

Application of Face Detection Method for Design of Attendance System

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ABSTRACT

Attendance is a compulsory requirement of every organization. Maintaining the attendance register daily is a difficult and time-consuming task. There are many automated methods for the same available like Biometric, voice recognition, and many more. This paper provides an efficient and smart method for marking attendance. As it is known that the primary identification for any human is its face, face recognition provides an accurate system that overcomes the ambiguities like fake attendance, high cost, and time consumption. The goal of this project is to create an automated attendance system using face recognition.. This system, which is based on a face detection and recognition algorithm automatically detect the student when he enters the classroom and marks the attendance by recognizing him.

Keywords: Facedetection, face recognition, attendance

1. INTRODUCTION

In this modern era of automation, many scientific advancements and inventions have taken place to save labor increase accuracy and to ameliorate our lives. Automated Attendance System is the advancement that has taken place in the field of automation replacing traditional attendance marking activity. Automated Attendance Systems are generally bio-metric based, smart-card based, and web-based. These systems are widely used in different organizations. The traditional method of attendance marking is very time-consuming and becomes complicated when the strength is more.

Automation of Attendance System has edge over traditional method as it saves time and also can be used for security purposes. This also helps to prevent fake attendance. An Attendance Management System which is developed using bio-metrics in our case face generally consists of Image Acquisition, Database development, Face detection, Pre-processing, Feature extraction, and Classification stages followed by the Post-processing stage. The subsequent sections in this paper are a literature survey, a detailed description of various stages in the proposed model, results and conclusions, and scope for improvement.

Student enrollment in schools and colleges increasing every year and taking each student's attendance plays a very vital role. So, it is necessary to discuss the effective system which records the attendance of a student automatically.

2. LITERATURE REVIEW

In this paper, the idea of two technologies namely the Student Attendance and Feedback system has been implemented with a machine learning approach. This system automatically detects the student's performance and maintains the student's records like attendance and their feedback on the subjects like Science, English, etc. Therefore the attendance of the student can be made available by recognizing the face. On recognizing, the attendance details and details about the marks of the student are obtained as feedback.

Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detect the student face when he/she enters the class and

the system is capable to marks the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detects human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves time and also helps to monitor the students

3. PROPOSED SYSTEM

The proposed system describes the attendance system for school and colleges. There are total 3 modules that are,

1. When there are so many students in a schools andcollege, it becomes more and more difficult to mark attendance for each student and it is time-consuming too. The Existing system of any institute is a manual entry for the students. This system faces the issue of wastage of time and also becomes complicated when the strength is more than usual. Here, the attendance is being carried out in the handwritten registers
2. It is a very tedious job for us to maintain the record of the user. Whenever we have to measure the performance of students, finding and calculating the average the attendance
3. This existing system requires correct feed-on input into the respective field. Therefore we are in a need of an automated system for marking and maintaining the attendance of the students. Let us suppose that the wrong inputs are entered, the application resists working. So, the user finds it difficult to use the existing system

4. DISCUSSION

In the following subsection we discuss the modulesthat are involved in this project:

- i) Our objective is to detect unique faces with the help of a mobile camera amidst the other Natural components like walls, backgrounds, etc, and to extract the unique features of faces amongst other face characteristics such as beard, spectacles, etc. of a face useful for face detection and recognition.
- ii) A facial recognition system is used to identify a verified person from an image or a video source. It uses biometric software's along with AI-enabled devices for mapping facial features and bring out a recognition step

5. EXPERIMENTALDETAILS

[A]. Features of Our Attendance System:

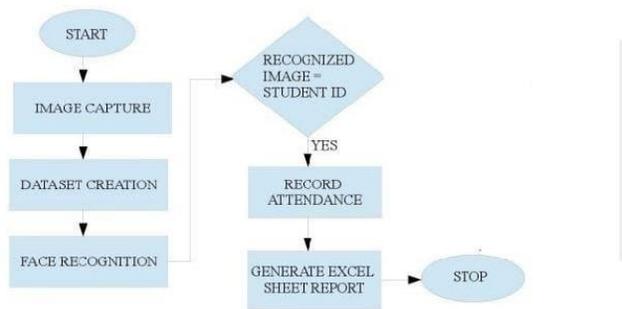
1. Face Recognition is an integral part of biometrics. In biometrics, the basic traits of humans are matched to the existing data. Facial features are extracted and implemented through algorithms, which are efficient, and some modifications are done to improve the existing algorithm models. Computers that detect and recognize faces could be applied to a wide variety of practical applications including criminal identification, security systems, identity verification, etc. The face recognition
2. The use of face recognition for attendance marking is the smart way of an attendance management system. Face recognition is a more accurate and faster technique among other techniques and reduces the chance of proxy attendance. Face recognition provides passive identification that is a person who is to be identified does not need to take any action for thier identity.

[B] Working OfOurProject:

1. The proposed system uses the openCV library. It is an Open Source Computer Vision Library that is free for both academic and commercial use. It has C++, Python, and Java interfaces and supports

Windows, Linux, macOS, iOS, and Android. It has a strong focus on real-time applications

2. The library has more than 2500 optimized algorithms, these algorithms can be used to detect and recognize faces, identify objects, etc. Open-CV has a face recognizer class library for face recognition. This recognizes and manipulates faces from Python or from the command line
3. It is a very simple library built using Dlib's state-of-the-art face recognition built with deep learning. The Dlib is a cross-platform open-source software library that is implemented on multiple computing platforms. The model has an accuracy of 99.38%. This provides a simple face recognition command-line tool that lets you do face recognition on a folder of images from the command line



[C]. Algorithm:

[A] Image capture

Algorithm 1 Pseudo Code of Proposed System

1. Capture the Student's Image
2. Apply Viola-Jones algorithm (FaceDetection)
3. Extract the ROI in Rectangular BoundingBox
4. Convert to gray scale, apply histogram equalization and resize 100x100
5. if updating the database then

Store in database

Else,

Apply PCA/LDA/LBPH (For feature Extraction)

Apply Distance Classifier/SVM/Bayesian (for Classification) end if

6. Post-processing

image is preferred to be of size 640x480 is avoided
resizing of the image in the backend as we observe

resizing may sometimes result in poor performance

[B] Face detection

A proper and efficient face detection algorithm always enhances the performance of face recognition systems. Various algorithms are proposed for face detection such as Face geometry-based methods,

Feature Invariant methods, out of all these methods, Viola and Jones proposed a framework that gives a high detection rate and is also fast. Viola-Jones detection algorithm is efficient for real-time application as it is fast and robust. Hence we chose Viola-Jones to face detection algorithm which makes use of Integral Image and AdaBoost learning algorithm as a classifier. We observed that this algorithm gives better results in different lighting conditions and we combined multiple haar classifiers to achieve a better detection rate up to an angle of 30 degrees

[C] pre-processing

The detected face is extracted and subjected to preprocessing. This pre-processing step involves histogram equalization of the extracted face image and is resized to 100x100. Histogram Equalization is the most common Histogram Normalization technique. This improves the contrast of the image as it stretches the range of the intensities in an image by making it more clear

[D] database development

As we chose a biometric-based system enrollment of every individual is required. This database development phase consists of image capture of every individual and extracting the biometric feature, in our case it is face, and later it is enhanced using pre-processing techniques and stored in the database. In our project, we have taken the images of individuals in different angles, different expressions, and also in different lighting conditions. A database of 80 individuals (NITW-database) with 20 images of each has been collected for this project. Figure to shows a few extracted and pre-processed faces stored in the database

[E] feature extraction and classification

The performance of a Face Recognition system also depends upon the feature extraction and their classification to get accurate results. Feature extraction is achieved using feature-based techniques or holistic techniques. In some holistic techniques, we can make use of dimensionality reduction before classification. We compared the results of different holistic approaches used for feature extraction and classification in real-time scenarios. Table II provides the comparison details. Principal Component Analysis (PCA) was the first algorithm that represents the faces economically. In PCA the face images are represented using eigenfaces and their corresponding projections along each eigenface. Instead of using the dimensions of an image only meaningful dimensions are considered to represent the image.

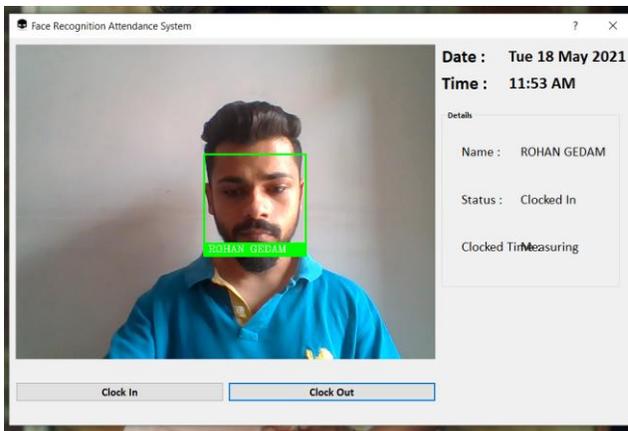
In general, features extracted from PCA and LDA are subjected to distance classifiers. The distance between the features of the probe image and features of trained images is calculated. If the distance is less than the threshold then the probe image is recognized.

[F] post-processing

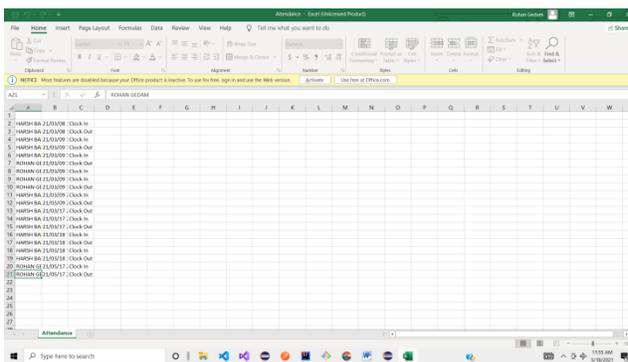
In the proposed system, after recognizing the faces of the students, the names are updated into an excel sheet. At the end of the class, a provision to announce the names of all students who are present in the class is also included. This is implemented using text to speech conversion.

6. CONCLUSION

Thus, we have completed our main project in which the main working principle of the project is that the video captured data is converted into the image to detect and recognize it. Further, the recognized image of the student is provided with attendance, else the system marks the database as absent. The captured video needs to be converted into frames per second for easier detection and recognition of the student's face generating the attendance database.



Face Detection is the process where the image, given as an input (picture) is searched to find any face, after finding the face the image processing cleans up the facial image for easier recognition of the face. After the completion of detecting and processing the face, it is compared to the faces present in the students' database to update the attendance of the students.



7. SCOPE FOR FUTURE WORK

An automated Attendance System can be implemented in larger areas like in a seminar hall where it helps in sensing the presence of many people. Sometimes the poor lighting condition of the classroom may affect image quality which indirectly degrades system performance, this can be overcome in the latter stage by improving the quality of the video or by using some algorithms. Over the years, movies have fixed a futuristic fantasy in our minds that a time will come when the software would be used to recognize people by their faces. A time when our faces will be our ID cards. With the advent of facial recognition technology, that time is already here. Today, along with drones, AI, and IoT, facial recognition technology is also defining our millennium. Facial recognition is a biometric technology used for authentication and examination of individuals by correlating the facial features from an image with the stored facial database. Face Recognition is one of the most popular applications of image analysis software and is no more considered a subject of science fiction.

8. REFERENCES

1. N.Sudhakar Reddy, M.V.Sumanth, S.SureshBabu, "A Counterpart Approach to Attendance and Feedback System using Machine Learning Techniques",*Journal of Emerging Technologies and Innovative Research (JETIR)*, Volume 5, Issue 12, Dec 2018.
2. Dan Wang, Rong Fu, ZuyingLuo, "Classroom Attendance Auto-management Based on Deep Learning",*Advances in Social Science, Education and Humanities Research*, volume 123,ICESAME2017
3. AksharaJadhav, AkshayJadhav, TusharLadhe, Krishna Yeolekar, "Automated Attendance System Using Face Recognition", *International Research Journal of Engineering and Technology (IRJET)*, Volume 4, Issue 1, Jan 2017.
4. B Prabhavathi, V Tanuja, V MadhuViswanatham and M Rajashekharababu, "A smart technique for attendance system to recognize faces through parallelism", *IOP Conf. Series: Materials Science and Engineering* 263, 2017
5. Prajakta Lad, Sonali More, SimranParkhe, PriyankaNikam, DipaleeChaudhari, " Student Attendance System Using Iris Detection", *IJARIII-ISSN(O)-2395-4396*, Vol-3 Issue-2 2017
6. Samuel Lukas, Aditya Rama Mitra, RinirIkanaDesanti, Dion Krisnadi, "Student Attendance System in Classroom Using Face Recognition Technique", *Conference Paper DOI: 10.1109/ICTC.2016.7763360*, Oct 2016
7. K.SenthamilSelvi, P.Chitrakala, A.AntonyJenitha, "Face Recognition Based Attendance Marking System", *IJCSMC*, Vol. 3, Issue. 2, February 2014
8. S. N. Ajani and S. Y. Amdani, "Probabilistic path planning using current obstacle position in static environment," *2nd International Conference on Data, Engineering and Applications (IDEA)*, 2020, pp. 1-6, doi: 10.1109/IDEA49133.2020.9170727.
9. Rao, J. Nageswara, and M. Ramesh. "A Review on Data Mining & Big Data." *Machine Learning Techniques. Int. J. Recent Technol. Eng* 7 (2019): 914-916.
10. S. Ajani and M. Wanjari, "An Efficient Approach for Clustering Uncertain Data Mining Based on Hash Indexing and Voronoi Clustering," *2013 5th International Conference and Computational Intelligence and Communication Networks*, 2013, pp. 486-490, doi: 10.1109/CICN.2013.106.
11. Karthik, A., MazherIqbal, J.L. Efficient Speech Enhancement Using Recurrent Convolution Encoder and Decoder. *Wireless PersCommun* (2021). <https://doi.org/10.1007/s11277-021-08313-6>