Attendance management system by using facial recognition

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ABSTRACT - This paper is about the biometric attendance management. The automatic attendance management will replace the manual method, which takes a lot of time consuming and difficult to maintain. There are many biometric processes, in that face recognition is the best method. In this paper we are going to describe the attendance without human interference. In this method the camera is fixed in the classroom and it will capture the image, the faces are detected and then it is recognized with the database and finally the attendance is marked. There are various methods for comparing the faces. The local binary histogram is the one of the method. Histogram matrix values are used in computer vision problem of face recognition.

Index Terms -Biometric, Face Detection, Face Recognition, Local binary histograms, Cropping, Database.

I. INTRODUCTION

The Attendance Management system is an essential part of any organization or institution. The automated system has replaced traditional paper-based methods with modern approaches such as Facial recognition, Biometric fingerprint Scanning, QR codes, RFID-based, voice recognition etc. The Attendance Management by Facial recognition is the latest and most promising development in this field. The traditional paper-based system has many challenges. Students are passing paper sheets one by one to others to sign in front of their name which is time consuming and distracts the student. Some students do not come to college but sign attendance by proxy. In some cases, teachers take attendance by calling the student's name or roll number. If a student misses in between then attendance is not marked and this process is also time consuming and error prone. Due to use of Facial Recognition technology, the attendance management process has become faster, reliable and more efficient. Facial Recognition technology works by capturing the facial features by high-resolution camera and then matching them with pre-existing databases. This system not only saves time but also eliminates the chance of proxy attendance. In this paper, we have discussed the implementation of the Attendance Management System by Facial Recognition, its benefits, improved security and efficiency. We also discuss the various components involved in implementation of the system, including Face detection, Feature extraction, and recognition and how these components work together to create an efficient attendance management system.

II. LITERATURE SURVEY

Authors in [3] 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 [4], 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 [5], 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 [6] researches 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 [7], 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 student's face followed by applying Radial Basis Function (RBF) for classifying the facial objects. This system achieved an accuracy rate of 82%.

III. PROBLEM DEFINITION

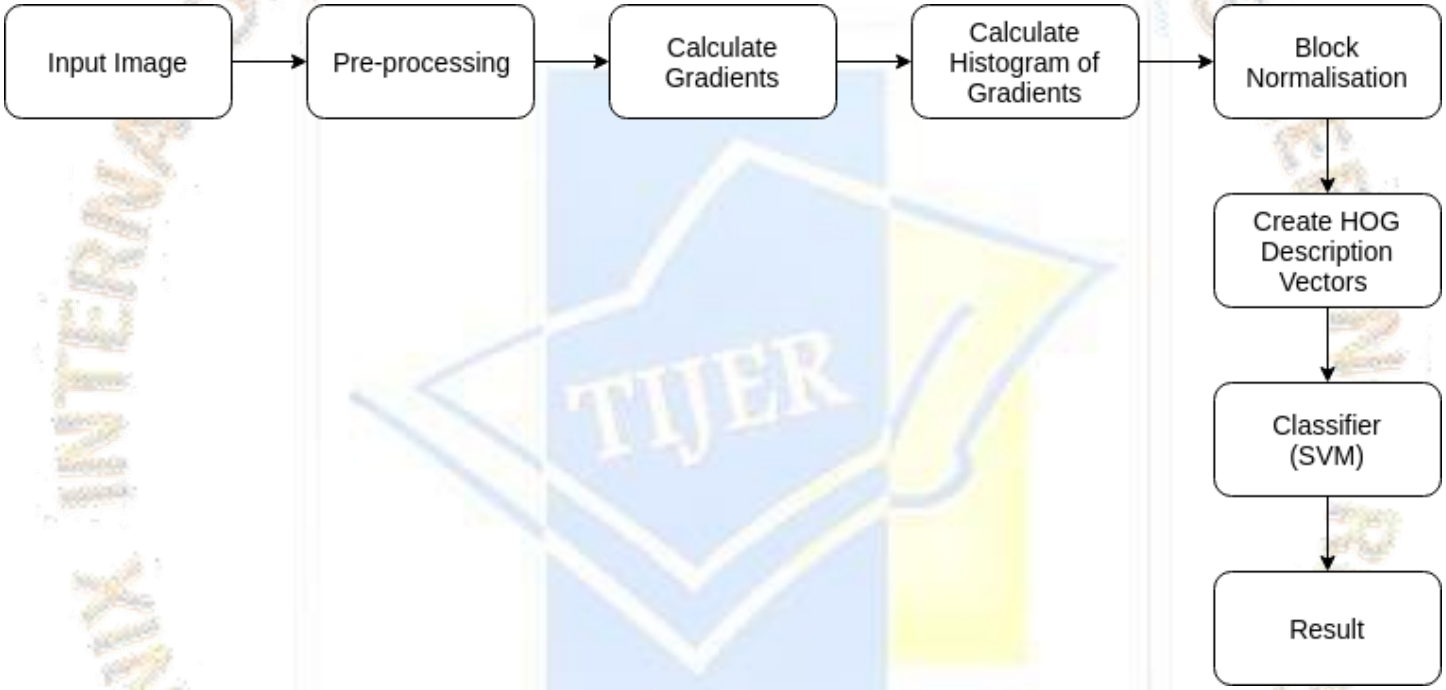
The problem that Attendance Management System using Facial Recognition seeks to address is the need for an efficient, accurate and automated attendance tracking system in various settings such as schools, universities, and workplaces. The traditional attendance tracking methods such as manual paper-based systems or biometric-based systems using fingerprints or cards are time-consuming, prone to errors, and can be subject to fraud or proxy attendance. Facial recognition-based attendance systems aim to overcome these challenges by automating attendance tracking through the use of advanced facial recognition technology, which can accurately identify individuals and mark their attendance in real-time. However, there may be challenges in implementing such a system, including issues related to data privacy and security, the cost of implementation, and the need for user acceptance and training. The problem definition for Attendance Management System using Facial Recognition is, therefore, to develop a system that can effectively address these challenges while providing an accurate and efficient attendance tracking mechanism.

IV. PROPOSED METHODOLOGY

The entire process of student attendance is divided into 4 steps.

1.Face detection- A normal live video consists of a lot of stuff which is not required by us. We require only faces of the students and for that the faces have to be extracted. To extract the faces of the students from live video we use the HOG algorithm. The Histogram Oriented graphs algorithm needs to be trained to detect human faces. This trained data to extract features of human faces is saved in the haarcascade_frontalface_default.xml file. This xml file consists of the edge features that the algorithm uses to decide if it is a human face or not.

Fig 1 . HOG algorithm working

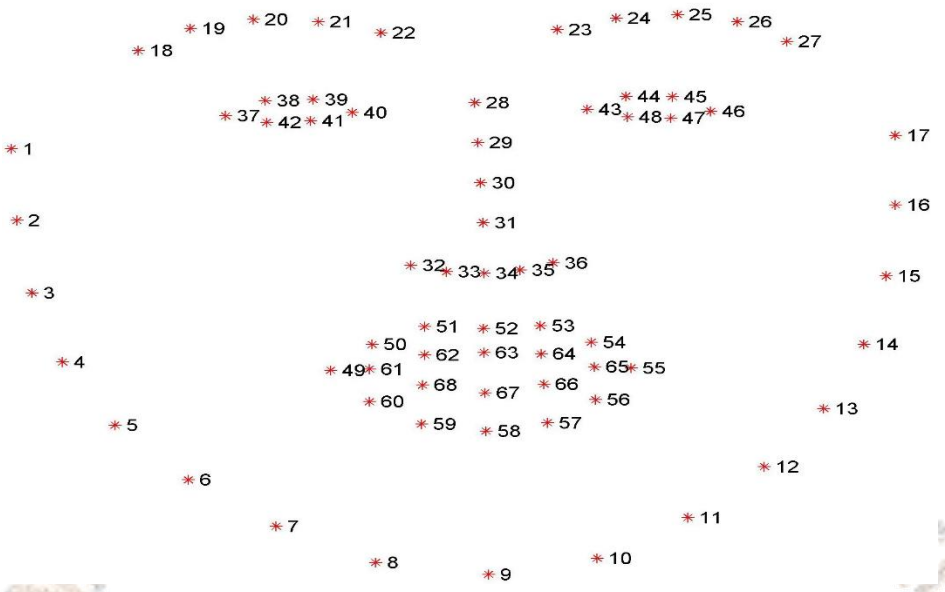


2. Dataset creation - The next step is to create the dataset of the students. This is done by taking 150 images per student. The images are taken from the webcam through live video and then the images are converted from RGB to grayscale. The face of the student is cropped and then that grayscale image is stored in our local folder. The original video consist of multiple colours which makes it difficult to judge the number of pixels present in it. This is why to make the process of recognition easier the images are converted to grayscale.

3.Landmark extraction – For this method we have used the dlib face landmark extraction model The facial landmark detector in dlib uses a machine learning algorithm to identify 68 key points on a face, including the corners of the mouth, the eyebrows, the pupils, and the nose. These landmarks can be used for a variety of tasks such as face recognition, emotion detection, and head pose estimation.

The code will load an image, detect faces using the dlib face detector, and extract the 68 facial landmarks using the dlib shape predictor. It will then draw circles around each landmark and display the resulting image.

Fig 2 . Dlib 68 face landmarks



4. Facial encoding – For recognition we have used the dlib facial recognition model by Adam Geitgey . face_recognition is a popular Python library for face recognition tasks, created by Adam Geitgey. It uses dlib, a popular open-source C++ library for computer vision tasks, to detect and extract facial landmarks and then uses these landmarks to recognize faces.
The face_recognition library can be used for a variety of tasks, including face recognition, face identification, face clustering, and face encoding. The facial landmarks extracted from an image are then used to create a face encoding. The face encoding is a 128-dimensional vector that represents the unique features of a face. The face_recognition library uses a neural network to create the face encoding. The face encoding of a face is then compared to the face encodings of known faces in order to recognize the face. The library uses a distance metric, such as Euclidean distance or cosine similarity, to compare the face encodings. If the distance between the face encoding of the face being recognized and the face encoding of a known face is below a certain threshold which is 0.7 set by us then the face is recognized as a match.

5. Face recognition model - The first step is to train the linear SVM on a set of known face embeddings. The training data consists of a set of face images along with their corresponding face embeddings. The SVM learns to classify the face embeddings into different categories based on their corresponding labels. Once the SVM is trained, a classification model is created by storing the learned parameters of the SVM. This model can be used to classify unknown face embeddings by predicting their corresponding label. To classify unknown face embeddings, the embeddings are first extracted using a face recognition library such as face_recognition by Adam Geitgey. The embeddings are then passed to the classification model, which predicts their corresponding label.

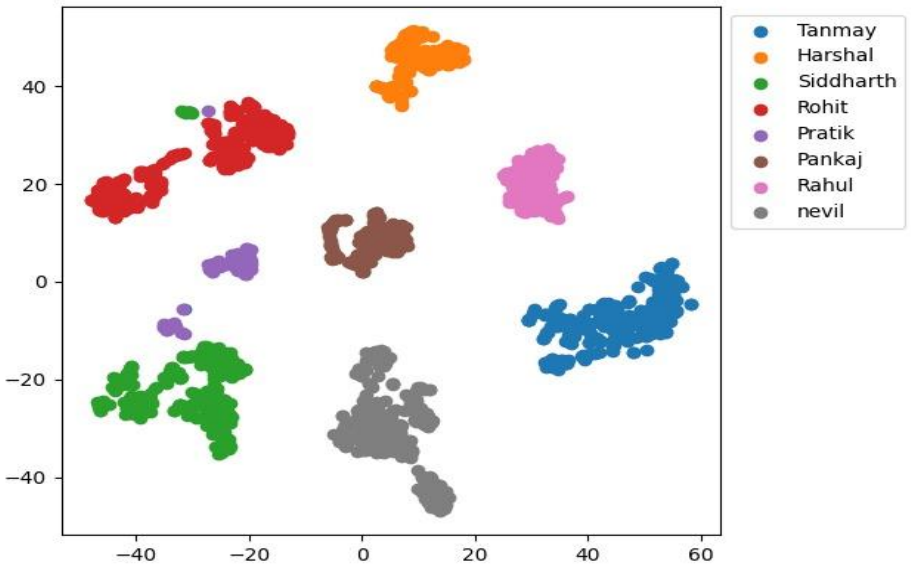


Fig 2 . **SVM trained model**

V . Results

Fig . 3. Multiple students attendance

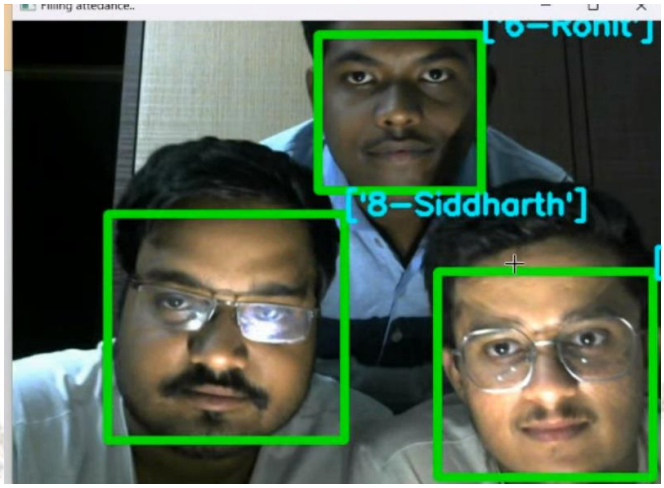


Fig 4. Attendance recorded

Date	Student	Present	Time in
April 23, 2023	Pankaj	P	April 23, 2023, 12:06 p.m.
April 23, 2023	Pratik	P	April 23, 2023, 12:06 p.m.
April 23, 2023	Rahul	P	April 23, 2023, 1:21 p.m.
April 23, 2023	Rohit	P	April 23, 2023, 12:06 p.m.
April 23, 2023	Siddharth	P	April 23, 2023, 12:06 p.m.
April 23, 2023	Tanmay	P	April 23, 2023, 12:06 p.m.

Fig 5 .Attendance marked

VI. Conclusion

This paper presents a simple yet efficient approach to calculate the attendance in a class by employing facial recognition techniques. The output of this system can be outlined as follows: The system not only detects just one face of a single student, but successfully detects multiple students or faces. As the system works for three faces at once by law of induction we can say that it will work for at least more than 5 faces at a single time. The system also successfully recognises and marks the attendance of the marks the attendance of the detected students. We wish to implement an efficient, time saving and easy to operate system which will in turn benefit both faculty and students

VII. REFERENCES

[1] ttps://www.researchgate.net/publication/326261079_Face_detection_system_for_attendance_of_class'_students

[2] Hapani, Smit, et al. "Automated Attendance System Using Image Processing." 2018 Fourth International Conference on Computing Communication Control and Automation (ICCUBEA). IEEE, 2018

[3] Akbar, Md Sajid, et al. "Face Recognition and RFID Verified Attendance System." 2018 International Conference on Computing, Electronics & Communications Engineering (iCCECE). IEEE, 2018.

[4] Okokpujie, Kennedy O., et al. "Design and implementation of a student attendance system using iris biometric recognition." 2017 International Conference on Computational Science and Computational Intelligence (CSCI). IEEE, 2017.

[5] Rathod, Hemantkumar, et al. "Automated attendance system using machine learning approach." 2017 International Conference on Nascent Technologies in Engineering (ICNTE). IEEE, 2017.

[6] Siswanto, Adrian Rhesa Septian, Anto Satriyo Nugroho, and Maulahikmah Galinium. "Implementation of face recognition algorithm for biometrics based time attendance system." 2014 International Conference on ICT For Smart Society (ICISS). IEEE, 2014.

[7] Lukas, Samuel, et al. "Student attendance system in classroom using face recognition technique." 2016 International Conference on Information and Communication Technology Convergence (ICTC). IEEE, 2016.

[8] https://becominghuman.ai/face-detection-using-opencv-with-haarcascade- classifiers-941dbb25177

[9] https://www.superdatascience.com/blogs/opencv-face-recognition

[10] Salim, Omar Abdul Rhman, Rashidah Funke Olanrewaju, and Wasiu Adebayo Balogun. "Class attendance management system using face recognition." 2018 7th International Conference on Computer and Communication Engineering (ICCCE). IEEE, 2018.