Attendance System Using Face Recogoniton

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Abstract—The present manual attendance system is time-consuming and challenging to maintain, thus the system's objective is to develop a facial recognition-based class attendance system. In addition, it's possible that a proxy will appear. As a result, this system is increasingly in demand. The creation of the database, face detection, face recognition, and attendance updating are the four steps of this system. Databases are created using images of the students in the class. The live-streamed video from the classroom reveals faces that may be recognised. The attendance will be sent to the appropriate academics after the session.

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Index Terms— Face Recognition, Scanning, Web application

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1. INTRODUCTION

An attendance system using facial recognition involves using a camera to capture an image of an individual's face and then using software to compare that image to a database of known faces in order to determine the identity of the person. This type of system can be used to automatically track attendance at events or in classrooms, offices, or other settings where it is important to know who is present. There are several benefits to using a facial recognition system for attendance:

Accuracy: Facial recognition software is very accurate, and can typically identify an individual with a high degree of confidence. This makes it a reliable way to track attendance.

Convenience: With a facial recognition system, there is no need for individuals to check in or swipe a card. This can make the process of tracking attendance much faster and more efficient.

Security: A facial recognition system can add an extra layer of security to a facility by ensuring that only authorized individuals are allowed access.

Customization: The system can be customized to fit the specific needs of the organization, such as by setting up alerts for when certain individuals arrive or leave, or by tracking attendance for multiple locations.

Fig 1. *Face recognition design*

Various methods:

Analog System	Physically marking the attendance
Fingerprint	Using Fingerprint Technology
Magnetic Cards	Using Magnetic Pulse

2. DATASET AND METHEDOLOGY

Collect and store reference images: The first step is to collect reference images of the individuals whose attendance you want to track. These images should be high-quality and taken from a consistent angle in order to ensure that the facial recognition software can accurately identify the person. The images can be stored in a database, along with identifying information such as the person's name and employee or student number.

Fig 2.*student faces in the dataset that have been pre-processed and extracted*

Set up the camera and facial recognition software: The next step is to set up the camera and facial recognition software. This typically involves installing the software on a computer and configuring the camera to stream video to the computer. The software will use the reference images in the database to create a model of each person's face, which it can then use to recognize the person in future images.

Test the system: Once the system is set up, it is important to test it to ensure that it is working correctly. This can be done by having a few people walk in front of the camera and checking to see if the software correctly identifies them. Any errors or issues can be addressed at this stage.

Implement the system: Once the system has been tested and is working correctly, it can be implemented in the desired location. This might involve installing the camera and setting up the computer in a classroom, office, or other location.

Track attendance: With the system in place, it can be used to automatically track attendance by capturing images of individuals as they enter the location and using the facial recognition software to identify them. The system can be configured to record the time and date of each person's arrival and departure, and to generate reports or alerts as needed.

A. Face detection and pre-processing

Face detection is the process of identifying the presence of faces in an image or video. This is often the first step in a facial recognition system, as it allows the system to locate the face in the image and extract it for further processing. There are various algorithms and techniques that can be used for face detection, including Haar cascades, Viola-Jones algorithm, and deep learning-based approaches.

Pre-processing refers to any steps that are taken to prepare the data for further processing. In the context of a facial recognition system, this might include steps such as:

Resizing the image: If the image is too large or too small, it may need to be resized in order to

be processed by the facial recognition software.

Adjusting the lighting: If the lighting in the image is poor, it may be necessary to adjust the brightness or contrast in order to improve the visibility of the face.

Removing noise: If the image is noisy (e.g., due to low resolution or compression artifacts), it may be necessary to apply image filters or other techniques to remove the noise in order to improve the accuracy of the facial recognition system.

Rotating or aligning the face: If the face is not perfectly centered or is tilted at an angle, it may be necessary to rotate or align the face in order to make it easier for the facial recognition system to process.

These steps are important because they can help to improve the accuracy and reliability of the facial recognition system by ensuring that the data is of a high quality and is in a consistent format.

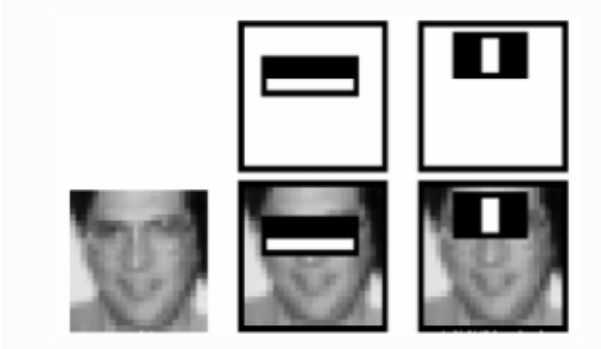


Fig 3. example of relevant haar features

B. Face Identification.

Once the face has been detected and pre-processed, the next step in an attendance system using facial recognition is typically to identify the person. This is typically done using a facial recognition algorithm, which compares the face in the image to a database of known faces in order to determine the identity of the person.

There are several different approaches that can be used for facial recognition, including:

Eigenfaces: This method involves extracting features from the face image (such as the distance between the eyes and the shape of the nose) and then representing the face as a vector of these features. The vectors for known faces are then compared to the vector for the unknown face in order to determine the identity of the person.

Fisherfaces: This method is similar to eigenfaces, but it takes into account the variations in lighting and facial expression that can occur between images of the same person.

Local binary patterns (LBPs): This method involves dividing the face into small regions and then calculating a histogram of the patterns of pixels within each region. The histograms for known faces are then compared to the histogram for the unknown face in order to determine the identity of the person.

Convolutional neural networks (CNNs): This method involves training a deep learning model on a large dataset of labeled face images in order to learn the features that are characteristic of each person. The model can then be used to identify unknown faces by comparing them to the learned features.

Once the facial recognition algorithm has identified the person in the image, the attendance system can record the time and date of the person's arrival or departure and update the attendance record accordingly. The system may also be configured to generate alerts or notifications if certain individuals arrive or leave, or to generate reports on attendance patterns over time.

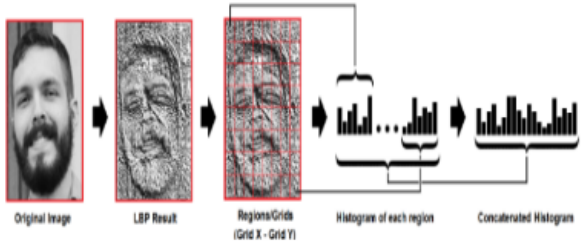


Fig 4. Process of LBPH algorithm on an image

C. Final step in Face detection.

Post-processing in an attendance system using facial recognition refers to any steps that are taken after the face has been detected and identified. This might include:

Storing the attendance record: The system may store the time and date of each person's arrival and departure, along with the person's identity, in a database or other record-keeping system.

Generating alerts or notifications: The system may be configured to send alerts or notifications if certain individuals arrive or leave, or if attendance falls below a certain threshold. For example, an instructor might be notified if a student is absent from class, or an office manager might be notified if an employee has not checked in after a certain time.

Generating reports: The system may be able to generate reports on attendance patterns over time, such as the number of days an employee has been absent or the percentage of classes that a student has attended. These reports can be useful for tracking attendance and identifying any problems or trends.

Updating access controls: In some cases, the attendance system may be integrated with access control systems, such as doors or gates that are locked or unlocked based on whether an individual is authorized to enter. In this case, the system may update the access controls based on the attendance record, allowing or denying access as appropriate.

Overall, the post-processing steps in an attendance system using facial recognition can help to ensure that the system is effective and efficient, and that it provides the information and functionality that is needed by the organization.

3. PERFORMING FACE RECOGONITION

The system has already been trained at this point to recognise faces.

A separate histogram is used to represent each image in the training dataset.

As a consequence, we repeat the procedures for a fresh picture after receiving an input image to produce a histogram that symbolises the image.

The only thing left to do is compare two histograms and return the image with the closest histogram in order to discover the image that matches the input image.

•The distance between two histograms can be calculated using a variety of techniques, including the Euclidean distance, chi-square, absolute value, and others.The well-known Euclidean distance, which is determined using the following formula, may be used in this situation.

$$D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$$

The method then returns the ID from the image with the closest histogram.The programme should additionally output the computed distance, which serves as a "confidence" metric.

Don't be misled by the word "confidence"; lower confidences really signify a stronger separation between the two histograms.Then, we can check to verify if the algorithm accurately detected the image using a threshold and the "trust" value.If the trust is below the specified level, the algorithm has been effective in identifying it, we may say.

Fig 5. Image samples databases

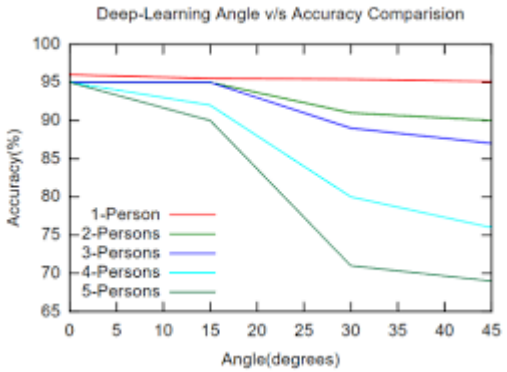
4. COMPARISON OF FACE RECOGONITION TECHNIQUES.

A. Image Enhancement

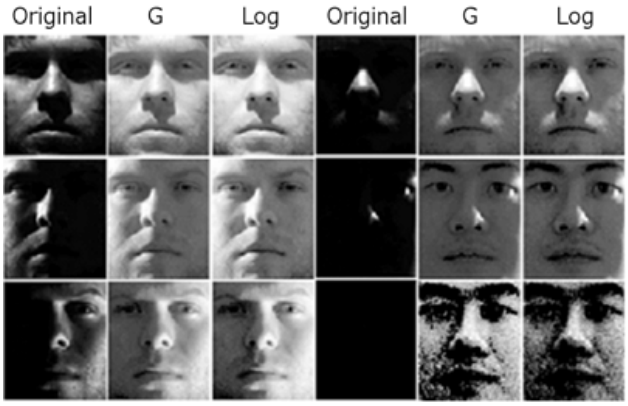
Image enhancement is the process of improving the visual quality of an image, typically by adjusting the contrast, brightness, or color balance. In an attendance system using facial recognition, image enhancement techniques may be used to improve the quality of the face images that are captured by the system. This can help to improve the accuracy and reliability of the facial recognition algorithm by ensuring that the images are of a high quality and are free of noise or other artifacts.

There are many different techniques that can be used for image enhancement, including:

Histogram equalization: This technique adjusts the contrast of the image by redistributing the pixel values in order to stretch out the overall range of intensity. This can help to bring out details in the shadows or highlights, and can make the image appear more balanced overall.

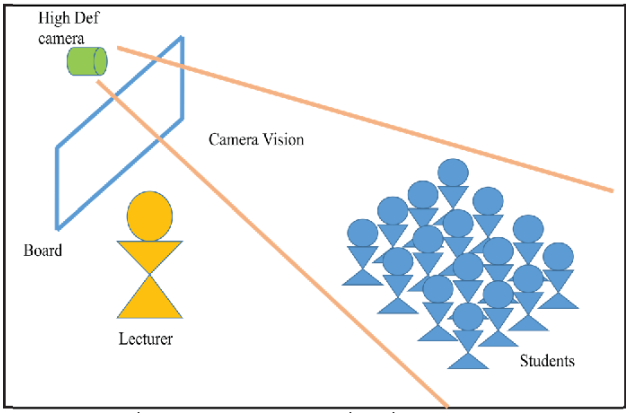


Gamma correction: This technique adjusts the brightness of the image by applying a nonlinear transformation to the pixel values. This can help to compensate for problems with the lighting or the display, and can make the image appear more natural or pleasing to the eye.



Color balance: This technique adjusts the overall color balance of the image by adjusting the levels of red, green, and blue. This can help to correct problems with the white balance, such as when the image appears too warm or too cool, and can make the colors in the image appear more accurate.

Image enhancement techniques can be applied either automatically or manually, depending on the needs of the system. In some cases, it may be useful to apply image enhancement algorithms as part of the pre-processing step in the facial recognition process, in order to improve the quality of the images before they are analyzed by the facial recognition algorithm.



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B. Face Detection

Face detection is the process of identifying the presence of faces in an image or video. This is often the first step in a facial recognition

system, as it allows the system to locate the face in the image and extract it for further processing. There are various algorithms and techniques that can be used for face detection, including:

Haar cascades: This method involves training a classifier on positive and negative examples of face images in order to learn the features that are characteristic of a face. The classifier can then be used to scan an image and identify the presence of faces by looking for patterns of these features.

Viola-Jones algorithm: This method is a machine learning-based approach that uses a series of simple features (such as edges and lines) to detect faces in an image. It is fast and efficient, but may not be as accurate as some other methods.

Deep learning-based approaches: These methods use convolutional neural networks (CNNs) or other deep learning models to detect faces in an image. These approaches can be very accurate, but may require a large dataset of labeled face images in order to be trained.

In an attendance system, face detection is used to locate and isolate the face in an image or video in order to extract it for further processing. This is typically done using a face detection algorithm, which analyzes the image and identifies the presence of faces based on certain features or patterns.

There are several benefits to using face detection in an attendance system:

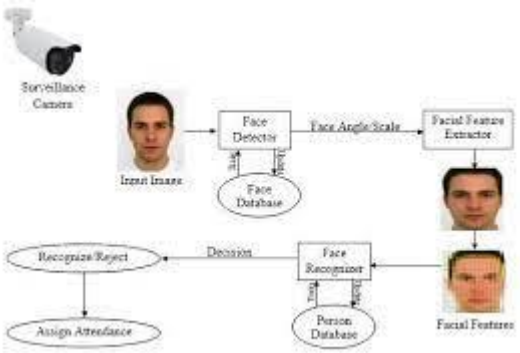
Accuracy: Face detection algorithms are generally very accurate, and can typically identify the presence of a face with a high degree of confidence. This can help to ensure that the attendance system is able to accurately track attendance.

Efficiency: Face detection algorithms are typically fast and efficient, which can help to reduce the processing time and improve the overall performance of the attendance system.

Customization: The system can be customized to fit the specific needs of the organization, such as by setting up alerts for when certain individuals arrive or leave, or by tracking attendance for multiple locations.

Security: A facial recognition system can add an extra layer of security to a facility by ensuring that only authorized individuals are allowed access.

Overall, face detection is an important component of an attendance system using facial recognition, as it allows the system to locate and extract the face from the image or video for further processing.



5. SYSTEM DESIGN

An attendance system using face recognition could be designed as follows:

-The system would need a camera or multiple cameras to capture images of the faces of individuals as they enter the premises.

-The system would need to have a database of images and associated identity information for all individuals whose attendance needs to be tracked. This database could be stored on a server or in the cloud.

-The system would need to have a face recognition algorithm that can compare the captured images to the images in the database and determine the identity of the individual.

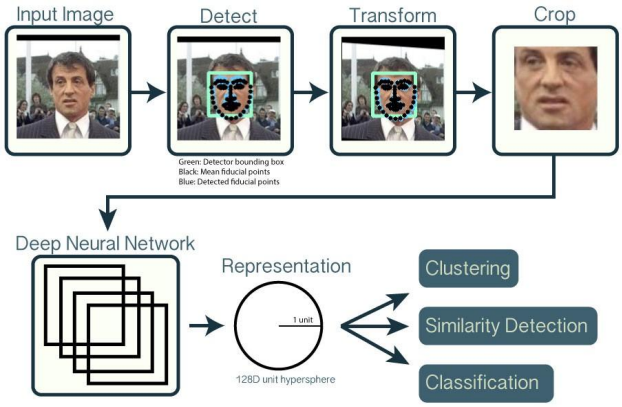
-The system would need to have a user interface that allows users to input additional information, such as the time of arrival and

departure and the reason for their visit.

-The system would need to have a way to record and store the attendance information, such as in a database or spreadsheet.

-The system could have an option to generate reports on attendance data, such as a list of individuals who were present on a particular day or a summary of attendance patterns over a specific period of time.

-The system could also have security measures in place to ensure the privacy and confidentiality of the attendance data. This could include measures such as password protection, encryption, and access controls to limit who can view and modify the data.



6. FUTURE SCOPE

There are several potential future developments that could be made to a student attendance system using face recognition:

- Integration with other systems: The attendance system could be integrated with other systems used by the school or university, such as the student information system or the course management system. This would allow the attendance data to be used in other contexts and could help streamline processes such as grading and class scheduling.
- Mobile app support: A mobile app could be developed that allows students to check in and out of classes using their smartphones. This could make it more convenient for students to track their attendance and could also reduce the reliance on fixed cameras and infrastructure.
- Customizable attendance rules: The system could allow administrators to set custom attendance rules for each class or course. For example, a class might require students to attend a certain percentage of lectures in order to pass. The system could automatically track attendance and alert students and instructors when attendance falls below the required threshold.
- Predictive analytics: The system could use machine learning algorithms to analyze attendance patterns and predict which students are at risk of poor attendance. This could allow instructors and administrators to intervene and provide support to students who may be struggling.
- Real-time tracking: The system could provide real-time information on student attendance, allowing instructors to track attendance in real-time during lectures and alerting them if a student has not checked in. This could be especially useful in large classes where it may be difficult to keep track of attendance manually.

7. CONCLUSION

Prior to the creation of this project. The traditional system of taking attendance has a lot of flaws, which has produced a lot of problems for most institutions. Since the previous method had weaknesses, the facial recognition function built into the attendance monitoring system can not only guarantee that attendance is taken

properly but also fix those issues. Utilizing technology to eliminate flaws not only conserves resources but also minimises the need for human involvement by delegating all the difficult tasks to machines. The sole expense associated with this method is having enough room in the database storage to accommodate all of the faces. Thankfully, there are devices like micro SD that may make up for the data capacity.

8. ACKNOWLEDGEMENT

We are very thankful to the Computer Science & Engineering (CSE) department of Adi Shankara Institute of Engineering and Technology for permitting us to work on the topic “Student Attendence System Using Face Recognition”. We truly express our gratitude to Prof. Sumesh M.S, Department of CSE, ASIET for giving constant support and guidance.

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