ADVANCE ATTENDANCE SYSTEM USING OpenCV [Face Recognition]

Nayan Acharya
Computer Science and Engineering
(Internet of Things)
Jain (Deemed-To-Be University)
Kanakapura Taluk – 562112,
Ramanagara District, Karnataka, India
Ramanagara District, Karnataka, India

***Abstract*-The improved attendance system tracks the attendance of students and employees at both public and private educational institutions. This automatic technique, as opposed to the traditional manual method, substitutes the time-consuming and difficult procedure of taking attendance. In compared to other attendance systems, it is one of the most effective alternatives. Its principal function is to keep a record of student information, which is safely stored in a database. This software allows computerised attendance tracking by utilising a facial detection technique. The system is web-based and can be accessed via PCs or Android devices, demonstrating its versatility to our tech-driven era in which smartphones play an important role in our daily lives. The main technique, known as "Attendance recording with facial recognition," entails precisely acquiring, scanning, tracking, and analysing student data, eliminating errors and proxies. This innovative attendance system not only improves data efficiency, but it also saves money by reducing hardware needs. It marks a substantial advancement in attendance management, providing educational institutions with a simplified and accurate solution.**

Keywords—System, face detection, automatic attendance, Open CV

I. INTRODUCTION

Implementing a sophisticated attendance system is critical in educational institutions and workplaces. Many high school students miss courses due to boredom, inactivity, or diversions such as internet activities or gaming. Some may even be enticed away from class by pals, which often goes unreported by parents. The improved attendance system tackles these issues by allowing students and teachers to engage in real time. It enables teachers to determine pupils' physical and mental presence in class by replacing the time-consuming and manual roll call with an efficient facial recognition system. Not only does this technology save time, but it also decreases the paperwork associated with congested classes.

The attempt to implement an improved attendance system goes beyond simply automating the procedure; it intends to completely eliminate paper-based labour while improving student information management. Traditional attendance-taking systems entail physical roll calls or sign-in sheets, both of which are prone to mistakes and require a significant amount of time and work. The suggested system, which employs face detection, transforms attendance records by improving efficiency, security, ease of maintenance, and cost-effectiveness.

The importance of this advanced attendance system lies in its ability to reduce human effort, improve security measures, facilitate easy maintenance and updates, generate quick and accurate analyses through report generation, be cost-effective, and maintain user confidence through its accuracy and user-friendly interface. Recognizing the educational sector's need for solutions that simplify data collection and increase lecture efficiency, the system incorporates OpenCV, a web application, and a variety of Python libraries, including "Dlib," "Numpy," "cv2," "shutil," "os," "skimage," "io," "csv," "ftplib," "pandas," and "datetime."

Furthermore, the system uses face recognition technology, a type of biometric identification, to scan, capture, analyse, and identify each individual's unique qualities. This technology, which is often used for security, ensures that only authorised individuals have access to certain regions. The Advanced Attendance System with Face Detection's primary purpose is to upgrade outmoded ways of attendance recording and provide an efficient and effective means of tracking participation. Improved security, ease of maintenance, cost-effectiveness, quick results, accurate and efficient data, and user-friendliness are among the benefits. As technology advances, it becomes increasingly important to incorporate solutions that streamline data collecting while also improving the overall educational experience.

II. LITERATURE SURVEY

[1] Viola-Jones Algorithm: The Viola-Jones Algorithm excels at face detection due to its high detection speed and accuracy. However, it has downsides such as lengthy training timeframes, limited effectiveness in detecting faces with specific head angles, and trouble detecting dark faces.

[2] Local Binary Pattern Histogram: This approach has a straightforward computation and a high tolerance for monotonic lighting changes. However, it is limited to binary and grayscale images, and its overall performance is regarded less precise than the Viola-Jones Algorithm.

[3] Ada Boost Algorithm: The Ada Boost Algorithm's success is largely dependent on the quality of the training data, making it sensitive to weak classifiers despite the fact that it does not require prior information about face anatomy.

[4] SMQT Features and SNOW Classifier Method: This approach, while capable of dealing with illumination challenges in object detection and efficient in computing, may misidentify regions with identical grey values as faces.

[5] Neural-Network: While the Neural-Network approach achieves excellent accuracy with huge training image sizes, it has downsides such as a long detection procedure, extensive processing, and overall poorer performance when compared to the Viola-Jones algorithm.

The Viola-Jones Algorithm is a superhero when it comes to swiftly and precisely detecting faces, but it takes a long time to train and may struggle with awkward head postures or dark features. Meanwhile, the Local Binary Pattern Histogram approach is straightforward and good at dealing with variations in light, but it only works with certain sorts of photos and isn't as accurate overall. The Ada Boost Algorithm doesn't need to know anything about faces beforehand, which is great, but its performance is heavily dependent on the quality of the training data, thus it's picky about what it learns. Although SMQT Features and the SNOW Classifier Method are effective at dealing with lighting challenges and fast at computations, they can occasionally mix up items that seem similar to faces. Finally, the Neural-Network is like a smart detective with great accuracy, but it works best with big photographs, takes its time figuring things out, and isn't as powerful as the Viola-Jones Algorithm overall.

III. PROBLEM STATEMENT

Manually taking attendance in a large classroom full of children is a huge pain and takes a long time. To make things easier, we intend to develop a smart system that will perform this task automatically using face recognition. Instead of the teacher calling out names and taking attendance on paper, a camera in the classroom will photograph the kids' faces. These images will be used as input for our system. To ensure that it works properly, we'll utilise computer techniques to enhance the images, such as turning them black and white and altering the lighting. The system will next examine these images, identify each student's face, and mark them as present. We want our system to be extremely accurate at recognising faces, even if pupils are seated at the back of the room when the lighting is poor. Our goal is to make it accurate and quick so that teachers can know who is in class without spending too much time on attendance.

IV. OBJECTIVES

To correctly recognise the student faces. To automatically record attendance. Reduce the time and effort required for manual attendance in order to give a helpful attentive system for both the teacher and the students. It increases flexibility and decreases time loss. There will be no opportunity for a proxy. The goal of this project is to create an automated student attendance system based on face recognition. The following are the expected achievements in order to meet the objectives:

- To extract a face segment from a video frame.
- To extract useful features from the recognised face.
- To categorise the features in order to recognise the identified face.
- To keep track of the specified student's attendance.

Fig 1: Block Diagram of the General Framework

V. METHODOLOGY

Before the attendance management system can function, a set of data must be entered into the system, which consists primarily of the individual's basic information, which is their ID and their faces. The initial step in portrait acquisition is to use the Camera to capture the individual's faces. In this procedure, the system will first recognise the

presence of a face in the acquired image; if no face is detected, the system will prompt the user to capture their face again until it fulfils the required number of portraits for each student in this project. The photos will then run through multiple pre-processing steps to produce a grayscale image and cropped faces of equal sized images. The graphic below depicts both of the processes stated above.

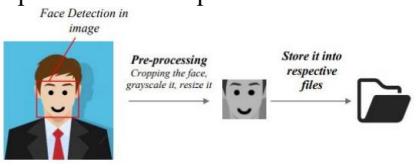

Fig 2: Methodology

VI. SOFTWARE DEVELOPMENT

The software development component has two key system flows, as shown below:

The establishment of the face database

The procedure for recording attendance

Both of the preceding stages are critical since they form the foundation of the attendance management system. The processes of both flows will be briefly detailed in this section. Meanwhile, their entire capabilities, precise requirements, and methods/approaches for achieving such goals will be detailed in the following chapter.

The development of the face database:

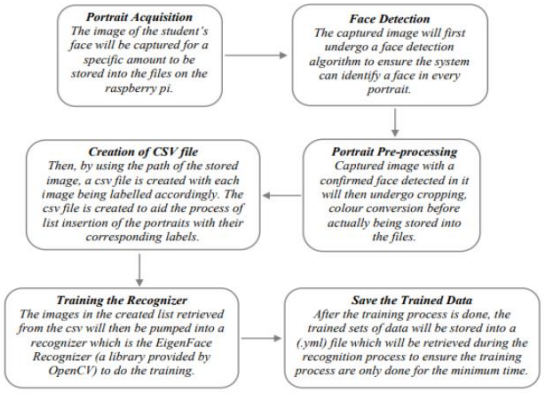

Fig 3: creation of the face database

The face database is a critical stage that must be completed before any further process can begin. This is due to the fact that the face database serves as a comparison factor during the recognition process, which will be explored more below. Because each student will have more than one portrait stored, a csv file is prepared to facilitate the process of image labelling. Labels are used to distinguish them in order to group their portraits under the name of the same individual. Following that, the photos will be fed into a recognizer to train it. Because the training procedure has become increasingly time consuming as the face database has grown in size, training is only performed after a batch of new student photos is added to ensure that the training is as brief as possible.

The procedure for recording attendance is as follows:

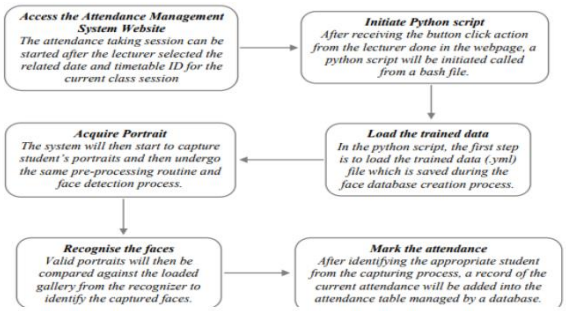

Fig 4: process of attendance taking

VII. FLOWCHART

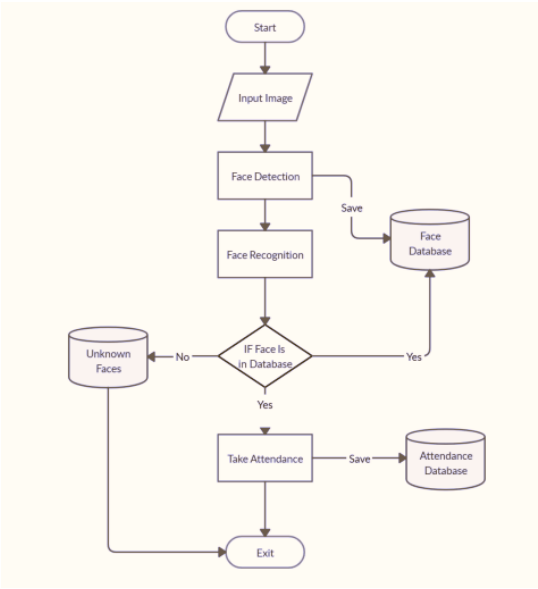

Fig 5: Flowchart of attendance taking using facial reorganization

VIII. RESULT AND OUTCOME

From the beginning to the end of the development process, a number of notable accomplishments have been realised. The overall findings are as follows:

Administration that is simple to use: The system has a user-friendly interface that is designed to be easily administered by people who do not have a strong

experience in information technology. This strategic approach ensures that even non-IT specialists can manage and operate the system seamlessly.

Market-Ready for Commercial Deployment: Extensive testing and refinement have resulted in a system that is fully ready for commercial use. Its broad functionality and dependability position it for immediate market deployment, satisfying the standards required for extensive commercial use.

Scalable Face Recognition Capacity: The system's ability to recognise up to a thousand faces is an impressive feature. This scalability provides adaptability in application, making the system appropriate for a variety of scenarios requiring the identification and management of big databases of individuals.

Serviceability across Organizations: The system has been designed to meet the needs of organisations of all sizes. The system's architecture enables for smooth scalability to suit the demands of diverse organisational structures, whether serving a small team or a large corporation. It can service as many people as needed inside an organisation, providing broad application.

In conclusion, the development process resulted in a technologically advanced system that excels in user accessibility, commercial feasibility, facial recognition scalability, and organizational-wide serviceability. These achievements combined establish the system as a cutting-edge solution poised to make a substantial market impact.

The Python software is used to store user data in the database.

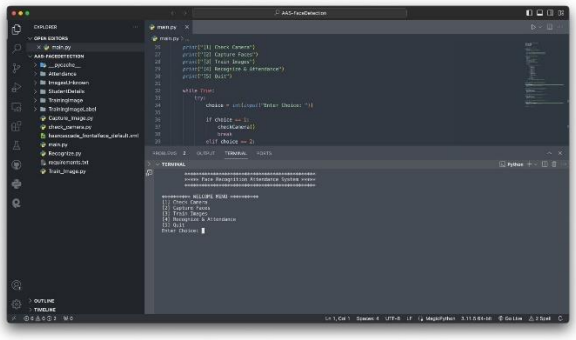

Fig 6: Python code for facial recognition

Student data is collected through this program by taking picture of face and entering student data:

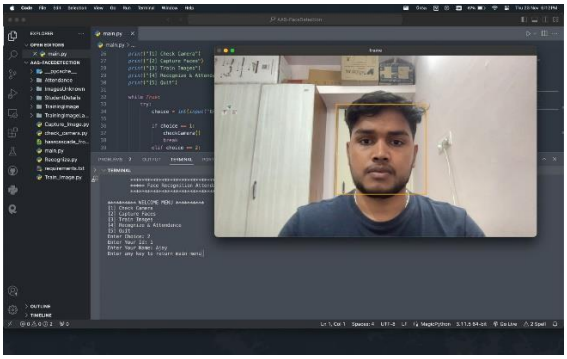

Fig 7: Adding student data

Taking the student attendance using face recognition:

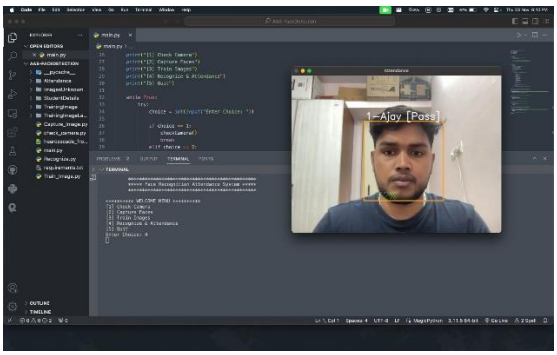

Fig 8: Taking attendance

Student attendance is stored in the database and can be access in excel sheet:

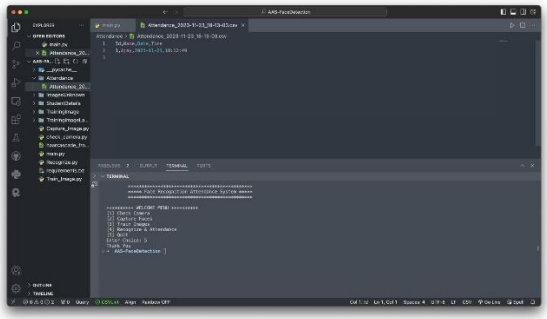

Fig 9: Student attendance data

IX. FUTURE SCOPE

Looking ahead, our facial recognition attendance system has some intriguing possibilities. We can make it smarter in the future by adding features that alert the teacher whether a student is sleepy or not feeling well based on their facial expressions. Furthermore, we may investigate ways to make it perform well in a variety of settings, such as outdoor classrooms or dimly illuminated spaces. It could also be interesting to connect it to other school systems,

such as delivering automated notifications to parents if their child is absent. Consider a system that not only tracks attendance but also contributes to the creation of a good and caring learning environment. As technology evolves, there are several chances to improve and expand our face recognition system, making it more useful to instructors, kids, and parents alike.

X. CONCLUSION

Finally, building an automated attendance system based on facial recognition holds great promise for reducing the time-consuming chore of manually recording attendance in large classrooms. The proposed technology, which is meant to recognise students' faces using photos collected by a classroom camera, has the potential to transform attendance tracking. We hope to design a system that is both accurate and efficient, ensuring rapid identification of students while adjusting variations in backdrop, lighting, and stance by using image processing techniques for increased facial detection and leveraging real-time operations. In the future, the system's scope will include making it smarter by incorporating elements that can measure students' well-being based on facial expressions and adjusting it for varied learning contexts. The ultimate goal is to develop a system that not only simplifies administrative chores for teachers but also contributes to the development of a good and caring educational environment. The opportunities for development and extension are infinite as technology advances, promising a more seamless and supportive experience for educators, students, and parents alike.

XI. REFERENCES

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