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Facial Recognition Attendance System usingMTCNN and FACENET

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***Abstract*—In this technological age, Face Recognition systems play a vital role in almost every sector. Face Recognition is one of the most used biometric systems. It can be used for authentication, identification, security and has many advantages over other biometric systems. Although face recognition is less accurate when compared to Iris or Fingerprint recognition, it is being widely used due to its contact-less process. Furthermore, the Face Recognition system can also be used for recording attendance in the classroom. This project is one such Face Recognition system which aims to build a Face recognition-based attendance system, as the existing manual attendance system is tedious and also a burden to maintain. And the chance of proxy attendance exists as well. Thus, the implementation of the said system will improve the situation by completely automating the process. The proposed system is a Web application, it uses Multitask Cascaded Neural Network (MTCNN) algorithm to detect faces, and FaceNet algorithm is used to recognise the individual.**

***Index Terms*— Face Detection, Face Recognition, Attendance System, FaceNet, MTCNN, Web Application.**

I. INTRODUCTION

The conventional method of marking attendance using pen and paper is tiresome. But this system of marking attendance is still followed in most of the schools and colleges. It is also an additional task to teachers who should mark attendance manually, by calling the names of students which might take about 5 to 10 minutes ofthe entire period, depending on no.of students [1]. There is also a chance of proxy. Hence, many educational organisations started using other methods for recording attendance like use of RFID [2], Fingerprint recognition [3], iris recognition [4] and so on. There is no chance of proxy in these methods and no extra task is involved for teachers. However, these types of attendance systems involve an individual's interaction. Thus, it consumes more time. Face recognition is a fairly accurate [5]and non-intrusive method which is inexpensive compared to any other biometric method. The purpose of this system is to build an attendance system using Facial recognition techniques. This system consists of four phases- creation of dataset, face detection in uploaded image, face recognition, attendance marking. A web application is created which will have options to register and login. Images of students must be uploaded at the time of registration to create a dataset of face encodings. Faces are detected using MTCNN [6] and individuals are recognized by FaceNet algorithm [7]. An image of the classroom should be uploaded, after logging in, which

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will be passed through the same pre-trained Machine Learning model to get encodings of faces present in the class. Those encodings will be compared with the encodings stored in the pickle file at the time of registering the class and attendance will be marked for recognised faces in an excel sheet, which can be downloaded from the website.

II. Proposed System

The teacher of a certain class will have to register the students of his/her class on the website by providing thedetails of the class and uploading the images of the students of the class, where the file-name of each of the image should be the name of the student in the image which will be stored as is in the database as well. Once the teacher uploads the images, all the images are passed through the ML model and Face-Encodings for every student are generated and stored in a python pickle file [8] as a dictionary [9] against their respective names. Once the pickle file is generated, the registration process is done, and the teacher will be redirected to the loginpage of the website. When the teacher wants to take attendance for a class, he/she can log into the website using the credentials with which the teacher has created the account for that particular class and upload an image of the class, that he/she has taken when the lecture for said class was taking place, in which the faces of all the students are clearly visible so that the ML model can recognise all the students clearly. The model will recognise all the faces and generate Face-encodings for all the faces present in the image and compare all these encodings to the ones present in the pickle file created at the time of registering the class and attendance is marked for recognised faces.
The system uses the MTCNN model [5] to recognise and get the coordinates of all the faces uploaded in an image. The MTCNN model has three tasks, Face Classification, Bounding Box Regression, and Facial Landmark Localization. The proposed system uses the coordinates obtained with this model to crop out the image of the face of the student and pass it to the FaceNet Model to obtain face encodings.

III. Methodology

A. Registering a class

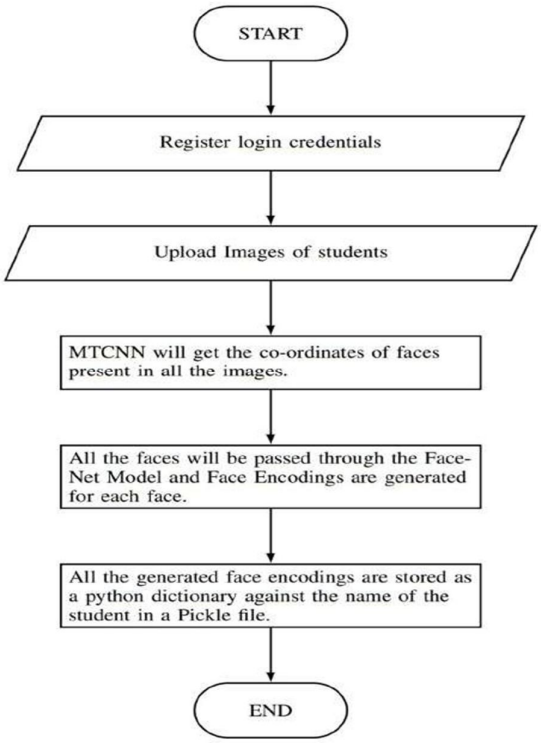

Fig. 1. Process of Registering class

Fig. 1 depicts a step by step process of registering a class. The teacher has to enter the name of the class and provide the login details in step 1 and upload the photos of all the students of the class individually, keeping in mind that the file names should be the names of the respective students. After uploading, the MTCNN model will first recognise the location of the face in each photo and these coordinates along with the photo are passed to the Face-Net as described in [6] model trained by VGGFace2 dataset [10], which gives 0.9965 accuracy [11], will generate the Face-Encoding for that particular face and it will be added to a dictionary against the file name of the photo. This process is done for all the photos that are uploaded and at the end, the dictionary will be written into a python pickle file.

B. Getting Attendance

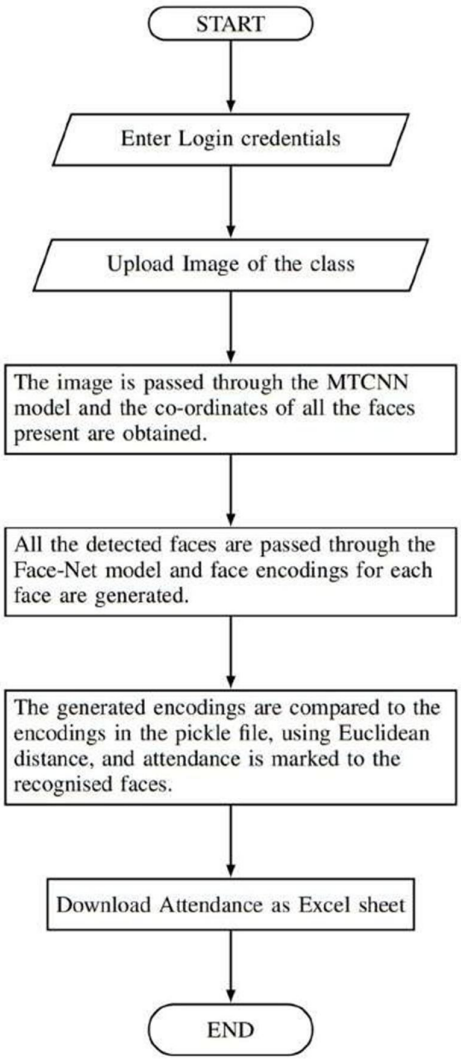

Fig. 2. Process of getting attendance of a class

As shown in Fig. 2, The teacher can log in to the account with the credentials provided during the time of registering and upload the photo of the classroom, which has been captured while the lecture was taking place, in which the faces of all the students who attended the class are visible. The uploaded photo will be passed through the MTCNN model first which will provide the coordinates of all the faces that are present in the photo. With these coordinates and the uploaded photo, we will generate the Face Encodings of all the

faces present in the photo and calculate the Euclidean distance [12] between these encodings one by one, with the encodings stored in the pickle file at the time of registering the class, and attendance will be marked to the one with the highest value. There is a threshold value for the Euclidean distance, and if the highest Euclidean distance of a face when compared to all the encodings present in the pickle file is less than the saidthreshold value, it will be considered as unknown.

IV. Experimental Results

The teacher can interact with the website and provide the details of the class and get attendance in the form of an excel sheet where all the students present in the photo uploaded by the teacher will be marked as present and the rest as absent.

Fig. 3. Images of students

As shown in Fig.3, the teacher will have to upload the images of the students of the class at the time of registration. These uploaded photos will run through the MTCNN model and FaceNet model and the respective encodings of each student are stored. For taking attendance, the teacher will log into the website and upload the image of the class, taken during the lecture. An example of this image can be seen in Fig.4. Once the website has calculated the encodings and marked the attendance, the image uploaded by the teacherwill be shown with rectangle boxes marked around every face present in the photo, just like Fig.5. Below the photo, the option to download the excel file with marked attendance will be available. The excel file will have the date and time at which the attendance has been marked, and the first column will have the names ofall the students of the class and the next column will have their attendance marked as ”Present” or ”Absent”.

Fig. 4. Image of class

Fig.6 shows an example of the excel file that will be generated. As we can see, one of the four friends is missing in the photo uploaded to the website. Hence, the fourth friend is marked ”absent” in the excel sheet.

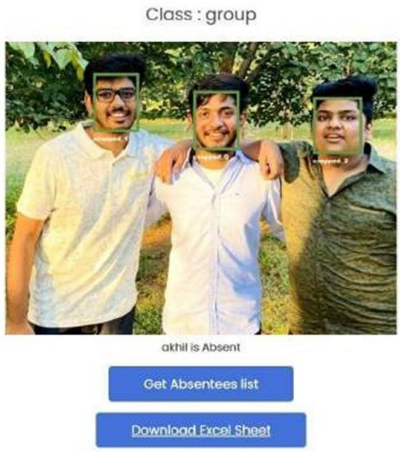

Fig. 5. Detected faces and absentees list

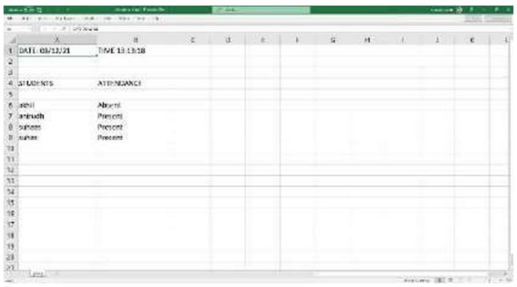

Fig. 6. Attendance in form of Excel sheet

V. Conclusion

The system we have developed automates the traditional attendance marking system, which has been followed for many years in all the educational institutions, using FaceRecognition techniques. The website takes in a photo of the class which is taken during the lecture and locates all the faces present in that image and generates face encodings for the same. These encodings are compared with the ones in the database and attendance is marked in an excel sheet which is available to download by the teacher.

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