

Face Recognition based Attendance System: Review

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Abstract - The planet just where we live in, have taken many measures to improve the technology. Wherein the image processing is a cornucopia of innovations which bolsters the digital and smart systems. When talking about the models such as identification (ID) of the faces or generation of attendance, these are few of many practical applications which are concerned to image processing. This Paper features and deliberates about the enhancements in previous and present systems of "Face recognition-based attendance model" chronologically. The solo purpose of this research is to critically analyze as well as evaluate the old and most recent model of "Marking of attendance". The conditions and criteria involved for the selection of papers for review are the models which can automatically detect the pupils in an image captured by camera and mark the attendance by recognizing the respective students. The process of attendance is generally known to be taken by manual methods which is recumbent to security and maintenance of the attendance log. Plethora of multiple "Face recognition-based attendance systems" have been already implemented and there are abundant of issues still in existence. Thus, after studying different attempts made in researches and a lot of pondering, this paper reviews the previous works on attendance system based on facial recognition. It not only provides the literature survey but also supports discussion and suggestions for future work.

Key Words: PCA, LDA, Haar cascade classifier, Face Recognition, Face detection, Attendance System, viola jones.

1. INTRODUCTION

The evolution of face identification has received many vigilances in recent years. It is a centric application in image analysis, but it is arduous to recreate an automatic model altogether which has the ability to pinpoint human face [1]. ID's of the face are vital in the model Management of Attendance. The non-automatic attendance process is time snatcher, so a highly qualitative and quantitative investment of time were given to get liable output. [2] Out of many answers to this hurdle is the use of model popularly known as biometric attendance structure. Inevitably it is still arduous to verify each pupil in a classroom as the volume of the class is high, and if the model is not able to detect a pupil, it can disturb the teaching process. There is plethora of requirements for biometric system or any equivalent model

which are expensive and need a lot of interaction with students, making it a time snatching model. Due to this, it is being considered by the researchers has a real challenge for building a perfect system which can detect and simultaneously recognize pupils with also a novelty of marking the presence of the students. The work and research till now have presented us with faster processing with adequate amount of efficiency and are also able to merge it with the technology which deals with Computer Vision.

Presently, Face identification methods can be found in 2 approaches. Firstly, the method uses localized model which specifically works on the features such as Nose, Mouth, Eyes etc. to match an individual face. On the other hand, the other way is global model. Which considers the whole face when feature extraction. The above mentioning of these models has been implemented with the support of many unique algorithms. The face identification includes many systematic proceedings such as, The Image acquisition that deals with Getting a decent captured image which includes the faces of the pupils. Followed by extraction which includes detection of faces to facial feature extractions to the making of databases. As necessary it sounds, this intermediate process is extremely important because the extraction of feature should be meaningful so that to further buttress the facial recognition process. Finally ending the process with Face matching which consist of face comparison. Albeit it is an ending operation, but every project contains post-processing which starts after face matching [3].

[4] The operation of face matching can be implemented in abundant of ways, with the help of many algorithms. The algorithms which are popularly recognized in helping of detection of pupils are as follows: - 'Haar Cascade', 'Viola Jones' whereas the algorithms which go toe-to-toe with identification process are as follows: - 'Eigen Face', 'PCA', 'Fisher Face', 'LDA', 'LBPH'. There working may differ and end results obtained will also be dependent upon the application i.e. whether it is used for single face recognition or it is being used for multiple face recognition. The various algorithms which were and are used in current decade is been reviewed in the further sections.

2. LITERATURE SURVEY

Tripathi et.al [1] claimed a real time system which can follow through the presence of the students in a classroom. The necessary supported images for this model was brought at a constant rate through a webcam until the system is turned off. The author scanned through several techniques in order for face detection and encourage them in recognition. Pupils are distinguished with the help of the Ada boost and Haar cascade classifier. Although for face exposers and recollection, the author made use of OpenCV libraries but still for in depth insight he made a quick use of PCA and LDA. The document also emphasized about the difference between LDA and PCA. In the end author confidently inclined towards the system's accuracy and noted that identification rate is entirely dependent on the database and the size of the used image.

Ms. Pooja Humbe et.al [2] made use of 360-degree rotating camera for building the model which detects the pupils in the class. This system without the software such as XAMPP controller, NetBeans, Java Advance for the front-end and back-end with MySQL could have been impossible as stated by author. The characteristics of face are being brought by principal component analysis (PCA). Once registered, the record containing the names of students attended will be sent through email to parents and teachers.

Shireesha Chintalapati et.al [3] defined the Viola Jones Face Detection Algorithm. The paper stated that this algorithm offers better results in various lighting conditions and the authors have clubbed multiple Haar classifiers to achieve better output rates up to 30-degree angles. The preprocessing phase relates to the histogram equalization of the facial image obtained in which it is scaled down to 100x100. Images are converted to grayscale; the equalization of histograms is applied and images are scaled to size of 100x100. The system employed the LBPH algorithm to extract the characteristics and the SVM classifier for classification purpose. This document used a 80-person database (NITW database) with approximately 20 images of each individual collected for the project. This document sets out some performance evaluation conditions when combining LBPH and distance classifier, the false positive rate is 25 %, the object distance for correct recognition must be 4 feet, the training time being 563 milliseconds, 95 % of recognition percentage for static images, the recognition percentage (real-time video) was 78 %, the occluded faces 2.3% In Microsoft Visual C #and the EmguCV container the GUI is developed using the WinForms application.

E. Varadharajan et.al [4] explained the automatic Attendance Management system based on Face Detection. The author describes how faces are sensed and then cut, before which background subtraction is performed on the image in order to improve system performance efficacy. The erudite authors recommend the use of Eigen face for its

simplicity and quality of performance in facial recognition. The document also concluded with the observation that in the case of women, the detection and recognition rate of the face with a veil was 45% and 10%, while in the case of women it was 93% and 87% without the veil. The identification and recognition levels, on the other hand, were 79% and 65% for bearded men.

Akshara Jadhav et.al [5] prompted face encounter algorithm Viola Jones and face recognition PCA algorithm with support for machine learning and SVM for extraction functionality. The author also incorporated reprocessing which includes the histogram equalization of the facial image extracted and is scaled to 100x100. The use of neural networks for facial recognition has been shown, and we can see the possibility of a semi-supervised learning approach that uses facial recognition support vector machines for satisfactory results. The process followed after the face is recognized is the subsequent processing in which attendance is generated weekly or monthly and can be sent to parents or guardians.

Nirmalya Kar et.al [6] used Haar cascade front XML file for pinpointing a face and confirmation of faces using Eigen face. It was created using Open-CV Libraries. On the end of facial orientation, the test was prepared. Both detection and recognition levels were high when facial orientation was approximately 0 degrees with 98.7% and 95% respectively. The frequency decreased slowly as facial orientation rose from 0 degrees to 90 degrees. In the end, the identification and recognition levels ranged from 0 to 90 degrees.

Smit Hapani et.al [7] has magnified the system which approbated the model which contributes face distinguishing. Haar classifiers which uses cascade approach and followed by recognition which uses Fisher face. The system optimally offers efficacy up to 50% within 15 pupils when modelling with more than one face with respective to variations such as cap, spectacles. The proposed system makes use of classroom through video source, and these resulting frames are used to identify the faces. Thus, by following the procedures there by increasing the rate and accuracy of overall model.

Krishna Dharavath et.al [8] has produced excellent pre-processing results on a noisy image. The methods suggested for pre-processing are face cropping, resizing, normalizing & filtering. A low pass filter is used to eliminate components of high frequency noise. PCA, DCT (Discrete Cosine Transform) and combined Spatial and Frequency Domain approach are compared before and after pre-processing. The proposed combined form has the highest rate of face recognition and is not much influenced by pre-processing. The major drawback is that facial detection is performed before the pre-processing of image. In multiple face recognition system, this is not expected as the image needs to be pre-processed first before any face detection or recognition.

Priyanka Wagh et.al [9] multiple face identification system has been expressed using Viola Jones for face detection purposes and the Eigen face for face recognition. It described the face identification as an invariant of illumination, as it is a combined form of both Eigen face and PCA. While the face recognition rate as in the classroom is not established at a longer distance, the varying lighting conditions do not impact multiple face recognition.

Nazare Kanchan Jayant et.al [10] executed an automatic attendance system. This system is based on the Viola Jones facial detection and face recognition algorithm. First the 20 student's database is created using various head poses for culminated recognition results. The face finding algorithm was then applied, and its efficiency was determined depending on the number of faces detected. The same process is followed for calculating the facial recognition algorithm's efficiency.

Firoz Mahmud et.al [11] approbated use of 2 database types including UMIST database and ORL database. PCA and LDA both are used for face knowing purposes. The accuracy of the face recognition is determined using the above listed algorithms, depending on the face alignment. It is observed that front aligned faces have a much better accuracy of recognition than those of face side alignment.

Refik Samet et.al [12] has implemented a fully cell phone automatic attendance system. This is achieved using the Viola-Jones algorithm along with Ada-boost training for face finding, since according to the authors, they should work better in the real-life scenario. For the purposes of recognition, the Euclidean distance was determined for the 3 recognition methods, namely its Eigen face, Fisher face and LBP. A comparison of precision was made for all of the above-mentioned recognition techniques. The smartphone application was developed for the automatic attendance generating system.

Sathyanarayana n et.al [13] launched Automated Attendance system using facial recognition. The system specifies algorithms such as Jones' Purple algorithm for face detection and MSE (medium square error) face recognition. The document stated and elaborated about the system's level of security and accuracy improves as the number of training images increases. The machine is also checked for different face angles and alignment up to 60 degrees can be identified. It is observed that when the system is tested with an image of six students, the system recognizes five students with 70% efficiency.

D. Nithya et.al [14] has introduced Automated Attendance System which works on MATLAB. Extraction of the functions is accomplished by analysing the main components. The Eigen facial approach is utilized for its ease, speed and learning ability. The difference between the training values and the test image is calculated using the Euclidean distance.

Rajashree P. Suryawanshi et.al [15] prescribed the system with hardware such as Raspberry PI and a wired camera, but the software also consisted of using Open-CV. The very first step in facial recognition is to detect a face in a given image, and afterwards proceed with the recognition only if there is a face there. The face pinning was performed using Haar Cascade Classifier and Face Recognition was based on PCA.

K.L.P.M Liyanage et.al [16] prompted system having a separate application and a web-based application. The independent application deals with the process of facial recognition and the process of marking the attendance. The Web-based application mainly deals with the NLP process. Both applications link to a centralized database. Face detection is achieved using the Haar cascade method while face recognition is carried out using the PCM method. NLP is the other research framework developed in SMRT-FR for the processing and management of applications for employee licenses. Employees can easily request authorizations by sending an SMS or using the web interface and these requests for authorization are processed using the NLP application and the result of acceptance or refusal is generated in the light of different conditions and rules. The system has been able to detect faces with 68% accuracy so far.

Professor Arun Katara et.al [17] implemented a real time assistance system which can perform multiple facial recognition using the Raspberry PI model and Raspberry PI camera. For face pin-pointing it uses Open-CV libraries and for face recognition the combination of feature extraction methods such as principal component analysis along with LBP is implemented. Since the system can identify faces from a distance of 4 feet to 7 feet, the facial recognition efficacy is limited, and is suggested to be improved. Capture a video of classroom using a video camera and followed by processing images for facial recognition.

Kennedy Okokpujie et.al [18] describes a system that uses Viola Jones as a face detection tool and Fisher face algorithm for face recognition. Uses a webcam to build the database and to collect photos to process. It works well in good lighting conditions, but at different lighting conditions it decreases the face recognition rate (up to 54%). The system has access for the authority and the participants via the cell phone interface with the login credentials.

Nilesh D. Veer et.al [19] an automatic attendance system has been developed in which a video is collected as input. frames are captured when there is human presence detected. For face detection, Viola Jones is used, and PCA is used for face recognition, which also uses LBP for threshold purposes. The facial recognition rate is nearly 100% for a small number of students and the attendance of the student is recorded along with the entry time of the student.

A. Majumdar et.al [20] discussed how well they had done than PCA. To boost dispersion, they used the Fisher face subspace and LDA, and they also used KNN. Consequently, better results were obtained by using the Pseudo-Fisher facial technique. This article examines several methods that various authors consider to improve the rate of detection and recognition. The results show that Viola Jones, who uses Haar Cascade, is consistent in all the papers reviewed and offers a good detection rate whereas Fisher Face's LDA algorithm provides better performance and faster results.

3. CONCLUSION

This paper reviewed vivid ways in which one can consider to improve the detection and recognition rate. The results show that Viola Jones which uses Haar Cascade is consistent in all the papers studied and gives a good detection rate whereas the LDA algorithm which is used by Fisher face has a better performance and gives faster results. Albeit with the tedious efforts of authors to adjust those above-mentioned algorithms with model which deals with multiple faces, but it still lacks in both detection and as well as recognition thus reaching out for Deep Learning with the help of convolutional neural networks to engage and satisfy the need for the application.

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