need to rotate it so that it is straight

• We will be using multiple/ibug dataset with face landmark estimation algorithm for this where we get sixty-eight features of the face and then use them to rotate the face so that it is straight

• We can use different datasets in this process, like Helen, etc., so that efficiency can be improved further.

Figure-4: faces landmark detection's of a image

4.2.3 Finding the Encoding:

• A computer can only understand numbers; it doesn't understand the image color or the facial features like nose, eyes, etc., so we need to find the encoding for a face which is a specific set of numbers that can be used to recognize a face.

• We will use a convolution neural network to find all 128 encodings of the face.

• These 128 encodings will be different for different faces, and these can be used to uniquely identify a face.

• Brandon has made this easy by already publishing various models which are trained.

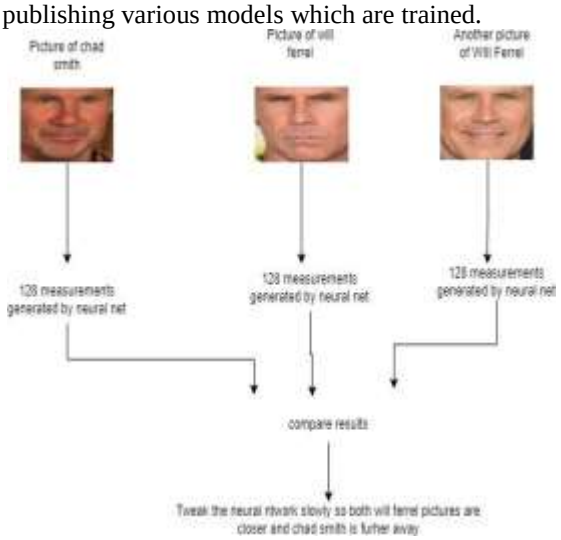

Figure-5: Encoding the image

4.2.4 matching the encoding with the encodings in database:

• After getting the encoding, the encoding must be compared with all the face encoding in the database so that we can recognize the face based on the encoding.

•We can see the person's name as the encoding in

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the database has a name associated with it.
•Comparing the encoding with all the encodings in the database takes a lot of time, so we use a classification algorithm like SVM to compare the encoding to the encodings in the database.
• A face is detected if there is a match, and attendance is marked in a spreadsheet.

V. IMPLEMENTATION:

- We will be importing the packages like cv2 and NumPy,face_recognition for estimating the location of face in image, .cv2 which helps in supporting computer vision algorithms and NumPy that are used to perform data manipulation and also helps in performing some mathematical calculations.
- The path is given where the images of students are present and the names of students are taken in list from existing images removing .jpg.
- find encoding method is called and all the encodings are recorded.Encoding for every face in the existing folder is found out using face_recognition.face_encoding() method.
- The encodings of every face in database is stored in encodelist.
- Mark attendance method is used after finding encoding and matching encodings
- It opens an attendance.csv file and appends the attendance and .findencoding method is called and all the encodings are recorded.
- The encoding of the face and the faces in the database are compared.
- Face distance is measured,Based on distance a rectangular box is drawn around the face.
- Based on matching of encodings names is displayedand attendance is marked in attendance.csv.

VI. RESULTS:

The primary objective of this project was to detect the faces and mark the attendance. The article focused on creating atechnologythatisportable,inexpensive,andcompatible with any normal operating system. Theproposedsystemaimsto detect the faces irrespective of various factors like alignment of face, brightness of image. The final output can be seen in figure 6.

	A	B	C
1	Name	Roll	Time
2	sravanth	1	13:22:50
3	monish	2	13:22:50
4			

Figure 6: Final output

VII. CONCLUSION AND FUTURE SCOPE:

7.1 Future Scope:

The current application is only designed to detect and recognize faces from a laptop's camera. Additional advancements can be made, including the ability to recognize the entire class with the use of a camera and faster recognition times. A better front end can be created for easy access to university personnel. User hierarchy must be maintained; some controls should only be given to teachers. Roles should be clearly defined between teachers and students, and who does what students can be given access to only see their attendance and not change it if they find that there is any error they can, then they can contact the respected teacher, and then he/she can change the attendance for him We can try and improve the clarity of the camera.

7.2 Conclusion:

Before this method, there were a lot of irregularities in how attendance is taken; this approach helps us to take attendance quicker, and it's less expensive compared to the traditional methods; once if we fix cameras in every classroom, it nearly suffices for the next 10-15 years, wecan always try to improve the accuracy of the model, with this we reduce the wastage of paper and drastically reduce the amount of time an individual has to take to publish the attendance.

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