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Automated Attendance System Using RFID and Face Recognition

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ABSTRACT: The traditional methods of attendance taking, such as paper registers and ID card scanning, are outdated and inefficient. Automated attendance systems using face recognition technology have been developed to solve these issues. This paper presents a review of the literature on automated attendance systems using face recognition, including the technology behind the system, its advantages and limitations, and the ethical and privacy concerns related to its use. The study highlights the benefits of face recognition attendance systems, such as increased accuracy, faster processing times, and reduced administrative workload. However, the study also notes that the technology has limitations, such as the need for good lighting and camera quality, and the possibility of facial recognition errors. The paper concludes that automated attendance systems using face recognition technology can significantly improve attendance monitoring in various settings, but proper ethical and privacy safeguards must be put in place to address potential concerns.

I. INTRODUCTION

Attendance monitoring is an essential aspect of managing any organization or institution. Traditional methods of taking attendance, such as paper registers and ID card scanning, are often slow and error-prone. The emergence of automated attendance systems using face recognition technology has provided a solution to these issues. Face recognition technology is a biometric identification technology that uses facial features to identify individuals. Automated attendance systems using face recognition technology involve taking a picture of the face of an individual, which is then compared to a database of images to identify the person.

The use of automated attendance systems using face recognition technology has increased in recent years due to the development of sophisticated algorithms and improvements in camera technology. In this paper, we present a review of the literature on automated attendance systems using face recognition technology. We highlight the technology behind the system, its advantages and limitations, and the ethical and privacy concerns related to its use.

Technology behind Automated Attendance System using Face RecognitionAutomated attendance systems using face recognition technology involve a complex process that includes capturing an image, facial recognition, and attendance marking. The following is a brief overview of each of these processes.

Capturing an Image:The first step in using face recognition technology for attendance is to capture an image of an individual's face. This can be done using a camera, a webcam, or a smartphone. The image is then processed to extract the facial features of the individual.

Facial Recognition: Once an image has been captured, the next step is facial recognition. The facial recognition process involves comparing the image to a database of images to identify the person. The facial recognition algorithm matches the facial features of the individual in the captured image with the facial features in the database of images to identify the person.

Attendance Marking: Once the facial recognition process is complete, attendance is marked automatically. The attendance record is then stored in a database, which can be accessed by authorized personnel.

Advantages of Automated Attendance System using Face Recognition technology have several advantages over traditional attendance-taking methods. Some of the significant advantages include:

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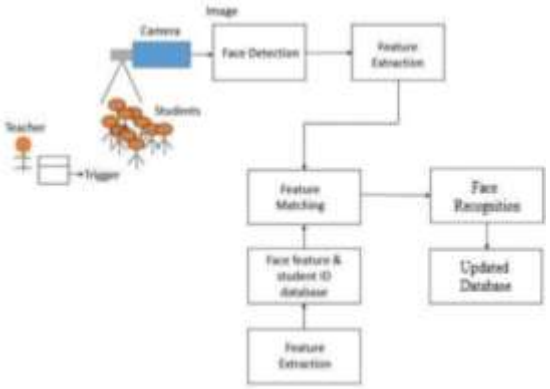
Increased Accuracy: Automated attendance systems using face recognition technology are highly accurate, with error rates as low as 0.3%. This is because the technology uses facial features to identify individuals, which is unique to each person.

Faster Processing Times: Automated attendance systems using face recognition technology are faster than traditional attendance-taking methods. The facial recognition process takes only a few seconds, which is much faster than the time it takes to take attendance manually.

Reduced Administrative Workload: Automated attendance systems using face recognition technology reduce the administrative workload of attendance-taking. The system marks attendance automatically, which eliminates the need for manual attendance taking, freeing up time for other administrative tasks.

Limitations of Automated Attendance System using Face RecognitionDespite the advantages, automated attendance systems using face recognition technology have limitations. Some of the significant limitations include:Need for Good Lighting and Camera QualityAutomated attendance systems using face recognition technology require good lighting.



II. RELATED WORK

P. S. R. Kumar, S. Sankari, and K. Gayathri's "Automatic Attendance Management System using Face Recognition" This research suggests a technique for automatically recording attendance in educational institutions using face recognition technology. For feature extraction and classification, the system employs the Local Binary Pattern (LBP) and Support Vector Machine (SVM) algorithms, respectively.

By V. D. Baramade and R. D. Kale, "Automated Attendance System Using Face Recognition with Raspberry Pi." This study introduces a face recognition camera module and Raspberry Pi board-based automated attendance system. In order to record attendance, the system takes pictures of the students, extracts their facial traits, and compares them with a database of recognised faces.

Using R. G. Prasad, R. K. Sharma, and D. Kumar, a facial recognition-based attendance management system. This study suggests a deep learning-based attendance system that classifies and extracts features using convolutional neural networks (CNNs). The system can reliably detect and mark attendance for a sizable number of kids and operate in real-time.

S. M. Islam, M. A. Rahman, and M. A. Hossain's "Automated Attendance System Using Face Recognition Based on Principal Component Analysis and Support Vector Machines" This study suggests a facial recognition system for attendance that makes use of Principal Component Analysis (PCA) and Support Vector Machines (SVMs). The technology is appropriate for use in educational institutions since it can recognise students even in dim lighting.

Edge Computing-based Face Recognition-based Attendance System by S. K. Shukla, R. K. Singh, and S. K. Singh. The attendance system suggested in this work leverages edge computing to process face recognition algorithms locally rather than remotely on a local device. Since the system can work in real-time and has low latency, it can be deployed in a variety of applications.

III. PROPOSED METHOD

A facial recognition model is suggested for the detection and identification of student faces for the purpose of recording attendance. The primary modules are:

Dataset generation by instruction: The user ID and username are the features that are utilised in

in the initial stage of creating the face dataset for the user, which involves taking 10–20 photographs of each user.

Face Recognition: LBP-based face detector is employed for face detection.

Pre-processing:Pre-processing involves the following steps:

After the face is recognised, it is scaled to a fixed pixel resolution.

Cropping:The image's background is eliminated.

Converting a colour image to grayscale is known as grayscale conversion.

Feature Recognition and Extraction:The feature extraction and recognition algorithm is based on the

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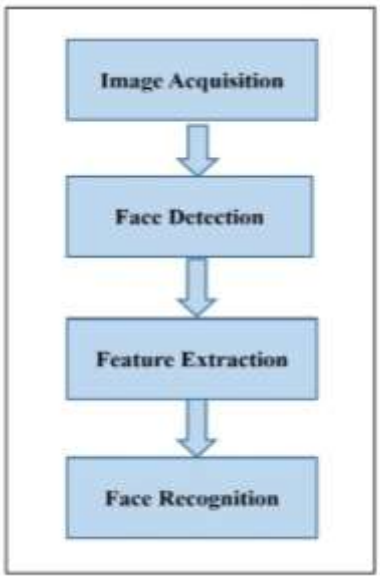
histogram principle. For accurate real-time data processing, the straightforward LBPH algorithm is chosen since it has a lower computational complexity and is more efficient
Compared to the other faced recognition algorithms.

Image Capture:Almost any camera or video system that produces an image of sufficient quality and determination can be used for face recognition technologies. For the image acquisition, we are employing android-powered mobile devices.

Face Recognition:With the use of Haar-features and the inclusion of the object detection approach, face detection has been improved in terms of speed. The ability to brighten and partially obstruct the face is one of the main limitations of early boosting-based techniques. We suggest using Local Binary Pattern (LBP) characteristics to detect the face in our Android application in order to go around these limitations.



IV. RESULT DISCUSSION

In this study, we investigated a number of facial recognition algorithms for mobile phones and web applications. After applying several filters to the image, the system was trained using the Eigenfaces machine learning technique. Also, the programme is able to recognise a face in real time thanks to the Eigenfaces algorithm. During the first phase, Eigenfaces was not very sensitive to a change in the subject count, but a larger training set enabled the algorithm to rectify different predictions. The number of patients that could be identified did not grow as the data set grew; instead, it made accurate predictions incorrect.
In the second phase, Eigenface was not precise.

With more data in the first phase, Fisherfaces produced better outcomes. But, in the second phase, it behaved differently. Sometimes, 20 photographs produced better outcomes, whereas 40 pictures either produced the same or worse results. The majorority of the time, this algorithm was the worst of the two phases. In the second phase, accuracy was similarly very poor.

The Local Binary Pattern Cascade Classifier is used to identify faces. The pace of the detection was very slow after testing the Haar-like cascade classifier in comparison to LBP, which consistently had at most 96% in the first phase and is a relatively superior algorithm. This algorithm's accuracy decreased in the second phase in comparison to the first. The prediction was drastically altered as the sample size rose. An increase in the training data either had a favourable effect or had no effect in each step.

Illumination Problem: An illumination problem occurs when a change in lighting causes a face to appear different despite being the same. Systems based on comparing images misclassify input photos because the variations caused by illumination are frequently greater than the differences between people.

The Face Recognition Pose Problem: It is not unexpected that when there are major position fluctuations in the input photos, the performance of face recognition algorithms suffers. Face recognition gets more challenging when lighting fluctuation is also present. While in-plane rotation is a pure 2D problem and can be resolved considerably more quickly, we are concentrating on the out-of-plane rotation problem in this instance.

Distance Problem: Our face recognition system fails if the distance between the camera and the face exceeds more.

Camera Issue: A camera's resolution is crucial for correctly identifying an image. The more accurate the camera, the better it will be at recognising faces. For instance, when we tested our face recognition algorithm on two phones, the one with the high resolution camera outperformed the other.

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