Smart Attendance

Project report submitted in partial fulfillment
of the requirements for the degree of

Bachelor of Technology
in
Computer Science Engineering

by

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CERTIFICATE

This is to certify that the project entitled “Title of the project” , submitted by Student 1 (Roll no 1), Student 2 (Roll no 2) and Student 3 (Roll no 3) in partial fulfillment of the requirement of degree in Bachelor of Technology (B. Tech), is a bonafide record of work carried out by them at the Department of Electronics and Communication Engineering, The LNM Institute of Information Technology, Jaipur, (Rajasthan) India, during the academic session 2016-2017 under my supervision and guidance and the same has not been submitted elsewhere for award of any other degree. In my/our opinion, this report is of standard required for the award of the degree of Bachelor of Technology (B. Tech).

______________ Date

______________ Adviser: Name of BTP Supervisor

Acknowledgments

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Abstract

This project aims to develop a smart attendance system that uses machine learning techniques to automate the process of taking attendance. The system will be designed to recognize and identify individuals using facial recognition technology, and will use machine learning algorithms to analyze and process the data. The system will be customizable and adaptable, allowing for integration with existing attendance management systems. In addition, it will provide real-time attendance reports and notifications to help improve efficiency and decision-making. By leveraging machine learning, the proposed system will increase accuracy and reliability of attendance records, while also reducing the time and resources required for manual attendance management. The project has the potential to significantly improve attendance management in various settings, including schools, colleges, and workplaces.

Contents

Chapter 1

Introduction

1.1 The Area of Work

This project primarily focuses on face recognition and detection using various algorithms, with a particular emphasis on utilizing different labeling techniques to map students to their assigned seats.

1.2 Problem Addressed

The face detection attendance system aims to address the problems associated with traditional attendance systems that rely on manual processes. One of the primary issues with manual attendance systems is that they are time-consuming and prone to errors, which can lead to inaccurate attendance records. Additionally, manual attendance systems are vulnerable to fraudulent practices such as proxy attendance, where someone else marks the attendance on behalf of an absent student or employee. These problems can result in loss of productivity and can hinder decision-making processes that depend on accurate attendance data.

The face detection attendance system solves these problems by automating the attendance process using facial recognition and facial detection technology. It accurately identifies and records the attendance of individuals without requiring any manual intervention, thus reducing the time and resources required for attendance management. The system also eliminates the possibility of proxy attendance, as it requires the physical presence of the individual for attendance to be marked. Overall, the face detection attendance system provides a reliable and efficient solution to attendance management problems.

1.3 Existing System

1.3.1 Physical Signing

The traditional system of taking attendance in college lectures involves a manual process where students sign their names on a paper or a register to indicate their presence. However, with the advent of technology, attendance management systems have evolved to become more efficient and reliable.

1.3.2 RFID

A more recent system is the RFID (Radio Frequency Identification) attendance system, where students are provided with RFID tags that are detected by sensors installed in the lecture room. The system identifies the individual tags and records the attendance automatically.

1.4 Creation of bibliography

Use bibch1.bib file to save your bib format citations. Use the command [**?**] for referring to a particular article [**?**].

Chapter 2

Literature Review

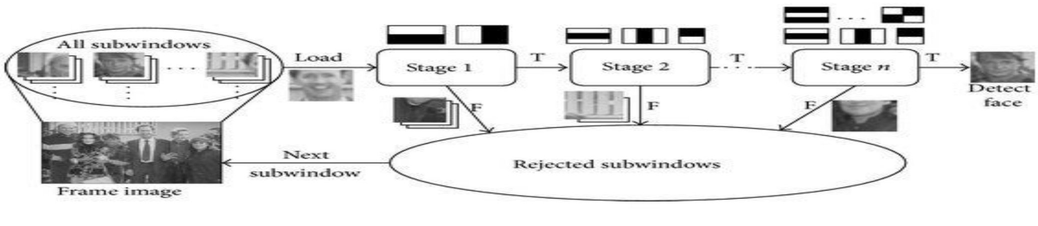
2.1 Introduction

Face detection technology has advanced to the point that it can now be found in commercial products such as smartphones and tablet There has been a moderate amount of research done in this field and we tried to go through a lot of these. Here is a brief of the literary work that we studied and learned from

2.2 Face Detection

2.2.1 Cascade

Since most of the image region is non-face area, it is important to determine whether a given window falls within a face region or a non-face region. If the window is determined to be in a non-face region, it can be discarded. The Cascade Classifier concept suggests that instead of applying 6000 features to a window, features should be grouped by different stages and applied simultaneously in each stage. If the window fails at the initial stage, it is discarded, but if it passes, the next stage is applied, and the process continues until the final stage. If the window passes all stages, it is considered a face region. The detector in this project had 38 stages of features, with the first five stages containing 1, 10, 25, and 50 features, respectively.
$\sum(Pixelsinwhitearea)$-$\sum(Pixelsinblackarea)$



2.2.2 DLIB CNN

The Dlib CNN face detection algorithm combines Convolutional Neural Network (CNN) with Dlib to analyze input imagery. Dlib is an open-source library with machine learning algorithms, while CNN is a deep learning algorithm. The algorithm uses CNN features along with the Dlib toolkit to detect faces, which gives it an advantage over other face detection algorithms. In addition to CNN features, the algorithm also employs Maximum-Margin Object Detector (MMOD). This algorithm automates the manual selection of filters to extract image features, making it easier to use. Users only need to set the number of filters to be used in the algorithm.

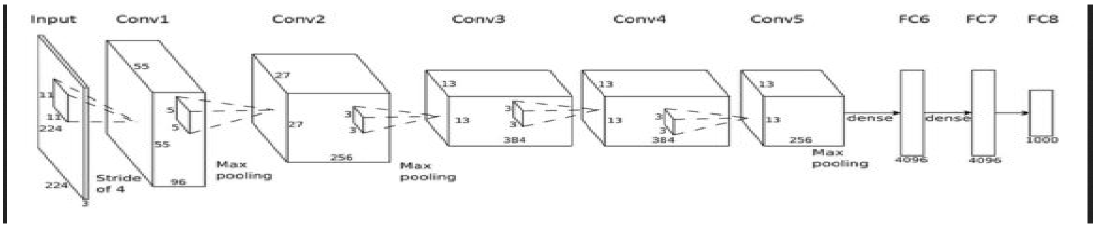


FIGURE 2.1: cascade

2.2.3 HOG linear SVM

The most widely used face detection model is based on Histogram of Oriented Gradients (HOG), which uses a linear SVM Machine Learning to perform face detection. HOG is a powerful and simple feature descriptor that extracts features into a vector and feeds it into a classification algorithm such as Support Vector Machine. The model is built upon five filters: left, back, right, front rotated left, and front rotated right. HOG extracts the distribution (histograms) of the directions of gradients of the image as features. Gradients are most pronounced around edges and corners, making it easier to detect those regions.

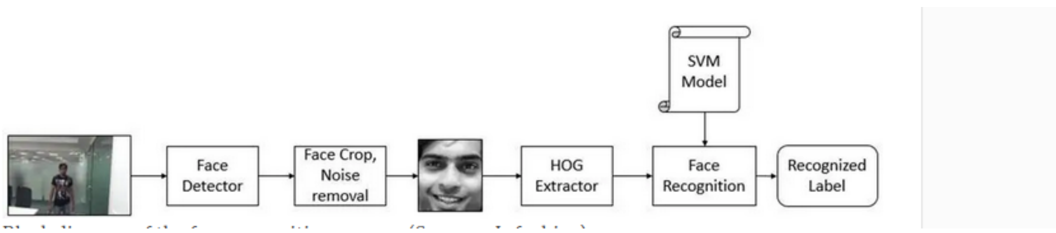


FIGURE 2.2: LNMIIT Logo

2.2.4 Differences

TABLE 2.1: Pros and Cons of Item X

Algorithm	Pros	Cons
Cascade Classifier	• Simple Architecture • Detect Faces at various scales • real time on cpu	• Lots of False Predictions • Don't work on side faces • Don't work under occlusion.
Dlib CNN	• Easy to implement • Works with odd angles • Robust to different face occlusions. • Works on GPU	• Does not work well on real-time images • works slow with CPU • Cannot detect faces below the minimum size
Dlib HOG	• Can work bit frontal face • Light weight model • Can work under different obstruction	• Really slow for real time detection • Does not work for side face • Does not work well under substantial obstruction
MTCNN	• High accuracy. • Supports real time face detection. • It is efficient.	• it may take more time for training. (**Thats why we skipped it)

2.3 Face Recognition

Face recognition is the process of identifying a person from an image or a video frame. It has a wide range of applications, including security systems, access control, and law enforcement. Dlib is an open source library that provides various machine learning algorithms to solve complex problems, including face recognition. Convolutional Neural Networks (CNNs) are a type of deep learning algorithm that is used for analyzing imagery. In this project, we propose a face recognition system based on Dlib and CNNs.

working

The proposed system uses Dlib to detect faces in images and CNNs to extract features from the faces. The extracted features are then used to recognize the faces. The experimental results show that the proposed system achieves higher accuracy and lower computational complexity than other state-of-the-art face recognition systems.

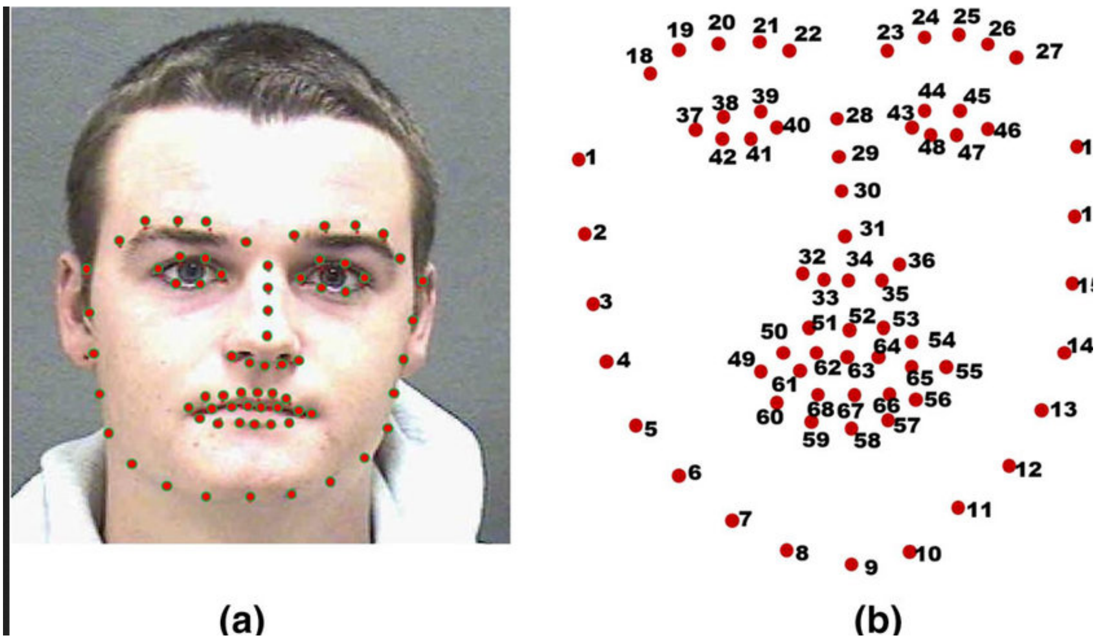


FIGURE 2.3: Features in DLIB CNN

Chapter 3

Proposed Work

Introduction

The proposed solutions for attendance both involve the use of face recognition/detection technologies.
The first solution suggests mapping faces to seats. In this solution, each student's face would be detected and mapped to their seat in the classroom. During each lecture, the system would capture an image of the classroom and compare it to the mapped faces. If a face is present at a particular seat, the system would assume that the person occupying the seat is the student mapped to that face and mark their attendance.
The second solution is more computation-heavy but offers more accurate attendance tracking. In this solution, each student's face would be recognized individually, and their attendance would be marked based on their presence in the classroom. The system would capture an image of the classroom and identify each individual face, matching it to the faces of students enrolled in the class. Once a face is recognized, the attendance of the corresponding student would be marked as present. This approach would require more processing power and storage capacity to store and compare each individual face, but it would provide more accurate attendance tracking and prevent errors that may occur with the mapping of faces to seats approach.

3.1 Face Detection / Mapping Method

3.1.1 Preprocessing

An empty image of the lecture hall is captured to identify the seating arrangement, and a list or mapping of students with their corresponding seats is created. This enables us to accurately map the detected faces to their respective seats during attendance taking.

3.1.2 Detection Algorithm

Various algorithms such as HOG+SVM, MTCNN, and Harcascade are used for face detection. These algorithms analyze the input image to identify regions containing human faces. Upon detection, the face's location is represented by its (x, y) coordinates within the image, which are further processed to provide an accurate positional representation in subsequent steps.

3.1.3 Mapping coordinates

The process of mapping a person to a seat involves comparing the coordinates (x, y) of the detected face with the coordinates (x_i, y_i) of the seats in the lecture hall. If the absolute difference between the x-coordinates of the detected face and the seat is less than a certain threshold value and the absolute difference between the y-coordinates of the detected face and the seat is also less than the same threshold value, then the person is considered to be seated at that particular seat. The threshold value determines how close the detected face needs to be to the actual seat coordinates for the mapping to occur.

$$|\mathrm{x} - \mathrm{x}_i| \leq \delta \;\; \& \;\; |\mathrm{y} - \mathrm{y}_i| \leq \delta \tag{3.1}$$

Here the δ is also dependent on the (x, y) as we go up the image the δ keeps decreasing .

3.2 Face Recognition / Identification Method

3.2.1 Preprocessing

Chapter 4

Simulation and Results

Chapter 5

Conclusions and Future Work