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Attendance Management System Based on Facial Recognition

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Abstract: Students at universities should be present. However, the general approach to attending college may involve a number of difficulties. Therefore, one approach to solving this issue is to use a facial recognition system to register participants. This essay will introduce the standard system that uses face recognition technology to restrict student access to the database. The student attendance program, image processing, face detection, and facial recognition will all be covered in more detail in this essay. The viola-jones algorithm approach will be used for the facelift portion, while the local binary method will be used for the face recognition portion (LBP). The program will ensure a quicker and more precise presence process.

I. INTRODUCTION

It's crucial to participate in today's world. In most universities, attendance is taken into account when calculating student grades. Usually, the retrieval employs a pamphlet that contains student information and doubles as an attendance record. Then, as confirmation that they were present that day, students will sign the document. There is a drawback to this accepted practice, though. One of the issues concerns a student using a close friend's false signature. There are numerous issues, including a lengthy presence process.

An automated presence system must be created to solve these problems. In order to address these problems, the team will present an automated facial recognition method in this paper. a program that automatically keeps the student on the website.

There is a technology that can be easily created as such, such as barcode readers, radio frequency identification systems (RFID), and Bluetooth, to automatically take students' attendance. Even while this technology can help shorten the amount of time it takes to be present, it still requires a machine and expensive, limited-use equipment because it is prone to breaking. Biometrics can also, be used instead. The biometrics plan does, however, primarily comprise an application that the instructor will utilize in class. Every time the teacher permits students to enter the classroom late, there will eventually be disruption because of this. Because students must wait in line to use the equipment when biometrics are used, it will also take longer.

The ideal solution to these issues is face recognition. Student faces will be captured in real-time while they are learning in the classroom, without the student's knowledge, to ensure a smooth learning experience. For attendance, students can also listen without being interrupted. Regarding the pastor, since attendance is automatically generated by the system, there is no need to preserve copies of every student's attendance records for future reports. The report's generated data will be accurate and outdated. false information due to the lack of opportunities for pupils to create proxies.

Numerous fields have long employed face recognition technology. Face recognition is a simple process in the modern world because cameras are widely accessible and practical. Due to the rapid development of technological equipment like security cameras and cell phones, it is simple to capture facial photos in daily life.

Safety is one of the areas of recognition that is significant. In the modern world, many homes and other buildings utilize face recognition technology to increase security.

II. LITERATURE SURVEY

There are various methods for detecting faces. The nose, eye, and ear are the fundamental face detection patterns. Face detection involves identifying faces in photos or videos. The advantages and disadvantages of each sort of detection technology are explored in this work. According to Sudhir Bussa et al. [3], they applied an open CV-based method for facial recognition. This concept incorporates a camera that records an input image using the Viola-Jones face detection method, the Ada-Boost algorithm, etc., a face detection algorithm that can then encode and identify the face and indicate its presence in a spreadsheet. By teaching the system with the faces of allowed pupils, the training database is formed. After that, the cropped photographs are stored in a database with their corresponding labels. The capability using the LBPH method to extract. In this study, the Viola-Jones method is used for face identification and face recognition for human faces.

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Euclidean distance classifier is used for face recognition, while LBPH is in favor of feature extraction. The general procedures used to do this are dataset creation, face acquisition, feature extraction, and classification. Python and OpenCV are used throughout the entire project. According to the number of people, departments, etc., Abin Abraham et al. offered numerous parameters or approaches to take attendance. Depending on the number of attendees, many methods such as calling by roll number, swiping the card, etc. are available for taking attendance. Biometrics like iris, handprints, and fingerprints are used in places with a higher employee population. We're working on a system that takes attendance automatically using face recognition since as technology advances daily, attendance methods also advance.

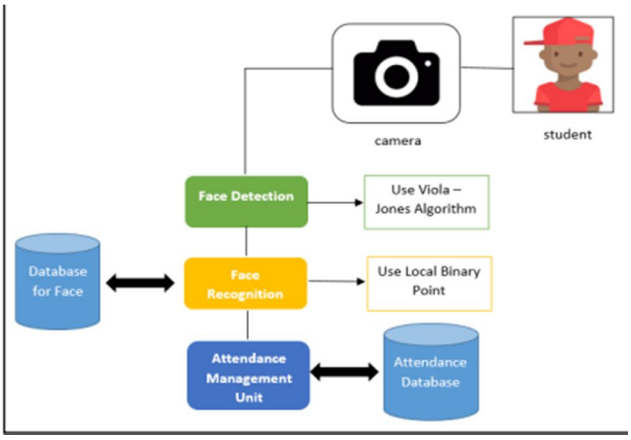


Fig 1: Work flow

III. MEHODOLOGY

A. *Face Detection*

Face detection is a process of capturing a face from an image and a video. There are so many algorithms et al. [2] available for face detection like Viola-Jones Algorithm, Ada-Boost Algorithm, etc. In this project, we are using Viola-Jones Algorithm for detecting faces. We will now talk about how the Viola-Jones algorithm: - The faces of the image are changed to grayscale because it is easier to work with and less data is also accessible to process the faces of grayscale images, according to Viola-Jones [6], which was developed for front faces so it can identify the best foresight instead of gazing up or down before tracing. The search outline for a face inside a box belongs to Viola-Jones. In essence, it is searching for characteristics resembling those of haar. In this instance, it makes use of a larger box and moves in a larger manner to demonstrate. In general, you can adjust the box and step sizes to meet your needs. There are several boxes made to distinguish small steps. Facets with haar-like characteristics. Data has been bundled together for all cases, assisting the algorithm in determining the position of the face. This formula consists of four steps. similarity to haar, Cascading Classifiers, Adaboost Training, and Creating an Integral Image.

1) *Haar-Like Trait*

Now, the images below show two sides, one black, and one white. These are the features that the machine has displayed. While the middle, which is often used to represent the nose, is often brighter and one of the sides is occasionally portrayed lighter to represent the edge of a brow. Three Haar-like characteristics were noted by Viola-Jones. These features include four-side features, edge features, and line features in the research.

2) *Create An Integral Image*

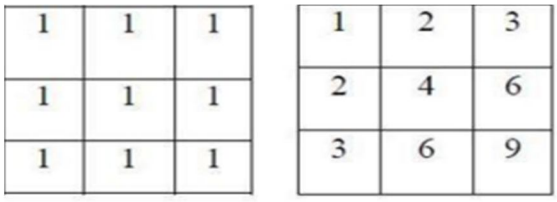
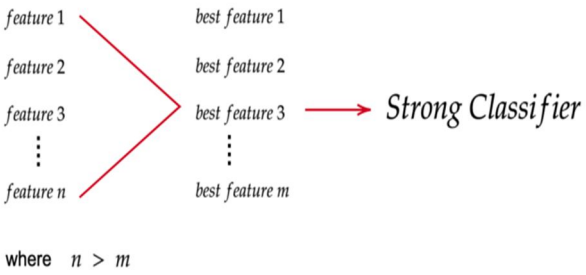


Fig 2: (a) input image (b) integrated image

An input image is transformed into an integral image in this stage as depicted in the figure. The total of the pixels to the left and above is contained in the integral image at location (x, y) (x, y).This uses just four numbers to add the pixels contained within any designated rectangle. These values correspond to the pixels that appear to be the edges of the rectangle in the input picture in the complete image.

3) Adaboost Instruction

This algorithm generates a 24-by-24-pixel image. One hundred eighty thousand different output properties for the image are possible. A lot of information will be taken from the photograph. Real-time execution of this is virtually impossible. In order to employ adaptive reinforcement for realization, a powerful filing cabinet that cuts down on calculation time is required. The classifier will tally the attributes and their respective weights for each image. Important facial features will be captured by the classifier and kept in the filing cabinet to create stronger classifiers.



4) Cascading Classifiers

Finally, a cascaded classifier determines whether a sub-window is unquestionably not a face or whether it might be. It will move on to the next step of the cascade if it is assessed as perhaps being a face, but it will be eliminated if it is recognized as not being a face.

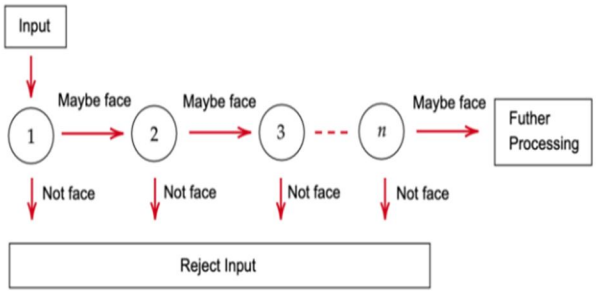


Fig 4: Cascading classifier

B. Image Training

The primary goal of the proposed virtual AI mouse is to provide a replacement for the traditional physical mouse that performs mouse functions with the aid of a computer vision-enabled device that is equipped with a web camera and recognizes fingers and hand gestures and processes the captured frames before using a machine learning algorithm to carry out the defined mouse functions, such as moving the cursor, right-clicking, left clicking, and scrolling function. In addition, we are working on this project with other libraries.

1) Training Method

This stage is crucial for facial recognition. To teach the rule, we must use a dataset of images. While teaching, keep in mind that we ought to line Associate in Nursing ID for each picture and that we ought to need a minimum of forty pictures of each person. The accuracy tends to increase as the number of images increases. The person's images ought to have an ID that is identical. We can also associate any text (such as a name, age, or other information) with a picture, causing that text to appear when the image is recognized

2) Utilizing LBP Operation

LBP is essentially a descriptor that uses textures and encodes local primitives as binary strings. The 3 3 mask size is what the original LBP operator uses. 9 pixels are contained in a 3 by 3 mask. The threshold for converting the surrounding pixels (the other 8 pixels) into binary digits will be the center pixel. The neighboring pixel value receives a 1 if it is greater than the center pixel value, else it receives a 0. The center pixel is then represented by a byte value created by concatenating the bits from the neighborhood pixels with a binary code.

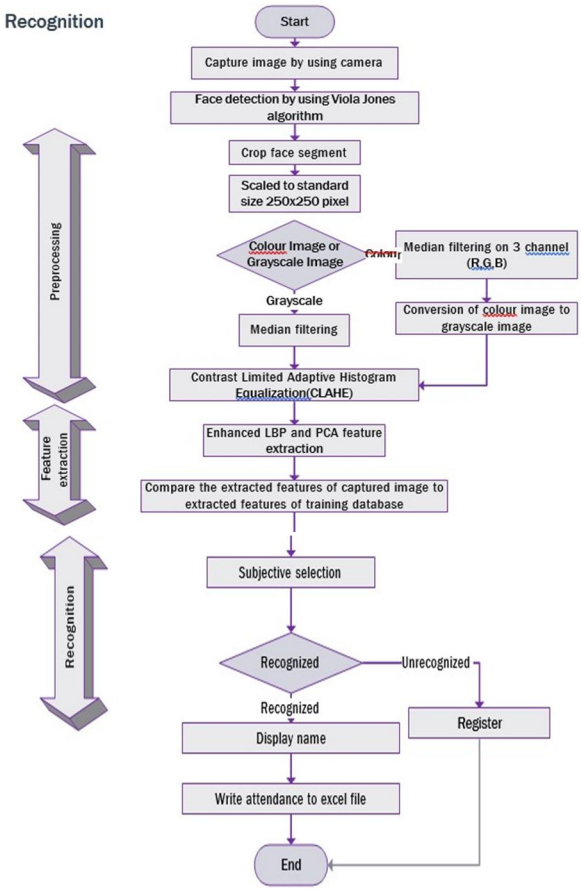


FIG 5.Attendance System graph MediaPipe

3) Distracting Qualities

In order to do this, we must use the image we typically obtain during training and divide it into different grids using the grid x and grid y parameters. Using the image below, we can extract the bar charts for each region. Each histogram only has 256 places, which correspond to the occurrences of each constituent intensity. As a result, we need to concatenate each bar chart to create a larger bar chart. The ultimate bar chart is where the original image came from.

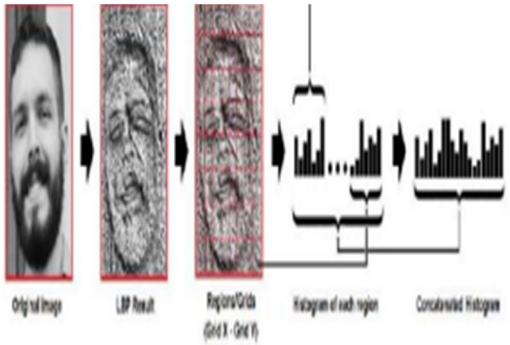


Fig 6: Feature Extraction

4) Use facial recognition software.

It is simple to recognize the face from a picture and a video after training the images. Every image from the training set is represented by a different histogram. Assume that we need to identify an input image from a given dataset. To achieve this, we must compare two histograms and then return the image with the closest histogram. There are several ways to compare the histograms, including Euclidean distance, chi, absolute value, and others. We finally received the output image with ID.

C. Face Recognition

Face recognition is a technique that allows us to recognize or confirm an individual's identification using their face. After face detection and image training, we can quickly identify a person's face. No matter where the technology is applied, it recognizes human faces and stops fraud. The confidence and threshold automatically estimate how accurately the system recognised the image. A confidence value that is below the specified threshold denotes correctness.

D. Comparison of Feature

The features will be compared with the stored features when the face recognition stage of the image has been completed. Both the face database and the attendance database will be kept with any similarities that are found.

The attendance will be saved into the attendance database after the comparison is finished. A student's student id, along with the date and the course code of the class in which the student attends, will be saved if the student is present on a given day.

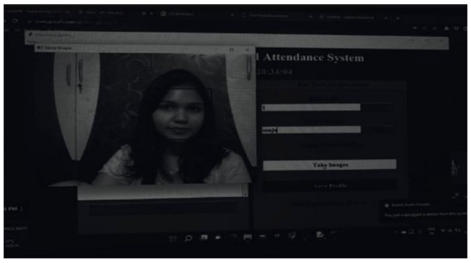


Fig 7: Portal

E. Attendance Records

The attendance will be saved into the attendance database after the comparison is finished. If a student attends class on a specific day, their student ID will be saved along with the date and the course code for the class in which they are enrolled.

IV. RESULT

The main objective of this project is to create facial recognition software based on an attendance management system that is used in organizations (such as schools, colleges, and workplaces) to record student attendance in an excel sheet along with their ID and names. When the given image exactly matches the database faces, the algorithm outputs the result. For greater experiment accuracy in this project, we are taking 40 photographs of each participant, and the attendance is automatically registered in the excel sheet.

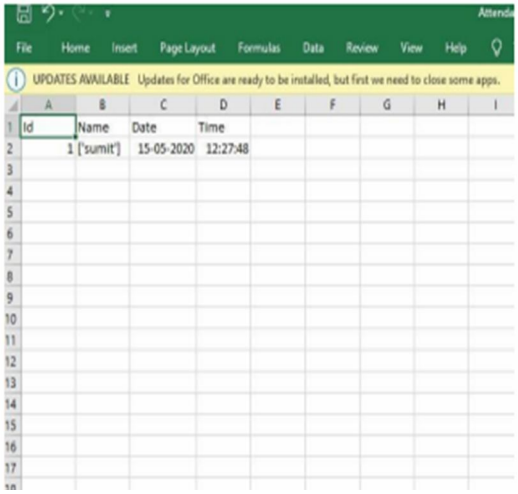


Fig 8: Excel Sheet for registering names

V. APPLICATIONS

There are numerous application use cases for the facial recognition-based attendance system. It can be applied in situations when there isn't enough room for a typical attendance system and when the use of one is being abused by people who take advantage of its weaknesses. This approach eliminates the need for a teacher or manager to exert physical pressure on students, and it can be employed in their absence.

Some Applications:

1) It has been found that the suggested system outperforms existing approaches by 95% in terms of accuracy. Without requiring physical support, it can be used in automation for robots and other devices. A similar system can be applied to the recognition of complex objects in the future and will be crucial in high-tech products.

2) Students who attempt to provide proxies for peers who did not attend college may find it difficult to cheat.

3) It is suggested against touching high-contact surfaces while using Covid-19 because doing so could cause the virus to spread. As a result, the suggested model offers a workable approach that can be utilized to manage automated attendance utilizing a web camera fixed to a specific wall and capable of carrying out nearly all the necessary tasks.

VI. CONCLUSION

In this project, features are extracted using local binary pattern histograms for feature extraction, and faces are classified using a Euclidean distance classifier. OpenCV and PyCharm are used to implement the proposed system. I can deduce that the following implementation has a higher recognition rate for LBPH and euclidean distance. The following ideas are open to further investigation based on the research conducted in the current study, and it would be beneficial to focus on the following issues in further work. By using a minimum distance classifier, the projected system is modified to cover all scenarios such as brightness, eyewear, beards, and twin situations. Within the evolution of genetic traits for facial expressions, the proposed method is ready-made. Studying the evolution of genetic traits for face expressions for various security metrics is helpful for protecting government-controlled databases and detecting criminal activity.

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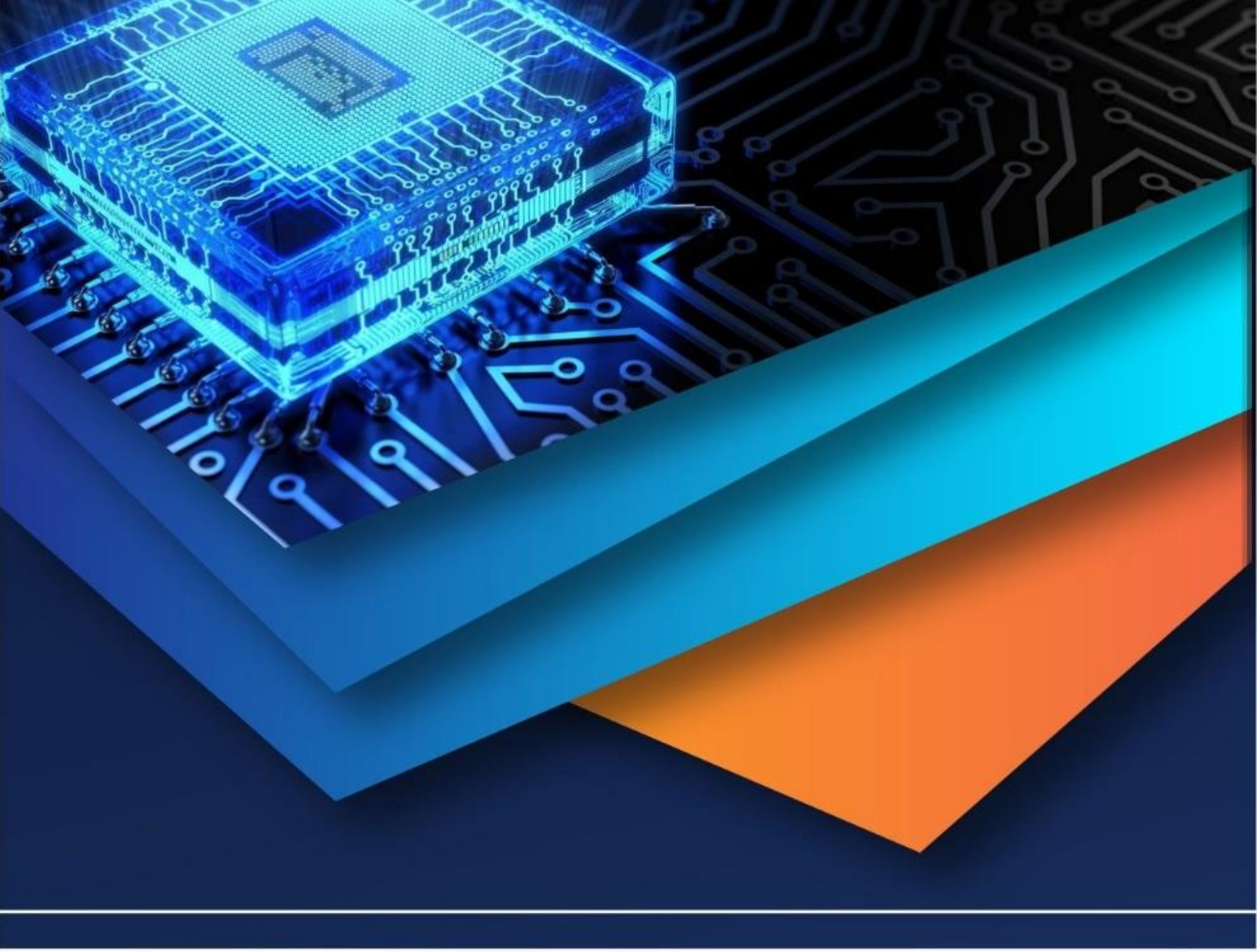

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