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Face Recognition for Attendance Management System Using Multiple Sensors

Dulyawit Prangchumpol

Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand

Dulyawit.pr@ssru.ac.th, Dulyawit@gmail.com

Abstract. The problem about checking attendant is the main problem of teacher in nowadays. In order to solve this problem, Many systems have been completely changed due to this evolve to achieve more accurate results. However, in my study, these study still lack of the efficiency about correct the face and students cannot verify or pose to edit the data when there is error in class. With this reason, this research aims to develop the facing attendant system to be more effective and the mechanic of the system which students can easily verify. The experiment of this research is to find the way to recognize the face by using the technique of Android Face Recognition with Deep Learning which can correctly recognize up to 97%. The database is connected to Attendance Management System web server by using cloud storage. The result on screen in real time on the application so that students can verify and check data.

1. Introduction

Maintaining attendance is very important in all educational institutions. Every institution has its own method of taking student attendance. Some institutions uses paper based approach and others have adopted automated methods such as fingerprint biometric techniques. This way waste the time of teaching with many students and sometimes there could be a mistake on checking such as the teacher forget to check the students, students cannot hear their name, or teacher skip the name. Some classes only use the paper so that it would be difficult to use for the next time because some classes collect the information unsystematic. In order to solve this problem, there should be the way to check students by using the least time.

Face recognition has been the motivation for research around the globe. The interest and time frame of studies in this field is indicative of its value and complexity, and has become an increasingly important form of biometric authentication. With the vast advancements in face recognition, more research should be done to improve the efficiency, practically and accuracy of the many method produced [1- 5].

Recently, many studies developed the checking system by using face recognition [6-12]. One of the factors to make face recognition lack of correction for the identity technique is light because light makes the dominant of feature information which moving and could be missed to check the similarity[13-18]. Moreover the number of android user on smartphone is growing rapidly. This research presented the way of face recognition for attendance system in the continuous time. Moreover, to develop it utilizing, this paper add the identification online result for students which can checking in the data.



2. Related Work

The proliferation of internet of thing sensors and devices has gained huge interest in all fields. It led to a new emerging wave of higher education or Education 3.0, which relies on business intelligence and business analytics 3.0 to deliver smart outcomes. The number of smartphones and tablets surpassed the number of PCs and laptops according to the Economist reports. The IoT capabilities enable mobile edge computing at largescale and add context and location awareness.

Some researcher proposed a student attendance management system (SAMS) that is based on fingerprints [19]. It is presented as a form of biometric identification that is unique and does not change in one's entire lifetime. The system consists of an enrollment phase and authentication phase. Minutiae points are extracted using ridge endings and bifurcations using the crossing number (CN) method. A Minutiae Score Matching (MSM) method was used for fingerprint recognition. The highest system accuracy is reporting 97.4% correct verification. The authentication phase required 4.29 s. The major advantage of fingerprint-based authentication is the impossible impersonation, but its invasiveness is not desirable. Any researcher designed and developed an android based mobile attendance management system. The system problem is that each student has to have a mobile phone. An SMS is sent to the parents for notification about absence cases[20].

Some researchers have proposed automated student attendance system based on face recognition. The proposed systems were used a camera to capture either all student faces at once or one by one [21]-[25].

Any researchers have proposed a real time internet based attendance system using face recognition. The proposed system employed Haar-cascade for face detection combined with LBP for face recognition [23]. This strategy can avoid the occurrence of queues during attendance process. However, the attendance systems that use this strategy had a low accuracy on face recognition as reported that were 53.33% and 60% using principle component analysis (PCA) and Euclidean distance and linear discriminant analysis (LDA), respectively [22],[26].

3. The framework of attendance system with face recognition techniques

In this session is demonstrates the developed process and the way to increase the correction on identification system. The face recognition consists of 5 parts which are catching the face, evaluating the face result, saving data and checking attendant and the result on screen with the order as shown in Figure 1 with this following details:

3.1. Student Registration

Student in a course needed to register and store face image. The face image was captured 10 times in the vertical direction to the camera with different expression such as normal, smiling, and laughing.

3.2. The face Detection

The face Detection, the research use Haar cascade technique to test because this one has the highest correction and use less time on evaluation [16, 19] which suitable with catching the real-time face recognition as Figure 1 presents an example of the system found the face. The system will be a square frame which the system was developed to catch multiple faces and to set up the real one, teacher can set up the camera at the entry room to check attendant while teaching.

3.3. The evaluating face result

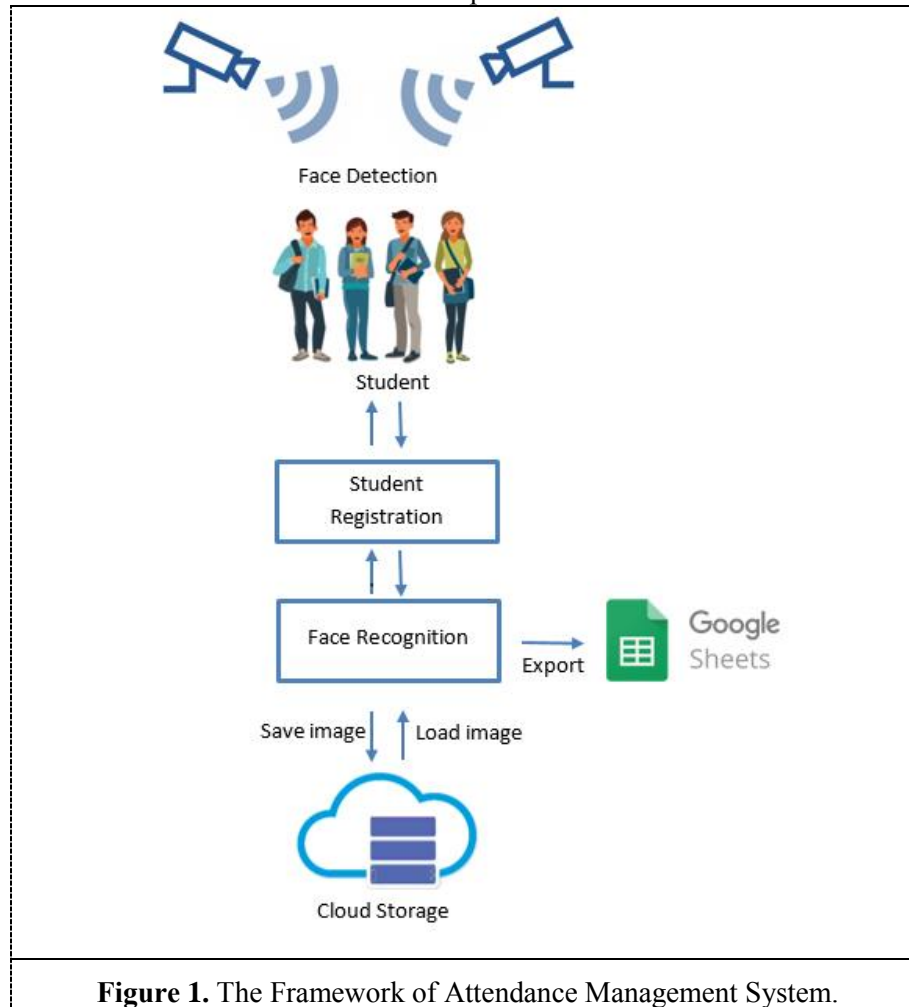
The evaluating of face result. This process is the developed program and installs at the computer. The evaluation of the face result will use the data from databased to compare the face of the tester with the data in the system. If subject test who has something similar more than the criteria, the system will identify whom the person.

3.4. Cloud storage

The data storage is process after identify the student, it will send the result to the saving part of checking attendant. For the saving result in each class, the system was applied Google Cloud as a databased.

3.5. Result Interface

The system was applied Google Cloud from Suan Sunandha Rajabhat University which make it easier for student to access and edit the information if there are some errors. Also, the evaluation of face recognition would show on the screen with the comparison.



4. Face recognition algorithm and Materials

This research apply android face recognition which face recognition algorithm that is deep learning technique to analyse face of student.

4.1. Materials

To develop an application use materials with OpenCV on Android OS using JNI, the following:

- JDK (Java Development Kit) and JRE (Java SE Runtime Environment).
- Android SDK (Software Development Kit) and SDK Platform Android 3.0 (API 11)
- Native Development Kit (NDK).
- Android Development Tools (ADT)
- OpenCV Android Software Development Kit (SDK)

- Android Virtual Device (AVD)
- OpenCV Manager

4.2. Linear discriminant analysis (LDA)

Linear discriminant analysis is common technique used for supervised classification problems which assigns an unknown sample to a class C_i if it has greatest linear discriminant value [27].

4.3 Euclidean distance (ED)

The Euclidean distance is the nearest mean classifier which is commonly used for decision rule is denoted as [28].

5. The experiment setting

The classifier was used in attendance system for all courses in this semester. The scenario store all face image from all students who registered. Then were used to train the classifier. Then a classifier was only used in attendance system for a certain course.

6. Experimental Result

The data set of experimental result is 25 subject tester. The result show on table 1 on our model has highest average accuracy and Total training time.

Table 1. The classification result.

Classifier	The number of classifier	5-fold cross validation	
		Average accuracy (%)	Total training time (s)
Our model	25	97.00	182.01
ED	25	96.21	50.47
LDA	25	96.00	45.04

7. Conclusion

From the problem of forgetting on checking attendant, the students could not hear their name or the waste of time on checking, this research developed the checking system with face recognition to reduce those problems. The developed system used OpenCV library to catch and identify real-time person and also used Google Cloud so that student could edit their information. This research had examined the way of how face recognition work properly by using Android Face Recognition with Deep Learning. As a result, Android Face Recognition with Deep Learning gives the most correct one which could increase the accuracy on identifying of the system.

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