IJETIR

ISSN (Online) 2583-0554

International Journal of Emerging Technologies and Innovative Research (IJETIR)

Volume 4, Issue 6, June 2024

Impact Factor: 5.731

Smart Attendance Monitoring System using Facial Recognition

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Abstract: *All Standard institutes of learning place high priority on class attendance that if the criteria is not met by the student, the student will not be granted access to sit for his/her examination conducted by the school. This makes class attendance an important activity for the student. Over the years, class attendance has been conducted manually and is still taking place currently in almost 80% of Nigerian Universities. Manual monitoring of attendance by the university's lecturer has become a hectic one for most lecturers and students. With the advancement of technology, manual marking of student's attendance has been replaced by biometric concepts. Though many researchers have made provisions on some biometric functions like fingerprint scanner, iris recognition, hand and finger geometric. In this paper we will propose a facial recognition concept as a means of verification in marking student's attendance and store it into the database once verified. The system made use of a dlib library OpenCv library in successfully carrying out facial recognition. Images are read into directory, and these images are encoded so as to generate 128 facial measurements like distances between the nose, ear, and eyebrow etc. This encodings will be used in making comparisons with images read from camera or from live streaming videos in other to find best matches. For the real time attendance system, we created a web application using python flask. Here we used bootstrap framework for frontend design, python as the programming language and Mysql for database design*

Keywords: Facial Recognition, Attendance Management, OpenCv, dlib, Python flask, Mysql database

I. INTRODUCTION

All Standard institutes of learning place high priority on class attendance that if the criteria is not met by the student, the student will not be granted access to sit for his/her examination conducted by the school. This makes class attendance an important one for the student. Over the years, class attendance has been conducted manually and is still taking place currently in almost 80% of Nigerian Universities. Manual monitoring of attendance by the university's lecturer has become a hectic one for most lecturers. Most times students tend to struggle to write attendance in the attendance sheet due to the large numbers of students present in class, most times students tend to help their friends mark attendance who are absent in class. With the advancement of technology, manual marking of student's attendance has been replaced by biometric concepts. Though many researchers have made provisions on some biometric functions like fingerprint scanner, iris recognition, hand and finger geometric. In this paper we will proposed a facial recognition concept as means of verification in marking student's attendance and store it into the database once verified

Facial recognition system is supplanting biometrics viably. It is different from all as it utilizes the facial characteristics of an individual for recognition. It can be ascribed as a procedure with least fault as the facial character of every individual is exceptional. Nobly outperforming in different fields, facial detection can successfully be utilized for security frameworks, however has not been sought after because of apparent defects. Marking of attendance through biometrics had a clumsy charge of additional exertion and individual time at the client end. After the flare-up of facial recognition as a valuable strategy, strategies were developed to fuse it in the attendance

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monitoring system. Biometric mode of management of attendance fundamentally utilizes iris identification or fingerprint checking. With entry of time, headways are likewise expected to fasten up with truly developing innovation. As multi tech classrooms are developing [1].

Management of Attendance through biometrics is additionally being improved and executed. As marking procedures are propelling, the desperate need to eliminate barriers, intricacies of devices, delays and a real attendance is the idea under concentration. Though the traditional marking of attendance system is slow and exposed, facial recognition marking of attendance utilizes face characters to distinguish and mark the student present as attendance. Facial Recognition is done through a camera with no component and automatically marks an attendance. The detected face is used to mark presence. The framework is valuable in marking and monitoring student attendance keeping up record for the lecturer and students. Facial algorithms are utilized to coordinate faces with the data set appearances of the student. Many have investigated this viewpoint and figured out how to execute the framework effectively [1].

II. LITERATURE SURVEY

Smart Attendance System [4] presents a smart attendance system using Radio Frequency Identification (RFID) technology for class attendance monitoring. The Radio Frequency Identification (RFID) innovation is a robotization innovation that is advantageous in improving the current traditional method of marking student attendance, as each tag has its own novel ID, it is not difficult to separate each label holder. A Radio Frequency Identification (RFID) innovation RFID tag is an item that can be applied to or embedded into an item, individual, or creature with the end goal of recognition and monitoring utilizing radio waves. A few labels can be read from a few centimetres or meters away and past the view of the reader. Likewise, a Graphical User Interface (GUI) gives a more productive approach to survey the student's attendance.

A Conceptual Model for Automated Attendance Marking System Using Facial Recognition [1] proposes a model for systematic marking of attendance. They made use of two databases in which one is a respiratory database and the other is used for keeping student's information. The respiratory database contains the generally assembled pictures and the covers determined by the facial fiducial point of the students to such an extent that of nose, eyes and lips principally. The other data set known as the student's data set will be utilized to check the attendance of the students. A camera will be fixed in the class in the front, at such a point where the image of the entire class can be taken. When the picture is caught, clamour will be computed and foundation will likewise be limited.

Gabor Filters or Jets will be applied after that through which each individual student's 31 facial fiducially focuses will be determined. It will figure the estimations of the facial highlights and afterward they will be coordinated to the picture data put away in the capacity information base.

This all calculation will be going on the worker. When the matches are done, the student's attendance is set apart to address the issue of approval of the student present in the class or not.

Mart Attendance Portal Using Facial Recognition [5] shows the colossal advancement accomplished by the deep learning techniques. The primary piece of the research work is Convolutional Neural Network based facial recognition and identification, and its application over simplifying everyday life is the illustration on how far these innovations have come. The execution of facial recognition gives a decent accuracy and the limitation in recognition can remove the greatest farce assaults which can be utilized to deceive the system. This present reality execution will have a few key components into play like execution of the facial recognition unit, no focus for inputting attendance, association speed, and nature of camera.

III. METHODOLOGY SECTION

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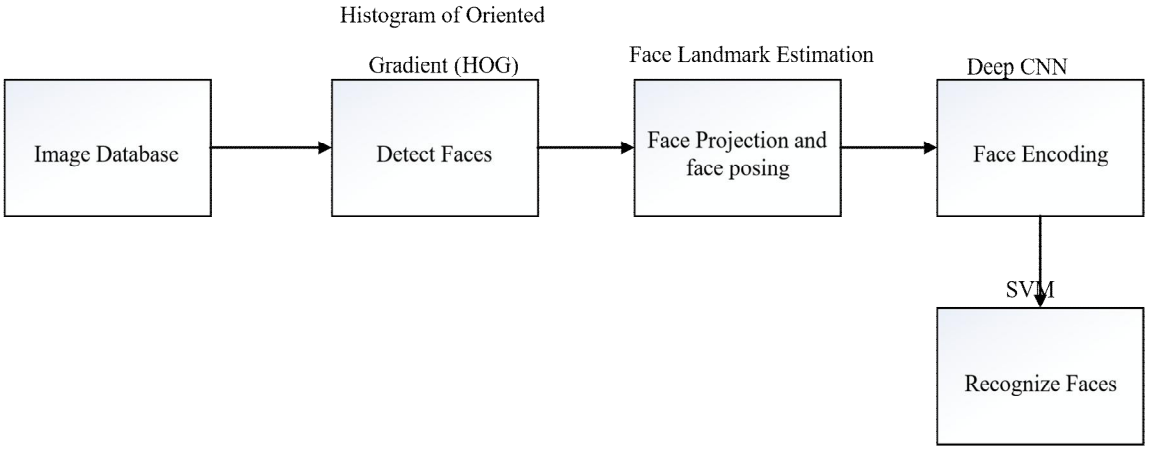

Figure 1: Architecture of the Proposed System

The following are the detailed explanation of the steps involved in our proposed smart attendance monitoring system using facial recognition

- **Image Database:** This contains the list of images that we will be using for training of our proposed system model for comparing various images with that of our trained images. The compared images can be that from camera and it also images from a live streaming video.
- **Detect Faces:** We will be making use of Histogram of Oriented Gradient (HOG) method in detecting images from cameras or live streaming videos. Histogram of Oriented Gradient (HOG) is an element descriptor habitually utilized for object recognition. HOGs are broadly known for their utilization in common recognition. Histogram of Oriented Gradient (HOG) depends on the property of items inside a picture to have the appropriation of power angles or edge headings. Angles are determined inside a picture for every square. A square is considered as a pixel lattice wherein angles are composed from the extent and course of progress in the powers of the pixel inside the square.
- **Face Project and Posing:** Most times, various images are taken on a different projection, some can be taken from the side while some can be taken from the front and also most images taken by a person tends to have different posture. So in order to solve the problem of face projection and posing on images and live streaming videos, we will be making use of Face Landmark Estimation.
- **Face Encoding:** To solve the problem of comparing different faces on an image or a live streaming video, we need to encode this image so that we can directly compare an unknown image from a camera or a video with the image in our database. For comparison, we can make measurements with the ear size, distance between the eyes, nose length e.t.c. To achieve this we will be employing a deep convolutional neural network to encode these images and carry out these measurements. The images will be trained to make 128 measurements.
- **Recognize Faces:** Here, we will be making use of a basic machine learning algorithm to the measured encoded images, and tell which person will have the closet facial match.

IV. RESULT AND DISCUSSION

This system proposes a smart attendance monitoring system using facial recognition as concept of verification. The system starts by acquiring images that will be used for training. Each of this image will be saved with the name of the individual. The acquired images was saved into a folder called training_images. This images was read into directory as a list by using the os.listdir() function. For face recognition, we used a face_recognition library in python which was built using dlib's state-of-the-art facial recognition with deep learning, which has about 99.38% of accuracy. We created two arrays namely img and classNames. The img holds the training images and the classNames hold the name of the individuals whose images are stored in our training folder. After the processes, we encoded our training

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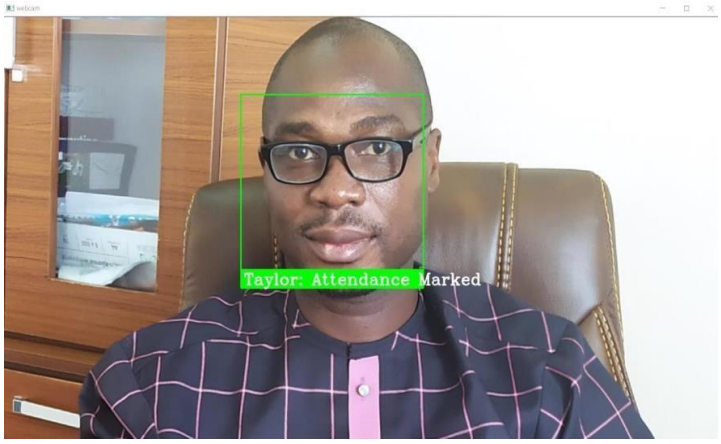
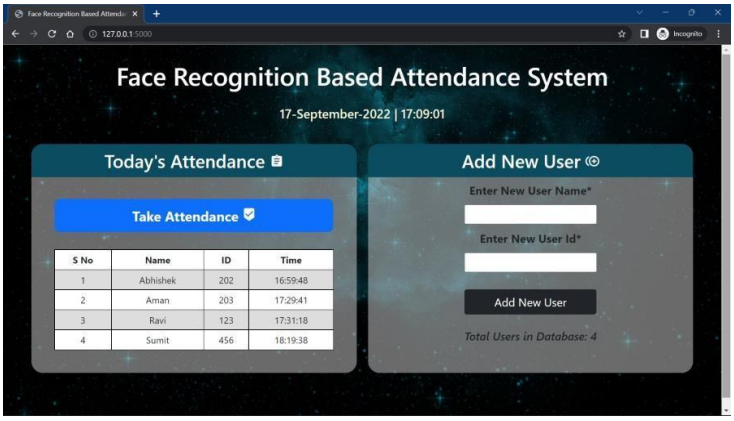
images in other to generate some measurements in which we will be using in comparing other images read from camera and live streaming videos.

Comparison will be done using face location which has to do with distances between the nose, the ear, eyebrow etc. Figure 2 shows the encoded measurements of our training images which are being stored in the training folder. After successfully completing our encoded trained images, we used cv2 which OpenCV in streaming a live video (cv2.VideoCapture (0) in loading a live video from our local web camera. The images were read from the camera by using cv2.imread(), which holds the variable assigned to the live streaming camera. We also resize the read images to 250 x 250 pixels. We used the Histogram of Oriented Gradient (HOG) method in detecting images from the live streaming video. We converted the read images to white and black by using cv2.cvtColor() function which holds the images and assigns an RBG color to it. We used landmarks in assigning a location to the images, and finally we encoded the read images by using the deep convolutional neural network. For facial comparison we assigned a variable called faceDis which holds the compared distance results from the compared images. We draw a rectangle using cv2.rectangle function (), and we input the names of every person found on the database on the output images and we input no record found on the unknown images. For the real time attendance system, we created a web application using python flask. Here we used bootstrap framework for frontend design, python as the programming language and Mysql for database design. The web application is made of a login page which can be seen in, here the lecturer have to login, select course on which he/she wants to mark attendance on, and click on mark attendance button, automatically a live video is being popped up and attendance is being marked and stored on Mysql database once the student face is being recognize in the database.

Figure 2





V. CONCLUSION AND FUTURE WORK

All Standard institutes of learning place high priority on class attendance that if the criteria is not met by the student, the student will not be granted access to sit for his/her examination conducted by the school. This makes class attendance an important one for the student. Over the years, class attendance has been conducted manually and is still taking place currently in almost 80% of Nigerian Universities. This paper proposed a smart attendance monitoring system using facial recognition as a concept of verification. The system made use of a DLIB library OpenCV library in successfully carrying out facial recognition. Images are read into the directory, and these images are encoded so as to generate 128 facial measurements like distances between the nose, ear, and eyebrow etc. This encodings will be used in making comparisons with images read from camera or from live streaming videos in order to find best matches. This system was further deployed for a real time attendance management system using python flask. This work can further be extended by using Raspberry Pi with a CCTV camera to capture images of students in class and mark them present as attendance.

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