

Facial Recognition Attendance Using LBPH Algorithm

A Project Work Synopsis

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Abstract

The implementation of a Facial Recognition System can aid in identifying or verifying a person's identity from a digital image. Accurate attendance records are vital to classroom evaluation. However, manual attendance tracking can result in errors, missed students, or duplicate entries. The adoption of the Face Recognition-based attendance system could help eliminate these shortcomings. This innovative approach involves utilizing a camera to capture input images, detecting faces using algorithms such as Haarcascade, Eigen values, support vector machines, or the Fisher face algorithm, verifying the faces against a database of student profiles, and marking attendance in an Excel sheet. The use of OpenCV, an open-source computer vision library, ensures the efficient functioning of the system. The proposed model involves training the system with the authorized students' faces to create a database. The system crops and stores the images in a database with corresponding labels and extracts features using algorithms such as LBPH, Eigen values, support vector machines and Fisher face algorithm. The Face Recognition-based attendance system could help automate attendance records with high accuracy and reduce the burden of manual attendance tracking.

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1. INTRODUCTION

In today's competitive world, with increasing working hours and less classroom time, teachers need EdTech tools which help them manage precious class time efficiently. Instead of focusing on teaching, faculty members are often stuck with completing formal duties, for e.g., taking daily student attendance. Manually taking attendance and registering it in files & musters makes the daily attendance a mundane task for the faculty and unnecessarily consumes classroom time. To overcome such inefficient work processes, there are various school software systems available to speed up the attendance process and reduce manual work. An online attendance management system or digital attendance platform is one of them, which is developed to automate the daily attendance in schools. Additionally, it helps to maintain accurate records and generate summarized student attendance reports. Attendance management system keeps track of daily attendance, working hours, breaks, login, and logout time. It prevents staff's time theft. An attendance management system integrates all attendance devices such as smart cards, biometric, and facial recognition devices in real-time. MasterSoft's Student attendance management software allows schools of all sizes to manage various attendance requirements. This system makes it easy to create daily attendance reports, absentee lists, letters and other documents

almost effortlessly. Student attendance system helps teachers to mark online attendance of students during class & reduce manual work. It is used to track student's attendance, absentee

record, attendance history & other related documents. Student attendance software allows you to record & manage daily student attendance to speed up the daily attendance process. Online attendance management system enables school administrators to record, manage & compile daily student attendance data. Along with student attendance, this software also allows teachers to generate 100% accurate student attendance reports.

Purpose: - The purpose of creating an attendance management system is to automate the traditional method of taking attendance. Another reason for designing this programme is to automatically generate the report at the end of the session or in the middle of it.

1.1 Problem Definition

Attendance is an important part of daily classroom evaluation. At the beginning and ending of class, it is usually checked by the teacher, but it may appear that a teacher may miss someone or some students answer multiple times. Face recognition-based attendance system is a problem of recognizing face for taking attendance by using face recognition technology based on **high-definition** monitor video and other information technology. The concept of face recognition is to give a computer system the ability of finding and recognizing human faces fast and precisely in images or videos. Numerous algorithms and techniques have been developed for improving the performance of face recognition. Recently Deep learning has been highly explored for computer vision applications.

1.2 Problem Overview

Attendance Management System is software developed for daily student attendance in schools, colleges and institutes. It facilitates to access the attendance information of a particular student in a particular class. This system will also help in evaluating attendance eligibility criteria of a student. By just a click on the mouse, the system will be able to produce the students' attendance report thus reducing the need for manual labour which is prone to human errors and time consuming.

This application is built for automating the processing of attendance. It also enhances the speed of performing attendance task easily. The concept of face recognition is to give a computer system the ability of finding and recognizing human faces fast and precisely in images or videos. Numerous algorithms and techniques have been developed for improving the performance of face recognition. Recently Deep learning has been highly explored for computer vision applications.

1.3 Hardware Specification

- A laptop
- OS: windows
- system type: 64-bit operating system, x64-based processor, OS build: 22000.675

1.4 Software Specification

- Anaconda Navigator
- Jupyter Notebook
- python3
- OpenCV
- Microsoft Excel
- Tkinter

2. LITERATURE SURVEY

2.1 Existing System

Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive. Over past 30 years, many researchers have proposed different face recognition techniques, motivated by the increased number of real-world applications requiring the recognition of human faces. There are several problems that make automatic face recognition a very difficult task. However, the face image of a person inputs to the database that is usually acquired under different conditions. The important of automatic face recognition is much be cope with numerous variations of images of the same face due to changes in the following parameters such as 1. Pose, 2. Illumination, 3. Expression, 4. Motion, 5. Facial hair, 6. Glasses, 7. Background of image. Face recognition technology is well advance that can be applied for many commercial applications such as personal identification, security system, image- film processing, psychology, computer interaction, entertainment system, smart card, law enforcement, surveillance and so on. Face recognition can be done in both a still image and video sequence which has its origin in still-image face recognition. Different approaches of face

recognition for still images can be categorized into three main groups such as 1. Holistic approach 2. Feature-based approach 3. Hybrid approach product.

1. **Holistic approach:** In holistic approach or global feature, the whole face region is taken into account as input data into face detection system. Examples of holistic methods are eigenfaces (most widely used method for face recognition), probabilistic eigenfaces, fisherfaces, support vector machines, nearest feature lines (NFL) and independent-component analysis approaches. They are all based on principal component-analysis (PCA) techniques that can be used to simplify a dataset into lower dimension while retaining the characteristics of dataset.

2. **Feature In feature-based approach:** based approaches or local feature that is the features on face such as nose, and then eyes are segmented and then used as input data for structural classifier. Pure geometry, dynamic link architecture, and hidden Markov model methods belong to this category. One of the most successful of these systems is the Elastic Bunch Graph Matching (EBGM) system [40],[41], which is based on DLA. Wavelets, especially Gabor wavelets, play a building block role for facial representation in these graph matching methods. A typical local feature representation consists of wavelet coefficients for different scales and rotations based

on fixed wavelet bases. These locally estimated wavelet coefficients are robust to illumination change, translation, distortion, rotation, and scaling. The grid is appropriately positioned over the image and is stored with each grid point's locally determined jet in figure 2(a), and serves to represent the pattern classes. Recognition of a new image takes place by transforming the image into the grid of jets, and matching all stored model graphs to the image. Conformation of the DLA is done by establishing and dynamically modifying links between vertices in the model domain.

3. Hybrid approach: The idea of this method comes from how human vision system perceives both holistic and local feature. The key factors that influence the performance of hybrid approach include how to determine which features should be combined and how to combine, so as to preserve their advantages and avert their disadvantages at the same time. These problems have close relationship with the multiple classifier system (MCS) and ensemble learning in the field of machine learning. Unfortunately, even in these fields, these problems remain unsolved. In spite of this, numerous efforts made in these fields indeed provide us some insights into solving these problems, and these lessons can be used as guidelines in designing a hybrid face recognition system. hybrid approach that use both holistic and local information for recognition may be an effective way to reduce the

complexity of classifiers and improve their generalization capability. Shirodkar M, et al. (2015) [41] proposed attendance administration device the use of the face focus method in which captured faces are matched with the face database of the students and mark attendance Sakshi, et al. Edelweiss Applied Science and Technology, 2021 Citation: Sakshi, Sharma C, Sharma S, Singh P and Khan AI. Advanced attendance management systems: applied sciences and applications (2021) Edelweiss Appli Sci Tech accordingly. Student photographs are captured in one-of-a-kind poses for the duration of the admission method and stored in the college database. Cameras are already established in the gadget which captures the solely frontal photograph of the pupil and matches captured image with the database if the image matches, then the device automatically mark the current for that precise student. Reports can be downloaded by means of the authorities at any time from the front end. The creator finished an accuracy of 83.2% from the proposed system. Jayant KN, et al. (2016) proposed attendance management system using hybrid face focus techniques. In this find out about writer set up excessive definition digital camera above the whiteboard of the type which capture all students

three times in the total period of the class due to the fact of editions in the pose of the students. Viola-Jones algorithm is viewed via the writer

for face detection in their learn about due to the quick feature resolution procedure. The machine will seize and manner statistics in three frames and the frame offers the very best detection charge that body will be considered through the gadget to mark the attendance in excel format.

Authors in [4] proposed a model of an automated attendance system. The model focuses on how face recognition incorporated with Radio Frequency Identification (RFID) detect the authorized students and counts as they get in and get out form the classroom. The system keeps the authentic record of every registered student. The system also keeps the data of every student registered for a particular course in the attendance log and provides necessary information according to the need.

In this paper [5], authors have designed and implemented an attendance system which uses iris biometrics. Initially, the attendees were asked to register their details along with their unique iris template. At the time of attendance, the system automatically took class attendance by capturing the eye image of each attendee, recognizing their iris, and searching for a match in the created database. The prototype was web based.

In [6], authors proposed an attendance system based on facial recognition. The algorithms like Viola-Jones and Histogram of Oriented Gradients (HOG) features along with Support Vector Machine (SVM) classifier were used to implement the system. Various real time scenarios such as scaling, illumination, occlusions and pose was considered by the authors. Quantitative analysis was done on the basis of Peak Signal to Noise Ratio (PSNR) values and was implemented in MATLAB GUI.

Authors in [7] researched to get best facial recognition algorithm (Eigenface and Fisherface) provided by the Open CV 2.4.8 by comparing the Receiver Operating Characteristics (ROC) curve and then implemented it in the attendance system. Based on the experiments carried out in this paper, the ROC curve proved that, Eigenface achieves better result than Fisherface. System implemented using Eigenface algorithm achieved an accuracy rate of 70% to 90%.

In [8], authors proposed a method for student attendance system in classroom using face recognition technique by combining Discrete

Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT). These algorithms were used to extract the features of students face followed by applying Radial Basis Function (RBF) for classifying the facial objects. This system achieved an accuracy rate of 82%.

2.2 Proposed System

The Software Requirement Specification (SRS) is aimed at defining the necessary functionalities and Uniform Resource Locator (URL) for the Intelligent Network Backup Tool. It intends to establish a clear understanding of the final product's features and specifications as envisioned by both the development team and the client. The requirement statements are prioritized and detailed in this document. It targets project developers, managers, users, testers, and documentation writers, providing them with information on design and implementation constraints, external interface requirements, system features, nonfunctional requirements, and dependencies. Identifying needs is crucial for businesses and organizations to evaluate their market performance and maintain a competitive edge. The proposed system seeks to automate the existing manual attendance system by utilizing face recognition technology. Its main objective is to capture and store each student's face for attendance purposes. Accurate detection of all facial features during the image

capture process is vital. With facial recognition steps applied to the captured image, teachers no longer have to take attendance manually during class. This paper tackles the challenges commonly associated with manual attendance systems. To detect faces, Haar Cascade classifiers are utilized, while the Local Binary Pattern Histogram (LBPH) algorithm is used to recognize student faces. The proposed system for Face Recognition based Classroom attendance system. The system requires a camera installed in the classroom at a position where it could capture all the students in the classroom and thus capture their images effectively. This image is processed to get the desired results.

2.3 Literature Review Summary (Minimum 7 articles should refer)

Year and Citation	Article/ Author	Tools/ Software	Technique	Source	Evaluation Parameter
2012	Naveed Khan Baloch	Face Recognition based Attendance Management System	Image acquisition <ul style="list-style-type: none"> • Histogram normalization • Noise removal • Skin classification • Face detection 	Journal of Emerging Technologies and Innovative Research	

			<ul style="list-style-type: none"> • Face recognition • Attendance 		
2020	Smitha, Pavithra S Hegde, Afshin	Face Recognition based Attendance Management System	<ul style="list-style-type: none"> • Dataset Creation • Face Detection • Haar-Cascade Classifier with OpenCV • Detect • MultiScale module 	International Journal of Engineering Research and Technology (IJERT)	
2018	Md. Sajid Akbar, Pronob Sarker, Ahmad Tamim Mansoor	Face Recognition and RFID Verified Attendance System	<ul style="list-style-type: none"> • Image Processing • OpenCV • Facial Recognition • RFID Tags • RFID Readers • Arduino Project • IR Module • Class Attendance • Smart Classroom • Radio Waves 	2018 International Conference on Computing, Electronics & Communications Engineering (ICCECE)	

2017	Kennedy Okokpujie, Etinosa Noma-Osaghae, Olatunji Okesola, Samuel Ndueso John	Implementation of a Student Attendance System Using Iris Biometric Recognition	<ul style="list-style-type: none"> • Biometrics • web application • attendance • Iris Recognition • Canny Edge detector algorithm, 	2017 International Conference on Computational Science and Computational Intelligence (CSCI)	
2017	Hemantkumar Rathod, Snehal Sane, Suresh Raulo, Yudhisthir Ware	Automated attendance system using machine learning approach	<ul style="list-style-type: none"> • Viola-Jones and Histogram of Oriented Gradients (HOG) • Support Vector Machine (SVM) classifier • Peak Signal to Noise Ratio (PSNR) values • MATLAB GUI 	ICNTE 2017, 10.1109/ICNTE. 2017.7947889	
2016	Lukas, Samuel	Student attendance system in classroom using face recognition technique	<ul style="list-style-type: none"> • Face recognition technique • Discrete Wavelet Transforms (DWT) 	2016 International Conference on Information and Communication Technology Convergence	

			<ul style="list-style-type: none"> • Discrete Cosine Transform (DCT) • Radial Basis Function (RBF) 	(ICTC). IEEE, 2016	
2014	Siswanto, Adrian Rhesa Septian, Anto Satriyo Nugroho, and Maulahikmah Galinium	Implementation of face recognition algorithm for biometrics based time attendance system	<ul style="list-style-type: none"> • Facial recognition algorithm (Eigenface and Fisherface) • Receiver Operating Characteristics (ROC) • Eigenface algorithm 	2014 International Conference on ICT For Smart Society (ICISS). IEEE, 2014	

3. PROBLEM FORMULATION

Attendance Management System is software developed for daily student attendance in schools, colleges and institutes. It facilitates to access the attendance information of a particular student in a particular class. Human brain can automatically and instantly detect and recognize multiple faces. But when it comes to computer, it is very difficult to do all the challenging tasks on the level of human brain. The face recognition is an integral part of biometrics. In biometrics, basic traits of human 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.

4. OBJECTIVES

The "Attendance Management System" is a piece of software designed to track a student's attendance in college on a daily basis. The staff members in charge of the topics will be responsible for keeping track of the students' attendance. Each member of staff will be given a unique username and password based on the subject they are responsible for. This is where the accurate report based on student attendance is prepared. This approach will also assist in determining a student's attendance eligibility criteria. On a weekly and monthly basis, a report on the student's attendance is generated.

User Friendly: User interface is very easy. Data storing and recovery is fast and secured. In addition, application is provided with graphical representation for easier interpretation and analysis.

Reports are Easily Generated: Various reports, such as student-by-student attendance, day-by-day attendance, class-by-class attendance, month-by-month-by-month-by-month-by-month-by-month Instant access to current and historical reports is possible.

5. METHODOLOGY

The proposed system face recognition-based attendance system can be divided into five main modules. The modules and their functions are defined as follows.

a. **Image Capture:** The high-resolution camera which is used for capturing video is used to take frontal images of the students.

b. **Pre-processing:** The images are converted from RGB to Grayscale and are scaled down by a factor of 1.2.

c. **Face Detection:** A proper and efficient face detection algorithm always increases the performance of face recognition systems. Various algorithms are proposed for face detection such as face knowledge-based methods, feature invariant methods, machine learning based methods. In this project, I implemented a system for locating faces in digital images. These are in JPEG format only. Before we continue, we must differentiate between face recognition and face detection. They are not the same, but one depends on the other. In this case face recognition needs face detection for making an identification to “recognize” a face. I will

only cover face detection. Face detection uses classifiers, which are algorithms that detects what is either a face (1) or not a face (0) in an image.

d. **Developing a dataset** The faces detected in images are stored in the database after pre-processing and detection. A minimum of 20 images are captured per individual student along with a unique ID. The dimensions of these stored images are 212×212 pixels. These images are later used to train the recognizer.

e. **Face Recognition:** Local Binary Pattern (LBP) is a smooth & adequate operator, which operates by setting the pixels of an image by thresholding the neighbourhood of each pixel and examines the outcome as a binary number. Histogram of Oriented Gradients (HOG) descriptor increases the detection performance when combined with LBP. Therefore, a combination of LBP & HOG which gives LBPH algorithm is used for face recognitio

6.CONCLUSION

The undertaking has a very widespread scope in future. The assignment can be implemented on intranet in future. Project can be updated in near future as and when requirement for the identical arises, as it is very flexible in terms of expansion. With the proposed software of database Space Manager ready and practical the purchaser is now able to control and therefore run the whole work in a whole lot better, accurate and error free manner. The following are the future scope for the project.

- Discontinue of particular student eliminate potential attendance.
- Bar code Reader based attendance system.

Attendance administration system maintains music of everyday attendance, working hours, breaks, login, and logout time. It prevents staff's time theft. An attendance management device integrates all attendance gadgets such as clever cards, biometric, and facial recognition devices in real-time

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