

Automated Face Recognition based Attendance Monitoring Approach for the Sustainable Economic Recovery in Sri Lanka

Yugani Gamlath
Wayamba University of Sri Lanka
Sri Lanka
yuganinavodya@gmail.com

Ashan Pathiraja
Wayamba University of Sri Lanka
Sri Lanka
ashan.pathiraja@gmail.com

Abstract— These days, biometric authentication methods, begin growing rapidly as one of promising authentication methods, besides the conventional authentication method. Almost all biometrics techniques require some actions by user, which are the user needs to place funds on the scanner to set the fingers. The user shall stand still in a fixed position in front of the camera for iris or retina identification process. The face recognition method has several external advantages compared to other biometric methods. Because this method can be done without action since the face image can be obtained by the camera. The new system can recognize the faces captured automatically by the camera accurately. And also this automated attendance monitoring method can use for the sustainable economic recovery in this economic crisis period in various phases.

Keywords—Recognition, Biometric authentication, Attendance, Face recognition, Automated, System

I. INTRODUCTION

The current method that institutes, universities or any workplace passes an attendance sheet and mark the attendance of the employees or students, which sometimes disturbs the discipline of the workplace or classroom and this sheet further goes to the admin or human resource department, which is then updated to an excel sheet. Actually these paper based attendance systems are very complicated and time consuming. It is very difficult to verify one by one person correctly.

Because of that lot of people in the world should shift to an automated attendance system which works on face recognition technique, fingerprint technique, iris identification technique, and lot of biometric identification techniques other than that sometimes use the RFID (Radio-Frequency Identification) tags and etc. Actually these above mentioned techniques are very good and secure ways for identifying people. Because of that face recognition technique was used to implement this attendance system as well. It uses the person's facial features to identify and verify the person. Be this system in a class room or any entry gates, it will mark the attendance easily. This system can be used for different groups of people such as employees, school children, undergraduates and etc. This

system records and stores data in real time. Actually this attendance system is one of the best option for the pandemic situations like COVID 19. Because of that using this kind of attendance system, people do not use paper based (stationary materials) for marking the attendance. Other thing is that the people work in these kind of public places often use only one pen or pencil and they always share these things each other as well. Actually I think that this automated attendance system is safe application. Because people do not share any attendance sheet, pen or pencil etc. Actually it is the huge advantage for preventing these kind of viruses as well. Because of that I encourage all the working places, working sites, schools, and universities to use these kind of automated biometric attendance system. These systems are efficient, safe and secure than manual paper or stationary based existing attendance systems as well.

This automated face recognition based attendance monitoring approach will be given huge support for the sustainable economic recovery in Sri Lanka. By automating attendance tracking, businesses and government agencies can streamline their operations. This can save time for both employees and administrative staff, allowing them to focus on more productive tasks. Improved efficiency can positively impact overall productivity. This can be enhanced workforce efficiency.

Automated attendance systems can significantly reduce financial losses caused by proxy attendance or time theft. Face recognition technology ensures that the person marking attendance is physically present, minimizing the possibility of fraudulent attendance records. Actually this can be reduced financial losses as well.

In summary, the adoption of a face recognition-based attendance monitoring system in Sri Lanka can significantly contribute to sustainable economic recovery by improving efficiency, resource management and

security ultimately leading to long-term economic growth and development.

II. LITERATURE REVIEW

Authors in paper [1] proposed a model of an automated attendance system. The model focuses on how face recognition incorporated with RFID detect the authorized students and counts as they get in and get out from the classroom. The system keeps the authentic record of every registered student. The system also keeps the data of every student registered for a particular course in the attendance log and provides necessary information according to the need.

In the paper [2], authors have designed and implemented an attendance system which uses iris biometrics. Initially, the attendees were asked to register their details along with their unique iris template. At the time of attendance, the system automatically took class attendance by capturing the eye image of each attendee, recognizing their iris, and searching for a match in the created database. The prototype was web based.

In this project faced recognition technique was used to identify participants. Facial Recognition API used to identify these people in the most efficient manner.

A. Face Recognition Library:

Recognize and manipulate faces from Python or from the command line with the world's simplest face recognition library. Built using dlib's state-of-the-art face recognition is built with deep learning. The model has the highest accuracy level. This also provides a simple face recognition command line tool that lets you do face recognition on a folder of images from the command line.

There are lot of fantastic features have in this face recognition library. It can find all the faces appear in pictures. Other thing is it can find and manipulate facial features in pictures. It can easily get the location and outlines of each person's eyes, nose, mouth and chin. It can recognize who appears in each photo. Actually developer can even use this library with other python libraries to do real time recognition. In this library developer should provide only one picture of each person who want identify. It did not use lot of images. It does those recognitions using only one image as well. These below systems are other existing recognition based attendance systems.

B. Fingerprint based recognition system:

In the Fingerprint based existing attendance system, a portable fingerprint device need to be configured with the students fingerprint earlier. Later either during the lecture

hours or before, the student needs to record the fingerprint on the configured device to ensure their attendance for the day. The problem with this approach is that during the lecture time it may distract the attention of the students.

C. RFID (Radio Frequency Identification) based recognition system:

In the RFID based existing system, the student needs to carry a Radio Frequency Identity Card with them and place the ID on the card reader to record their presence for the day. The system is capable of to connect to RS232 and record the attendance to the saved database. There are possibilities for the fraudulent access may occur. Some are students may make use of other students ID to ensure their presence when the particular student is absent or they even try to misuse it sometimes.

D. Iris based Recognition System:

In the Iris based student attendance system, the student needs to stand in front of a camera, so that the camera will scan the Iris of the student. The scanned iris is matched with data of student stored in the database and the attendance on their presence needs be updated. This reduces the paper and pen workload of the faculty member of the institute. This also reduces the chances of proxies in the class, and helps in maintaining the student records safe. It is a wireless biometric technique that solves the problem of spurious attendance and the trouble of laying the corresponding network.

III. METHODOLOGY

The proposed system is designed for automating the attendance of the different places and reduce issues of existing manual systems. The main process of this application is to identify a person by face pattern and mark the attendance and notify attendance details via Email. This system will be recognize students or employees with the respective employee ID in real time.

First of all every employee wish to use this system should be registered to the system by creating their own profile by giving details such as Name, Employee ID, Face image, Department and etc. Then if employees enter to the workplace, they should need to mark their attendance using this system. He or She must pressed the Mark Attendance button in Graphical User Interface and then show his or her face to the camera.

Then camera takes the stream of pictures and compare with reference image using the python face recognition algorithm. If there is a match, system identify who is this person and system mark the attendance information (Name, Employee ID, Date and Time) and stored those details on

CSV (Comma-separated values) file. Also attendance information notify to the human resource department (to office PC or any kind of mobile device) via email using SMTP (Simple Mail Transfer Protocol) protocol.

This following figure is illustrated the structure of the facial recognition based attendance system in best manner.

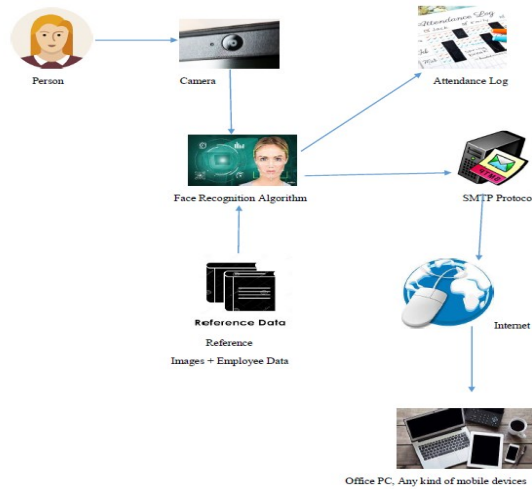


Fig. 1. Structure of the face recognition based attendance system

IV. TOOLS AND TECHNOLOGIES

Python is the programming language used for this project. Python is an interpreted high-level general-purpose programming language. Its design philosophy emphasizes code readability with its use of significant indentation. Its language constructs as well as its object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

Anaconda Navigator, and Spyder Integrated Development Environment are the working environments for this project as well. Anaconda Navigator is a desktop Graphical User Interface included in Anaconda distribution that allows you to launch applications and easily manage conda packages, environments, and channels without using command-line commands.

Spyder is an open source cross platform Integrated Development Environment for scientific programming in the python language. Spyder integrates with a number of prominent packages in the scientific Python stack, including as well as other open-source software.

Other Python modules are Face Recognition API and Tkinter module. Face Recognition API is used for identify faces as well. And the Tkinter Python module is used to create Python GUI's. Tkinter is a Python binding to the Tk

GUI toolkit. It is the standard Python interface to the Tk GUI toolkit.

V. RESULTS

The employee must press the Graphical User Interface Mark Attendance button then show his face to the camera. As the results then camera takes stream of pictures. After take these pictures, then compare with reference image using the python face recognition algorithm as well.

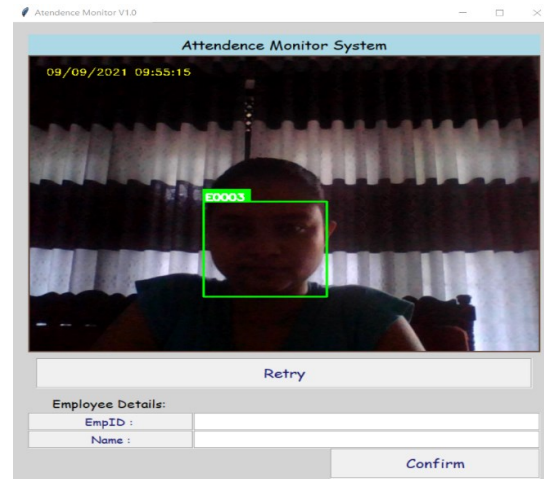


Fig. 2. Faces were recognized

If there is a match, system identify who is this person and system mark the attendance information (Employee ID, Date and Time) and stored those details on CSV file.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2	E0003	13:01:13											
3	E0004	16:38:40											
4	E0003	16:47:07											
5	E0003	16:48:03											
6	E0003	19:04:55											
7	E0003	23:08:30											

Fig. 3. Attendance Log

Other result is that attendance information notify to the HR department (to office PC or any kind of mobile device) via email using SMTP protocol.

VI. DISCUSSION

Context awareness feature of this system is that using biometric identifier (face pattern) to automatically mark attendance without human affect. Mainly use real-time face image as the context to identify the person in this system. This system focus on security and time context, because this system identify the user (authenticate) by face recognition algorithm and mark the real time attendance with correct time as well.

There are so many drawbacks in existing attendance systems. Those are, there is always a chance of forgery. (One person signing the presence of the other one) Since these are manually so there is a great risk of error. Recording attendance manually is very time consuming. Manual systems are wasting lot of stationary materials. The manual method are ineffective and getting out-of-fashion with the introduction of new technologies. More manpower is required. But the proposed system has lot of objectives than existing system as well. This system provide accurate results without human error. People will have a much higher security level in the workplace. Whole system is a much safer, time-saving, and using faster identification method to record the attendance.

VII. CONCLUSION

This system aims to build an effective class attendance system using face recognition techniques. The proposed system will be able to mark the attendance via face Id. It will detect faces via webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized student and update the attendance record. According to the above all the facts anyone can encourage to use this facial recognition based attendance system to all the educational institutes, factories, working sites, universities, schools and all other public places as well. Because of that these biometric identifier based systems are most suitable than existing paper based attendance systems as well. According to so many facts, it will be very much helpful for the sustainable economic recovery in Sri Lanka.

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