



A Survey on Face Recognition based Students Attendance System

Binyam Tesfahun Liyew¹, Prasun Hazari²

M. Tech Student, CSE, Parul Institute of Engineering and Technology, Vadodara, India¹

Assistant Professor, CSE, Parul Institute of Engineering and Technology, Vadodara, India²

Abstract: Face recognition is the detection and identification of humans by the unique characteristics of their Faces. Face recognition technology is the least intrusive and fastest bio-metric technology. It works with the most obvious individual identifier the human face. This research aims at providing a system to automatically record the students' attendance during lecture hours or exam in a hall or room using facial recognition technology instead of the traditional manual methods. The objective of this research is to thoroughly study the field of pattern recognition (facial recognition), which is very important and is used in various applications like identification and detection. And finally, apply this technology to support the student's attendance system. These will help the attendance system to record more efficiently. The proposed system will update the attendance once the students face is match with the template database.

Keywords: Biometrics, Face detection, Face recognition, Student Attendance System, database.

I. INTRODUCTION

First of all, Biometrics is the emerging area of bioengineering; it is the automated method of recognizing a person based on a physiological or behavioural characteristic. There exist several biometric systems such as signature, fingerprints, voice, iris, retina, hand geometry, ear geometry, and face. From all of such systems, facial recognition appears to be one of the most universal, collectible, and accessible systems.

Biometrics is mainly used for authentication purposes and also refers to automatic recognition of an individual, "providing a right person with the right privileges, and the right access at the right time". By that, securities could authorize an individual's identity depending on "who she is", and not "what she has" and "what she could remember".

Two main classes can be found in biometrics:

- Physiological – It is associated with the body shape, includes all physical traits, iris, palm print, facial features, Fingerprints, etc.
- Behavioral – Related to the behavioral characteristics of a person. A characteristic widely used till today is signatures. Modern methods of behavioral studies are emerging such as keystroke dynamics and voice analysis.

Facial recognition (or face recognition) is a type of biometric software application that can identify a specific individual in a digital image by analyzing and comparing patterns.

Face recognition is a useful identification method that overcomes the others by several advantages. This method can be done without any device participation from the user, and the images can be captured from distance. Furthermore, a necessary device of this method is any kind of camera according to a system demand. Thus, the face recognition provides an inexpensive and reliable identification system, which has the feasibility to apply for many purposes such as class attendance system, surveillance, access control system, etc.

The face recognition process can be divided into two main stages: face detection, and face identification (or recognition).

The first one is the detection stage; it has the properties of identifying and locating a face in an image. The second stage is recognition; it includes feature extraction, where important information for discrimination is saved, and the matching, where the recognition result is given with the aid of a face database.

Applying Facial Recognition for students attendance system is more significant than the others biometrics approach, hence It requires no physical interaction on behalf of the user, It is easy to use and in many cases, it can be performed without even the person is knowing. It is accurate and allows for high enrollment and verification rates, and It can use the existing camera device efficiently without a problem.

II. MOTIVATION

In the recent years, Image processing is about the extracting of necessary information form a digital image. This plays a tremendous advantage on technological advancements.



In order to support, and maintain the records of users in the organization with a better accuracy, I will design and implement a better system based on the above image processing technology. So this is the important key behind my motivation. And also the current attendance system that exists in our organization means Parul University is, of course, an automated system, but it is tedious and has so much process to mark the student's attendance. That is why my motivation to survey in this area is to know more about the pitfalls' on the existing procedure that the instructors call each and every student ID or passing the attendance sheet around the class during lecture time.

III. EXISTING SYSTEMS

In the existing system, the lecturer takes the attendance of the students during lecture time by calling each and every student or by passing the attendance sheet around the class. The lecturer then submits the student's attendance information through the online web-based attendance system and finally the students will get final attendance report using the system.

In the existing student's attendance system, there are two types of approach, manual attendance system and automated attendance system [8].

During the manual system, the lecturer has many works to do especially when there is a large number of students in the classroom; like collecting, verifying, and managing students record. In reality, the manual system also takes more time for recording and calculating the average attendance of every student in the class [8].

In addition to that, the automated system might give better benefits to the lecturer when we compare to the manual system. Because some other staff also shares the burden that was previously difficult to the lecturer. [8]

IV. RELATED WORK

Automated Attendance Management System Based On Face Recognition Algorithms [1] On this paper they propose an automated attendance management system. This system is basically based on face detection and recognition algorithms, automatically detect the student when he enters the classroom and marks the attendance by recognizing him. Because of LBPH outperforms other algorithms with better recognition rate and low false positive rate the system is based on this algorithm. The system uses SVM and Bayesian as a classifier because they are better when compared to distance classifiers. The workflow of the system architecture is when a person enters the classroom his image is captured by the camera at the entrance. A face region is then extracted and pre-processed for further processing. As not more than two persons can enter the classroom at a time face detection algorithm has less work. The future work they are saying on this paper is to improve the recognition rate of algorithms when there are unconscious changes in a person like tonsuring head, using a scarf, facial hair. The limitation of the system is it only recognizes face up to 30 degrees angle variations which have to be improved further. Gait recognition should be combined with face recognition systems in order to achieve better performance of the system.

An Evaluation of Face Recognition Algorithms and Accuracy based on Video in Unconstrained Factors [2] There are three well-known algorithms that this paper will compare Eigenfaces, Fisherfaces, and LBPH by using a database that contains a face of persons with a variety of position and expression. According to the experiment results, LBPH got the highest accuracy on the possible external factors like light exposure, noise, and the video resolution. However, this algorithm has limitation due to the negative light exposure and high noise level more than the other statistical methods. The recognition accuracy also tested with three various video resolutions that are 720p, 480p, and 360p. The results show LBPH got the highest accuracy in 720p while the others got the highest accuracy in 360p video resolution. LBPH can give reliable recognition accuracy hence it uses a histogram similarity, but it was sensitive in some cases.

Class Room Attendance System Using Facial Recognition System [3] This paper aims to introduce a new approach to identify a student using a face recognition system in the classroom environment, i.e. the generation of a 3D Facial Model. This research is to attempt to provide an automated attendance system that recognizes students using face recognition technology from an image/video stream to record their attendance in lectures or sections and evaluating their performance accordingly.

Real-Time Face Recognition For Attendance Monitoring System [4] On This paper they presented an automated attendance monitoring system with face recognition in a real-time background world for with a database of student's information by using Personal Component Analysis (PCA) algorithm. This task is very difficult as the real-time background subtraction in an image is still a challenge. And, managing a database with multiple of student information's is also a challenge to the system. Implementing of this system basically involving three main phases, which include face region detection, template extraction, and face recognition. Before the feature extraction process, all input images are extracted and converted from RGB into gray scale images. Then, the system starts the histogram



equalization in order to enhance the image and the picture is resized so that all images will have the same size. One of the functionality of the system is it will send an SMS to particular parents when the attendance rate of students is below the enforced rate. Euclidian distance is used to calculate the distance between the two images during the matching process when the extracted image is compared with the image in the template database. Then the system shows a result either accepted or rejected based on the threshold.

Automatic Attendance System Using Face Recognition [5] In this system they have implemented an attendance system by which lecturers or teaching assistants can record student's attendance. In this paper, they use Viola-Jones algorithm and PCA algorithm for face detection and face recognition respectively. The system capture images twice the first one is at the beginning of the class and the second one is at the end. Both of the images are important to identify and recognize a student. Finally, the student is marked present only if he/she is recognized in both the images. A sequence diagram for the working process is as follows:

An Efficient Attendance Management System based on Face Recognition using Matlab and Raspberry Pi 2 [6] This paper describes to obtain an automatic attendance system implemented with raspberry pi camera module and Matlab R2014a version. Two types of methods are used for feature extraction. Local Binary Pattern (LBP) and Histogram of Oriented Gradients (HOG) which are used for recognition of students face from the stored database for marking the attendance. Support vector machine (SVM) classifier is used for comparing stored features in the database with extracted features from the captured image.

Implementation of Attendance Management System using SMART-FR [7] In this paper authors describe the Raspberry Pi module that used for face detection & recognition. The camera will be connected to the Raspberry Pi module. The student's attendance will be sent to their parents using GSM technology. The System performs managing students with Open CV and raspberry pi module that is interfaced with fingerprint device.

Student Attendance System in Classroom Using Face Recognition Technique [8] In this paper both Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT) are combined to extract the features from the user's face and finally apply Radial Basis Function (RBF) to classify facial objects. Face detection is done from the inputted image that was captured during the students are attending the lecture class.

TABLE 1 COMPARSION

Title	Algorithms	Performance	Results	Advantage
Automated Attendance Management System Based On Face Recognition Algorithms [1]	-Viola-Jones detection - PCA/LDA/LBPH - Distance Classifier/SV M/Bayesian	-PCA + Distance Classifier (93,61)% -LDA + Distance Classifier (91,58)% -PCA+SVM (95,68)% -PCA + Bayes (94,65)% - LBPH + Distance Classifier (95,78)%	-LBPH outperforms other algorithms with better recognition rate and low false positive rate. -SVM and Bayesian are better classifiers	saves the time and also helps to monitor the students.
An Evaluation of Face Recognition Algorithms and Accuracy based on Video in Unconstrained Factors [2]	-Eigenfaces, -Fisherfaces, and LBPH - Haar-like feature	-Eigenfaces (11.31) -Fisherfaces (30.01) -LBPH (57.36) When the value of all variation factors are 0.	The results showed LBPH got the highest accuracy in all experiments, but this algorithm has the higher impact of the negative light exposure and high noise level more than the others that are a statistical approach.	LBPH method gives a reliable accuracy and appropriate to implement in the class attendance recording system.
Class Room Attendance System Using Facial Recognition System [3]	-color based detection and Principle Component Analysis (PCA) for face detection	It saves time and effort,	This attendance system shows the use of facial recognition techniques for the purpose of student attendance and for the further process this record of student can be used in	It saves time and effort, especially if it is a lecture with a huge number of students.



	-for feature extraction, PCA and Linear Discriminate Analysis (LDA).		exam related issues.	
Real-Time Face Recognition For Attendance Monitoring System [4]	-PCA for feature extraction -Euclidian distance for matching faces -histogram equalization for resizing images	-during daytime: 2.43 -during night time: 2.81	-result either accepted or rejected based on the threshold. -Student's attendance is recorded if the result is matched during the matching notifications.	-save time -send SMS for parents when the attendance rate is below the enforced rate.
Automatic Attendance System Using Face Recognition [5]	-ViolaJones algorithm for face detection and -PCA algorithm for face recognition.	Save time and effort.	-the image is captured twice at the beginning & the end. -Students must be recognized in both of the images to mark an attendance.	save effort and time.
An Efficient Attendance Management System based on Face Recognition using Matlab and Raspberry Pi 2 [6]	-LBP -HOG -Viola-Jones -SVM	supports multi-model biometric system	functioning with an accuracy of 92% as out of 12 faces 11 faces are recognized successfully	-user-friendly, easy to use, reliable, secure, and privacy and well-organized data on board
Implementation of Attendance Management System using SMART-FR [7]	-Viola-Jones -Wiener Filter -LBP	-Raspberry pi used to store students face -GSM technology is applied.	-The system could detect faces with 68% of accuracy. -Accuracy is based on picture clarity.	-User-friendly, accurate, easy to use, better security and privacy
Student Attendance System in Classroom Using Face Recognition Technique [8]	-DWT -DCT -RBFN - grayscale normalization - histogram equalization	-Multiple face recognition is applied -The rate of recognition is 82%	-from 16 students that were setting in classroom, it results in 121 out of 148 successful face recognition.	-accuracy is good

V. CONCLUSION

An automated students attendance system is necessary for learning and teaching environment. Most of the existing systems are time-consuming and require a semi-manual work from the teacher or students like calling students ID, and passing attendance sheet around the class, etc during lecture time. In the proposed system the aim is to provide a solution for the above-mentioned problems by integrating face recognition in the process of attendance management that can be used during exams or a lecture which will save effort and time. Currently, the facial recognition system is implemented by other researchers as well, but there is also have some limitations regarding on functionalities, accuracy, lighting problem, and etc that supposed to be solved by the proposed system.



So, the proposed system will support the performance of existing students attendance system in the following ways:

- Minimizing the time required for marking attendance and maximizing the time required for actual teaching process.
- Increase the efficiency of the overall system.
- Improving the security, hence attendance will do without even the students knowing.

ACKNOWLEDGMENT

I would like to express my deepest appreciation to all those who provided me the possibility to complete this Survey. A special gratitude to **Dr. Vilin Parekh**, Principal of Parul Institute of Engineering and Technology for providing facilities to achieve the desired milestone. I hearty thank my guide **Mr. Prasun Hazari** for his unlimited and important gaudiness. And finally, I also express my warm gratitude to the entire staff members of Computer Science and Engineering Department.

REFERENCES

- [1]. Shireesha Chintalapati; M. V. Raghunadh, "Automated Attendance Management System Based On Face Recognition Algorithms", 2013 IEEE International Conference on Computational Intelligence and Computing Research.
- [2]. Phichaya Jaturawat; Manop Phankokkrud, "An Evaluation of Face Recognition Algorithms and Accuracy based on Video in Unconstrained Factors", 2016 6th IEEE International Conference on Control System, Computing and Engineering (ICCSCE)
- [3]. Abhishek Jha: ABES Engineering College, Ghaziabad, "Class Room Attendance System Using Facial Recognition System", The International Journal of Mathematics, Science, Technology and Management (ISSN : 2319-8125) Vol. 2 Issue 3
- [4]. S. SAYEED, J. HOSSEN, S.M.A. KALAIARASI, V. JAYAKUMAR, I. YUSOF, A. SAMRAJ, "Real-Time Face Recognition For Attendance Monitoring System" Journal of Theoretical and Applied Information Technology 15th January 2017. Vol.95. No.1
- [5]. Ashish Choudhary, Abhishek Tripathi, Abhishek Bajaj, Mudit Rathi, and B.M Nandini, "Attendance System Using Face Recognition", International Journal of Modern Trends in Engineering and Research (IJMTER) Volume 03, Issue 04, [April– 2016] ISSN (Online):2349–9745; ISSN (Print):2393-8161
- [6]. Preeti Mehta, Dr. Pankaj Tomar, "An Efficient Attendance Management System based on Face Recognition using Matlab and Raspberry Pi 2", May 2016 International Journal of Engineering Technology Science and Research (IJETSR) ISSN 2394 – 3386 Volume 3, Issue 5
- [7]. G.Lakshmi Priya1, M.Pandimadevi 1, G.Ramu Priya1, P.Ramya, "Implementation of Attendance Management System using SMART-FR", November 2014 International Journal of Advanced Research in Computer and Communication Engineering ISSN (Online) : 2278-1021 ISSN (Print) : 2319-5940 Vol. 3, Issue 11.
- [8]. Samuel Lukas, Aditya Rama Mitra, Ririn Ikana Desanti, Dion Krisnadi, "Student Attendance System in Classroom Using Face Recognition Technique", 2016 International Conference on Information and Communication Technology Convergence (ICTC), IEEE Conference Publications Pages: 1032 - 1035.

BIOGRAPHY



BINYAM TESFAHUN has completed his BSC degree in Computer Science from Dilla University, Dilla, Ethiopia in 2015. He has a 1-year teaching experience in Dilla University. He is now studying M.Tech in Computer Science and Engineering, in India. His area of research is Machine Learning and Image Processing.