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FACE RECOGNITION BASED ON ATTENDANCE MONITORING SYSTEM USING HOG

Md. Irshad Hussain B[1*], Manasa K M[2]

Assistant Professor, Department of Master Computer Applications, University B.D.T College of Engineering, Davanagere, Karnataka, India[1]

Student, Master Computer Applications, University B.D.T College of Engineering, Davanagere, Karnataka, India[2]

ABSTRACT: The detection and identification of individuals based on their facial traits is known as face recognition. The most convenient and quick biometric technology currently available is face recognition. It is able to recognise people using only their faces. The purpose of this study is to develop an automated system to replace laborious manual methods of keeping track of students' presence in a classroom or exam room with facial recognition technology. The study of pattern recognition (facial recognition), which has many practical uses including identification and detection, is central to this investigation. Finally, this technology should be used to bolster the attendance logs kept by the students. These enhancements will make attendance tracking more accurate. Once a student's face is matched with the template database, the suggested system will update attendance.

KEYWORDS: Attendance tracking for students using facial recognition technology.

I.INTRODUCTION

It's a machine-based strategy for identifying a person by some trait of their anatomy or demeanour. A few examples of biometric identifiers are a person's signature, fingerprints, voice, iris, retina, hand geometry, ear geometry, and facial features. Facial recognition stands out as one of the most ubiquitous, sharable, and approachable of these kinds of technologies.

Providing "a correct person with the appropriate privileges, and the right access at the right time" is the main function of biometrics, which also refers to automatic recognition of an individual. That way, securities might verify a person's identity based on "who" she is, rather than "what" she owns or "what" she can remember. Biometrics can be broken down into two broad categories:

Physical characteristics, such as a person's iris, palm print, facial features, Fingerprints, etc., are all part of their physiological makeup.

Behavioural refers to how a person acts and thinks. Signatures are still an extremely popular distinguishing feature. New techniques for studying human behaviour, such as keystroke dynamics and speech analysis, are emerging.

Using pattern recognition and analysis, facial recognition (also known as face recognition) software may identify a person in a digital photo.When compared to other forms of identification, face recognition has many advantages that make it the best option. Images can be taken at a distance and without the need for the user to be physically there. In addition, any camera will do so long as it meets the system requirements. Consequently, face recognition offers a low-cost and trustworthy identification system that may be used for a variety of reasons, including but not limited to: attendance tracking in the classroom, video monitoring, and access control.

Two primary steps—face detection and face identification—comprise the entirety of the face recognition process (or recognition).

The first is the detection phase, which includes features like face recognition and face localization. The second step, recognition, entails using a face database to help with matching and feature extraction to retain relevant information for later use in discrimination.

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Because it does not require any sort of physical interaction on the part of the user, because it is easy to use, and because in many cases it can be performed without even the person knowing, applying Facial Recognition for students attendance system is more significant than the other biometrics approach. It's reliable, supports large enrollment and verification rates, and works with the standard camera equipment.

II. MOTIVATION

Extracting relevant data from a digital image has become the focus of image processing in recent years. The implications for technological progress are enormous.
I will develop and install a more precise system based on the aforementioned image processing technology to better assist and manage the organization's users' records. So this is the critical element that drives me. Furthermore, the existing attendance system at Parul University is automated, but it is time-consuming and has a complicated procedure for marking students' attendance. I'm conducting this survey because I want to be aware of any potential hazards associated with the current practise of having lecturers shout out individual student IDs or circulating a paper attendance sheet around the room.

III. CURRENT SETUP

The current system relies on the lecturer calling roll or passing a paper attendance sheet around the classroom to record student presence during class. After class, the instructor enters the students' attendance data into the web-based attendance system, and the students generate an attendance report.There are currently two methods for recording students' attendance: manual and automated [8].When there are a lot of students in class, the lecturer has a lot of extra work to do during the manual system, such as collecting, validating, and managing students' records. Keeping track of everyone's attendance and averaging it out is a time-consuming process when done manually [8].Furthermore, the automated approach may provide the professor with greater benefits than the manual system. This is because the professor no longer has to shoulder all the responsibility alone[8].

IV. FURTHER READING

Using Facial Recognition Algorithms, We Have Created an Automated Attendance Management System [1].
In this study, the authors propose a computerised system for tracking employees' attendance. This system, which relies heavily on facial recognition technology, can instantly identify a pupil as soon as he enters the classroom and record his presence there. The system is built on LBPH since it has a higher recognition rate and lower false positive rate than alternative algorithms. SVM and Bayesian are used as classifiers in the system because they perform better than distance classifiers do. When a student enters the classroom, his or her image is recorded by the camera installed there, as part of the system's workflow. Next, we remove the facial area and run some preliminary processing on it. Due to a limit of two students each class, the face detection algorithm has less to do. The authors of this report suggest further research into increasing the accuracy of face recognition algorithms in situations where a user's appearance has been subtly altered without their knowledge, such as when a user has been wearing a scarf or has grown facial hair. The system needs to be enhanced so that it can recognise angles of the face greater than 30 degrees. Better performance can be achieved by combining gait recognition with facial recognition systems.

The Effectiveness and Efficiency of Video-Based Face Recognition Algorithms in Unconstrained Conditions [2],
This study will use a database of human faces in different poses and expressions to compare three popular algorithms: Eigenfaces, Fisherfaces, and LBPH. The experimental results showed that LBPH achieved the maximum accuracy when considering variables such as light intensity, background noise, and video resolution. However, unlike other statistical methods, this one is constrained by excessive noise and unfavourable light exposure. 720p, 480p, and 360p videos were used to assess the recognition accuracy. According to the findings, whereas the others achieved their best levels of accuracy with 360p video, LBPH achieved it with 720p. As a result of its reliance on histogram similarity, LBPH provides accurate recognition accuracy. However, it showed sensitivity in specific applications.

Using a Facial Recognition System as an Attendance Monitor in a Classroom [3],
The purpose of this work is to present a novel method for recognising a student's face in a classroom setting, namely the creation of a 3D Facial Model. The goal of this study is to develop an automatic attendance system that can identify individual students inside a given class by analysing their faces within a given image or video stream.

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Attendance Monitoring Using Real-Time Face Recognition [4],
Using a Personal Component Analysis (PCA) technique, the authors of this research demonstrated an automated attendance tracking system that makes use of face recognition in a real-world setting to access a database containing information about individual students. Subtracting an image's backdrop in real time is still a major technical hurdle, making this a challenging undertaking. In addition, the system has the difficulty of handling a database containing several students' details. There are three primary steps in putting this system into action: locating face regions, extracting templates, and recognising faces. All input images are first transformed from RGB to grayscale before the feature extraction procedure begins. Histogram equalisation is then initiated to improve the image, and the picture is resized to ensure that all photos are the same size. The system can send a text message to a select group of parents if the student attendance rate drops below the required level. When matching an extracted image to a template image, the Euclidean distance between the two images is employed to determine a score. The system then displays an accepted or rejected result based on the criteria set.

Face Recognition-Based Automatic Attendance [5],
Presenters and TAs now have a streamlined method for keeping track of student attendance. In this work, the Viola-Jones algorithm is used for face detection, and the PCA technique is used for face identification. Two sets of photographs are taken by the system: one at the beginning of class and another at the end. Both pictures are necessary to properly recognise a student and identify them. The student is only counted as present if he or she is identified in both photos. A process flowchart would look something like this:

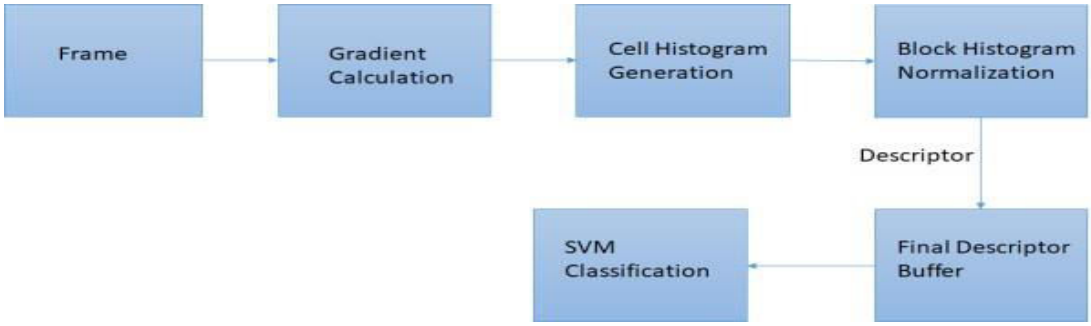
Attendance Management System Deployment Using SMART-FR [6],
This paper details the face recognition Raspberry Pi module used by the authors. The Raspberry Pi module is going to be linked to the camera. We will use GSM to notify parents of their children's attendance. The system uses Open CV and a raspberry pi module connected to a fingerprint reader to manage its student body.

V.METHODOLOGY

ALGORITHM

- **HOG (HISTOGRAM ORIENTED GRADIENT)**

HOG BLOCK DIAGRAM



As with the Canny Edge Detector, the Histogram of Oriented Gradients (HOG) serves as a feature descriptor. In computer vision and image processing, it is employed for the goal of locating concealed objects. In this method, the occurrences of gradient orientation in the targeted area of an image are counted. Both Edge Orientation Histograms and Scale Invariant Feature Transformations have a lot in common with this technique (SIFT). An object's structure or shape is highlighted by the HOG description. Since it takes into account both the magnitude and the direction of the gradient when calculating features, it outperforms other edge descriptors. It creates histograms for the image's regions based on the gradient's magnitude and orientation.

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Schematic Presentation of the Building's Layout:

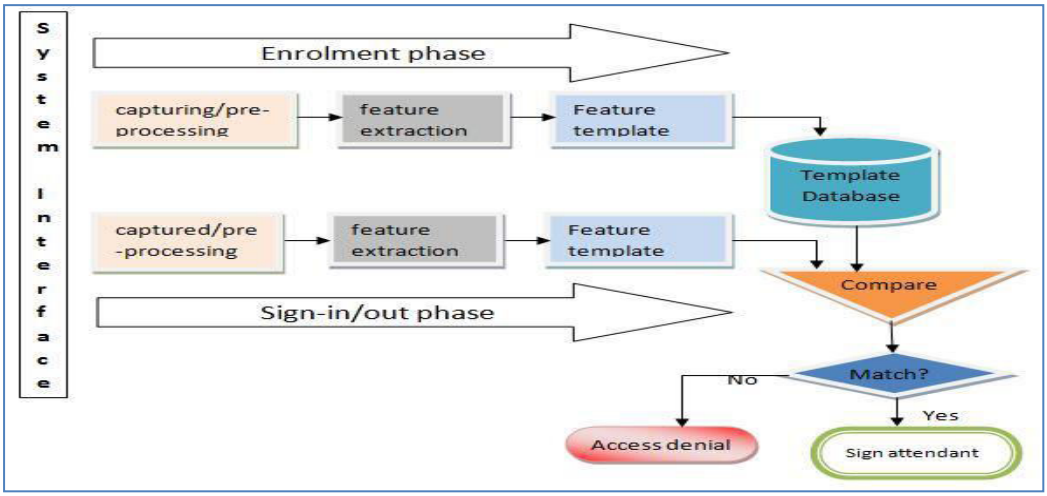
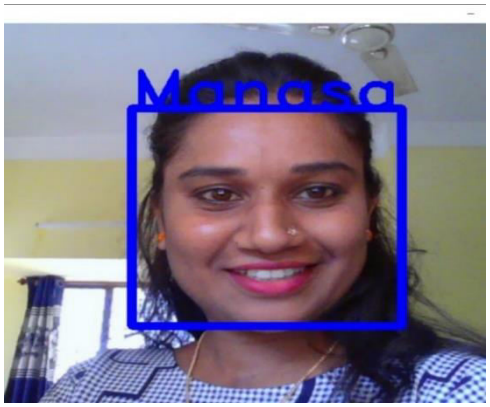
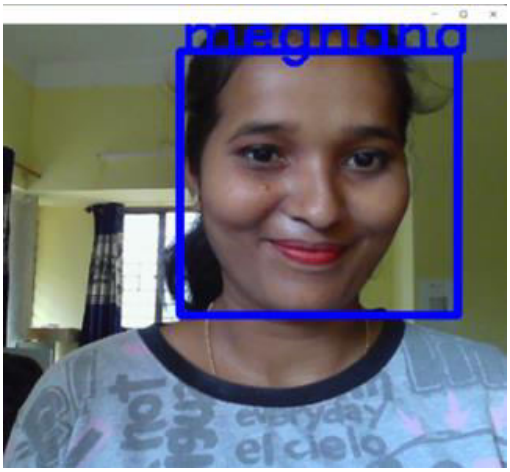


Fig: Diagram of the System's Layout

In the first phase, images are captured, features are extracted, and the template database is trained; in the second phase, a test image is captured via webcam, and the features are compared with the stored information present in the template data based using a machine learning algorithm, and if a match is found, the system generates a response.

VI. RESULTS OF EXPERIMENTS





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VII. CONCLUSION

A classroom cannot function without an automatic student attendance system. We extracted HOG features to pave the way for future hardware improvements and developments by others. As a result of this upgrade, the attendance process is more reliable and requires less human involvement. The project is planned so precisely that it automatically takes attendance, which is useful for institutions' data administration. The project's precise design makes it possible for institutions to take attendance manually or automatically, both of which are useful for data management. As a result of this upgrade, the attendance process is more reliable and requires less human involvement.

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