

Assessment of Face Recognition Technology for the Attendance System during COVID-19 Pandemic

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ABSTRACT

The pandemic of COVID19 has pushed the entire World into a very different scenario. Many corporate sectors have already started looking for a contact-less attendance system after the offices were reopened after a long lockdown period. However, most of such implementations included methods which were not imposing authentication in the process. Hence the idea of using Face Recognition Technology for this purpose was also considered. This is already being used in many highly secured places such as Airport, Customs etc. There is a possibility of implementing this concept in the education sector. By means of the special camera installed at the entrance gate, image (students or employees) is taken when they enter, and the image is processed. After completing the image processing, the face is then compared with the registered (students or employees) pictures. When the identity of the image (student or employee) is determined, will be registered as attendance. Still, there is a need for an assessment of the integrity of this technology which can be done by a thorough literature review in this research paper. Researchers have finally concluded that implementation of this technology for attendance system is very secure and beneficial for the organizations.

Keywords: Face Recognition Technology, COVID-19 Pandemic, Attendance System

Introduction

Attendance registration is very important for all educational institutions or companies, and to maintain this process, each institution has a different method of recording attendance. Where some institutions use a manual method by using the old paper approach, and this method is not feasible at present. Others use the automatic presence method through the use of biometric technologies. However, these methods cause long waits for staff or students.

As the teacher spends a lot of time recording attendance by manual method, and this consequently wastes a lot of time during this process that could have been used in teaching and gaining more information.

By this project Design and Development of Attendance System for the Department of Computing using Face Recognition Technology, it will mainly benefit education and companies, as well as airports and other places that require security and identity of importance. As the system consists of an algorithm by discovering the student's face, then the image is matched with the image that is in a database, by fetching the data that was recorded for a student in the college or a response.

This system aims to facilitate the registration process for students, which consumes effort and a lot of time, which they can benefit from in teaching, and this is an easy and comfortable way for students and lecturers. The system works by taking pictures of students who are in the classroom, and a face recognition algorithm is used to determine attendance. In this way, students' attendance is determined without the need to mention the names of the students each time.

This system has a user who is the lecturer, the supervisor and the students. As the system allows the administrator to update the database, such as registering a new student. The system also allows the lecturer to be informed of the starting time of the lecture, attendance sheets and other orders. As well as students, the attendance rate is displayed and notifications in case of delay and absence, but they cannot edit, modify or control the database.

The system aims to capture Attendance using Face Recognition Technology for the department of computing of the Middle East College. Its headquarters is in Muscat (Muscat Knowledge Oasis). It is one of the leading institutions of higher education, as the number of graduates with bachelor's and higher education programs has reached more than 5,000 students in engineering, business and technology. The college is affiliated with Coventry University, in the United Kingdom.

Problem statement

Since the spread of the Corona pandemic (Covid-19) in the world, the use of the fingerprint system has been discontinued as part of the precautionary measures and preventive measures to maintain the occupational health and safety of employees and students. As well as the attendance system using cards, the employee may forget the card or one of the employees may record attendance on behalf of another employee. And to solve this problem using an attendance system using the face for prevention, reliability, and protection. As the traditional system disrupts teaching, students are also distracted during exam time. Regardless of the paper that contains a list of students' names that is passed on to all students during the time of the lecture to record attendance. A class with a large number of students may face difficulty in passing the attendance sheet to all. Whereas, the system solves the attendance System for the Department of Computing using Face Recognition Technology method replaces the manual signature of the attendance record that causes and distracts students' attention or attention to sign their attendance. In addition to that, the system Attendance System for the Department of Computing using Face Recognition Technology contributes to eliminating or overcoming the problem of fraudulent approach also, lecturers should not count students every time to ensure the number of students who attended the lecture.

Research Aim

1. The purpose of this project is to design and develop an Attendance System for the Department of Computing using Face Recognition Technology to achieve the goals that are made through the expected accomplishments:
2. Identification and detection of a face image of the student or employee (individual recognition) through distinct, unique, and useful features of the face through facial recognition.
3. Create a database in which information about the times of lectures and pictures of students or employees is made, and the information obtained through the summary is linked to the database for the accuracy of the results.
4. Automatic updating process in attendance registration without the need for human intervention.
5. Notify the student and also the student's guardian in case of absence or delay.

Research contributions

This project contributes to saving time and speed. Implementation where the attendance registration process is done automatically as it saves time for students and lecturers in the lecture without the need to interrupt a lecture to record attendance it also contributes to not distracting students during exams or lectures and speed, as the attendance registration process takes place without the need to wait. The system also contributes to reducing the errors that may occur during the manual attendance registration. Also, from the security side, the project contributes significantly, as the student cannot register attendance on behalf of another student, as it eliminates the false attendance.

Similar work

Student Attendance System:

The flaws were explained by (Arun Katara et al., 2017)The RFID tag system (which works using radio frequency identification) as well as the fingerprint system, as well as the iris recognition system. Whereas, the RFID tag system is implemented to be simple. This is because the user helps his friends to register the attendance. After all, they have their friend's card. Also, the fingerprint system is ineffective. After all, it takes a lot of time to register attendance, because the user is forced to describe the attendance recorders. After all, it is a one-by-one verification process. While for face recognition, the human face must always be exposed and also contain less information than the iris of the eye. If it contains more details, this system may violate the privacy of the user. Voice recognition is an available system,

but in combination with other methods, it is less accurate. Whereas, it is proposed to apply the face recognition system in the student attendance system.

System type	Advantages	Disadvantages
RFID card system	Simple	Fraudulent usage
Fingerprint system	Accurate	Time-consuming
Voice recognition system	-	Less accurate compared to others
Iris recognition system	Accurate	Privacy Invasion

Table 1: Comparison of advantages and disadvantages between different biometric systems

Literature review

This paper, which describes the method of students' attendance system that is done through face recognition technology and in which the Personal Component Analysis (PCA) algorithm was used. As the system will automatically identify and record students' attendance in the classroom, which makes it easier for faculty members to easily access student information by keeping a record of entry time as well as exit time. Whereas, the authors presented this paper to propose an attendance management system based on facial recognition technology in institutions/organizations. This is done by taking the attendance of each student through the system that continuously records the notes for all entry and exit points. As the initial experimental results showed improved performance through attendance reports, and a difference between it and traditional attendance systems. As they focus in their current work on facial detection algorithms through images or videos. The authors also intend to improve face recognition through the interaction used between the system users and the administrators. (Kar et al., 2012)

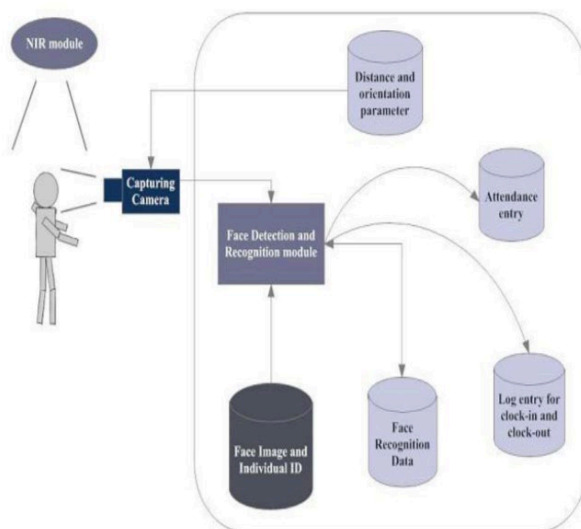


Fig. 1. Architecture of the system

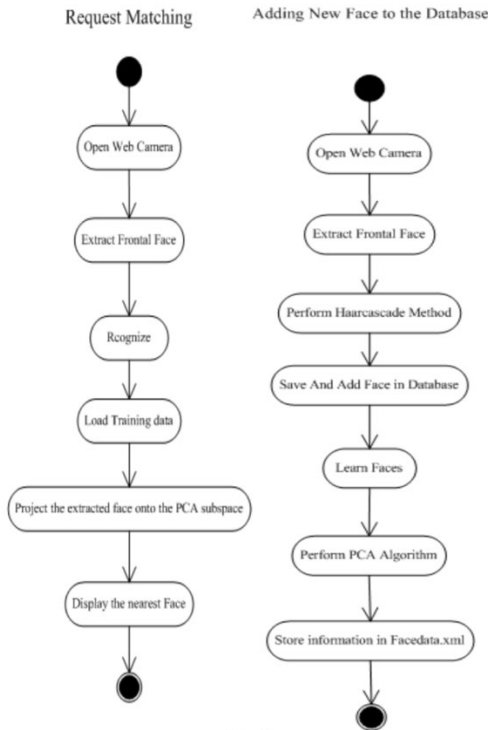


Fig. 2.

Pooja G.R, Poornima M, Palakshi S, M. Bhanu Prakash Varma, and Krishna A N presented a system that works on face detection and recognition algorithms by looking at various scenarios during real-time to evaluate the performance of different face recognition systems. Through this paper, the different techniques that need to be used to deal with threats such as plagiarism are described. Compared with traditional attendance, this system helps to monitor students as well as saves time. (Anirudhan Adukkathayar et al., 2015)

An approach to presenting this system through this paper solves the problems that occur during the integration of face recognition into practice. Although this system has shortcomings, one of which is the detection of a large number of faces, it can be improved. If the standard approach is applied to be able to improve units and reach the desired target of an acceptable detection rate and definition. The system can also be improved by increasing the accuracy, detection rate, and recognition rate. This helps to enable more students to discover and get to know them.

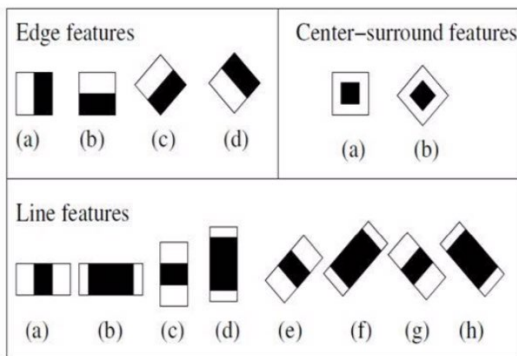


Fig 3. Different types of Haar Features

Each of Shireesha Chintalapati and M.V. Raghunadh a system that works or depends on the method of algorithms that detects the face and enables it to be recognized was proposed in this paper, and this was done automatically through a student's crack when entering the classroom, and the attendance was classified through recognition. Throughout this paper, LBPH outperformed the other algorithms through both a better discrimination rate and a lower false-positive rate. Also, SVM and Bayesian proved to be two of the best classifiers by comparing them to distance classifiers. In the future, the recognition rate of the algorithms can be improved through unintended changes such as a beard as well as the use of a scarf. The system recognizes through changes that occur in the angle of the face up to 30 degrees where it should be improved further. (Chintalapati & Raghunadh, 2013)

Type of the System	Drawback
RFID-based	Fraudulent usage
Fingerprint-based	Time Consuming for students to wait and give their attendance
Iris-based	Invades the privacy of the user
Wireless-based	Poor performance if topography is bad

Table 2: Drawbacks of various Attendance Systems

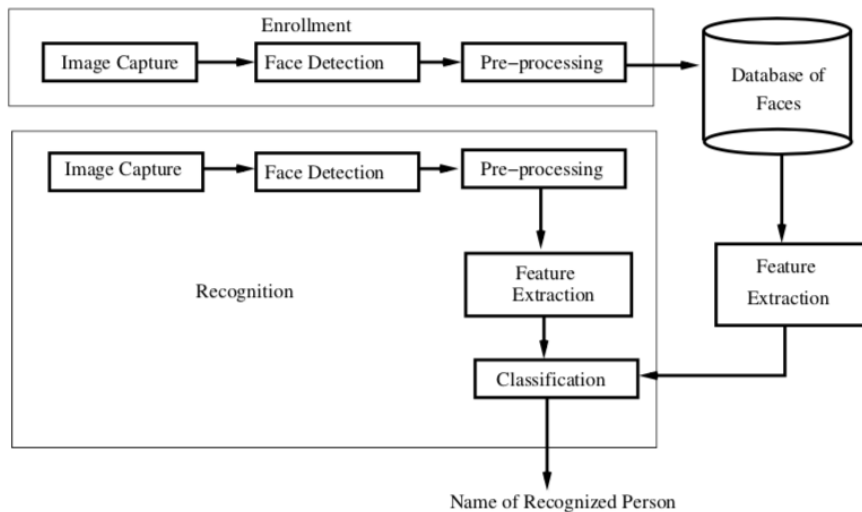


Fig. 4. System Architecture

In this paper, work has been done to improve the attendance system in various fields such as schools, colleges, organizations, and others, as the system works to capture live images through the camera. Face detection is applied through different techniques, which helps reduce manual work. Whereas throughout this paper they solved an interface by creating an interface and they also advanced training using Haar Cascade Classifier and AdaBoost for images. After that, he will discover successfully through recognizing the faces and non-faces. When both the stored images

and the comparison are matched, the attendance sheet update process is automatically updated and the time and date are also added. This makes it easier for faculty members. (Surve et al., 2020)

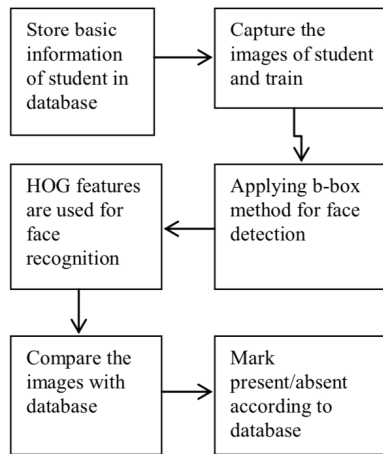


Fig. 5 Block Diagram

Review of tools to be used in design and implementation

.NET:

It is a platform through which applications, tools, programming language, and libraries are all developed. Also, there are multiple and different .NET applications with which he can run it through each installation. As .NET encoding is implemented through many different environments, such as Linux, macOS, Windows, iOS, Android, and others. NET Framework is considered an essential application as it supports both websites, consoles, and mobile applications that have several environments (open source for GitHub) in which they run. At present, data management has become in multiple formats that are needed by many software systems, by adding programming objects with XML data models that are linked. NET proposes that the integrated query architecture for LINQ be the next version of NETwork, to solve a problem by designing general style operators that run the standard query each of the transversal, filter, and projection. When there is an impedance mismatch ROX the programs become unwanted as it becomes more difficult to manage. As this pattern contributes to determining any of the .NET languages, a special syntax that the query understands, which is grouped by this is the basis of the pattern for these fundamental factors. (Meijer et al. 2020)

SQL:

It is Structured Query Language is an acronym for SQL as it is a specialized language for programming that aims to give the ability to manage and manipulate data that other applications mainly request in relational databases, as well as those applications that can run on one computer or another. Database server A computer system that provides database resources to programs or other computers through a client-server model. Also, each of the SQL Server database servers. Whereas, By providing Microsoft SQL Server versions for all the burdens that may occur during work, as well as the requirements. The data center version has also been improved to support the program and its scalability, as the rapid version of the platform is miniaturized. (Chaudhuri and Narasayya 2020)

StarUML:

StarUML (referred to as SU) is a performance by which to create diagrams for both UML class and generate class diagrams, as there are types and other language modeling schemes (UML). StarUML is a fast, flexible, and scalable open-source project. UML 1.4 that based it. It also contains 11 different types of the diagram and also accepts UML 2.0 notation. Whereas through it the MDA approach is fully supported, it does this by promoting the UML Profile definition and also allowing multilingual code generation. (Wong 2020)

Microsoft Project:

Microsoft Project is a program that contains a large and organized set of tools through which planning and supporting management and projects. As he is interested in supporting all the various projects such as development, financing,

financial services, construction, as well as financing, and health care. Also, there is no system for Microsoft Office. Also, Windows Project refers to it as Microsoft Office Project. As through the application, an easy-to-use support guide is provided for the users to achieve the final results from the development process throughout the entire project and to identify the resources. (Lowery 2020)

Python:

Python is one of the high-level, object-oriented programming languages that is characterized by ease of understanding and writing its sentences, and it is interactive interpreted where its sentences are translated and converted into a machine language that the computer understands during the implementation of the program, in addition to that the types of its variables and their values are determined dynamically during the implementation of the program, Python is much easier than other programming languages as it allows the user to create beautiful programs with little effort and more ease, and it is a multi-purpose language that can be used on any modern operating system, as it is used to process texts, numbers, images, scientific data and anything that can be saved on a computer, and examples of applications that use python; Google, YouTube, NASA, the New York Stock Exchange, and many other businesses, government and non-profit sites.

Photoshop:

Photoshop is the most popular image-editing program on the market, and it is generally used to edit images and create digital drawings similar to those drawn by hand, and Photoshop files have the (PSD) extension. It can be run on both macOS and Windows operating systems. , But not on Linux, and because this program was and still is the ideal program for editing images for a long time; His name has become used as a verb meaning (edit), for example, the phrase ("the image has been" photoshopped) means: the image has been modified, regardless of the program that was used to modify the images on it.

Conclusion

The Smart Attendance Management System was proposed to address the shortcomings of current manual solutions. To improve the system, we implemented a face recognition concept to track student attendance. In a variety of stances and modifications, the system operates well. (Laila Bhatti et al., 2018) This system will need to be enhanced in the future because it sometimes fails to recognize students from a certain distance. Exploring new augmentation techniques and leveraging newly collected images in runtime for automatic retraining of embedded data could be part of future work. Creating a specific classification solution for this problem could lead to improved accuracy on a smaller dataset.(Praneeth et al., 2020) We also have certain processing limitations, so working with a high-processing machine could result in even better performance. During COVID 19 pandemic, this proposed system could act as life saving solution at workplaces, where the work from home is not possible.

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