International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor (2018): 7.426

An Implementation of Resourceful Smart Application with Geo Location

Sandhiraj D[1], Suresh Babu A[2], Vinod D[3]

[1,2]Student, Sri Ramanujar Engineering College, Anna University, Chennai, India

[3]Professor, Sri Ramanujar Engineering College, Anna University, Chennai, India

Abstract: ***The objective of the work is to propose a resourceful smart application system with secure environment for college students with various features of location & face identification based attendance, SOS alert particularly for women's and attendance tracking. Mobile applications are popularly used due to its free of cost and ease use. It is to enhance the location & face Identification based Attendance for all students when they reaches inside the college. The most important feature is SOS Alert for emergency purpose particularly for women's who facing unexpected and unusual student access (like senior ragging, health problems etc.,). The system also focusing on tracking feature, if the student didn't attend the college, even though inside of the college. As an alternative, RFID, wireless, fingerprint, and iris and face recognition-based methods have been tested and developed for this purpose. Although these methods have some pros, high system installation costs are the main disadvantage. The present paper aims to propose a face recognition-based mobile automatic classroom attendance management system needing no extra equipment. To this end, a filtering system based on Euclidean distances calculated by three face recognition techniques, namely Eigenfaces, Fisherfaces and Local Binary Pattern, has been developed for face recognition. This work illustrates the overall planning of smart application for resource use of student access.***

Keywords: face identification, face recognition, eigenfaces, fisherfaces, attendance management system, mobile application

1. Introduction

In the past few decade most of the educational institutions are concerned with students' participation in courses since student participation in the classroom leads to effective learning and increases success rates [1]. Also, a high participation rate in the classroom is a motivating factor for teachers and contributes to a suitable environment for more willing and informative teaching [2]. The most common practice known to increase attendance in a course is taking attendance regularly. There are two common ways to create attendance data. Some teachers prefer to call names and put marks for absence or presence. Other teachers prefer to pass around a paper signing sheet. After gathering the attendance data via either of these two methods, teachers manually enter the data into the existing system. However, those non-technological methods are not efficient ways since they are time-consuming and prone to mistakes/fraud. The present paper aims to propose an attendance-taking process via the existing technological infrastructure with some improvements. A face recognition-based mobile automatic classroom attendance management system has been proposed with a face recognition infrastructure allowing the use of smart mobile devices. In this scope, a filtering system based on Euclidean distances calculated by three face recognition techniques, namely Eigenfaces, Fisherfaces, and Local Binary Pattern (LBP), has been developed for face recognition. The proposed system includes three different applications for teachers, students, and parents to be installed on their smart phones to manage and perform a real-time polling process, data tracking, and reporting. The data is stored in a server and accessible from everywhere at any time. Web services are a popular way of communication for online systems, and RESTful is an optimal example of web services for mobile online systems [3]. In the proposed system, RESTful web services were used for communication among teacher, student, and parent applications and the cloud server. Attendance results are stored in a database and accessible by the teacher, student and parent mobile applications. The paper is organised as follows. Section 1 provides a brief related works.. Section 2 introduces the proposed system, and section 3 follows by implementation and results. The last section gives the main conclusions.

2. Related Works

Fingerprint reading systems have high installation costs. Furthermore, only one student at a time can use a portable finger recognition device, which makes it a time-consuming process [4]. In the case of a fixed finger recognition device at the entrance of the classroom, attendance-taking should be done under the teacher's supervision so that students do not leave after the finger recognition, which makes the process time-consuming for both the teacher and the students. In case of RFID card reading systems, attendance-taking is available via the cards distributed to students [5]. In such systems, students may resort to fraudulent methods by reading their friends' cards. Also, if a student forgets his/her card, a non-true absence may be saved in the system. The disadvantage of the classroom scanning systems with Bluetooth or beacon methods is that each student must carry a device. Because the field limit of the Bluetooth Low Energy (BLE) system cannot be determined, students who are not in the classroom at the moment but are within the Bluetooth area limits may appear to be present in the attendance system [6]. There are different methods of classroom attendance monitoring using face recognition technology. One of these is a camera placed at the classroom entrance and the students entering the classroom are registered into the system by face recognition [7]. However, in this system students' faces could be recognized, although students can leave the classroom afterwards, and errors can occur in the polling information. Another method is the observation carried out with a camera placed in the classroom and the classroom image taken during the course. In this case, the cameras used in the system need to be

changed frequently to keep producing better quality images. Therefore, this system is not very useful and can become costly. In addition to all the aforementioned disadvantages, the most common disadvantage is that all these methods need extra equipment. The proposed system has been developed to address these disadvantages. The main advantages of the proposed system are flexible usage, no equipment costs, no wasted time, and easy accessibility.

3. Proposed System

3.1 Architecture of the Proposed System

The proposed system's architecture based is shown in Fig.1.

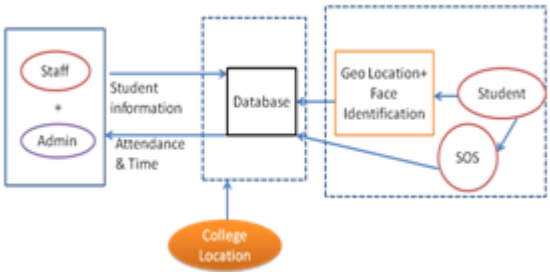

Figure 1: System Architecture

Location & Face Identification Based Attendance
When student reaches inside the college Geo location application will get a notification for attendance. To verify the student came to college by face identification. Based on these two methods student attendance will updated to the database. Then it shares to Staff/Admin of the college. If student turnoff of the GPS location it will sets an alarm sound to the student. After the taking the photograph, the teacher can use this photo to register attendance. For this aim, the photo is sent to the server for face detection and recognition processing. The results are saved into a database together with all the reachable data. The teacher gets a response by the mobile application and can immediately see the results. In case of errors (if a student is present, but not detected by the system), he/she can notify the teacher so he/she can fix the problem.

SOS Alert
If the student, particularly a women was catch on senior ragging they can sent a SOS alert to the staff/admin. While shaking the mobile or long press the volume button the SOS alert will sent to the respective staff/admin.

Attendance Tracking
If student didn't attend the college, the staff can track them where the student was. Even though inside of the college they can track student when not present to class.

2.2 Face Detection

Accurate and efficient face detection algorithms improve the accuracy level of the face recognition systems. If a face is not detected correctly, the system will fail its operation, stop processing, and restart. Knowledge-based, feature-based, template-based, and statistics-based methods are used for face detection [8]. Since the classroom photo is taken under the teacher's control, pose variations could be limited to a small range. Viola-Jones face detection method with Ada-boost training is shown as the best choice for real-time class attendance systems [9, 10]. In the most basic sense, the desired objects are firstly found and introduced according to a certain algorithm. Afterwards, they are scanned to find matches with similar shapes [11].

2.3 Face Recognition

There are two basic classifications of face recognition based on image intensity: feature-based and appearance-based [12]. Feature-based approaches try to represent (approximate) the object as compilations of different features, for example, eyes, nose, chin, etc. In contrast, the appearance-based models only use the appearance captured by different two-dimensional views of the object-of-interest. Feature-based techniques are more time consuming than appearance-based techniques. The real-time attendance management system requires low computational process time. Therefore, three appearance-based face recognition techniques such as Eigenfaces, Fisherfaces and LBP are used in the tested system. Fisherfaces and eigenfaces techniques have a varying success rate, depending on different challenges, like pose variation, illumination, or facial expression [13]. According to several previous studies, face recognition using LBP method gives very good results regarding speed and discrimination performance as well as in different lighting conditions [14, 15]. Euclidean distance is calculated by finding similarities between images for face recognition. A filtering system based on Euclidean distances calculated by Eigenfaces, Fisherfaces and LBP has been developed for face recognition. According to the developed system, firstly, minimum Euclidean distances of LBP, Fisherfaces and Eigenfaces algorithms are evaluated in defined order. If the Euclidean distance of LBP algorithm is less than 40; else if Euclidean distance of Fisherfaces algorithm is less than 250; else if Euclidean distance of Eigenfaces algorithm is less than 1500, recognized face is recorded as the right match. Secondly, if the calculated Euclidean distances by the three methods are greater than the minimum Euclidean distances, the second level Euclidean distances (40-50 (for LBP), 250-400 (for Fisherfaces), 1500-1800 (for Eigenfaces)) are evaluated in the same way. If the second level conditions are also not met, the filter returns the wrong match. Thirdly, if any two algorithms give the same match result, the match is recorded correctly. Finally, if no conditions are met, the priority is given to the LBP algorithm and the match is recorded correctly. The system's specific architecture aimed for flexibility, mobility, and low-cost by requiring no extra equipment. At the same time, its objective was to provide access to all users at any time. The system thus offers a real-time attendance management system to all its users.

4. Implementation and Results

The following platform was used. The cloud server has a 2.5 GHz with 4-core CPU, 8GB RAM, and 64-bit operating system capacity. Viola-Jones face detection algorithm and Eigenfaces, Fisherfaces and LBP face recognition algorithms were implemented based on OpenCV. Tests were done with both iOS and ANDROID. Forty different attendance monitoring tests were performed in a real

classroom, including 11 students, and 264 students' faces were detected. Tables I, II, and III show detection and recognition accuracy of all three different types of tested algorithms related to the Euclidean distance.

Table I: Accuracy Rate of Eigenfaces according to distance

Euclidean distance (d)	*True*	*False*	*Accuracy Rate (%)*
d≤1500	26	4	86.66
1500<d≤1800	20	9	68.96
1800<d≤2100	15	11	57.69
2100<d≤2500	23	18	56.09
2500<d≤3000	29	18	61.70
3000<d	28	63	30.76

Table II: Accuracy Rate of Fishefaces according to distance

Euclidean distance (d)	*True*	*False*	*Accuracy Rate (%)*
d≤250	39	0	100
250<d≤400	77	19	80.21
400<d≤550	37	19	66.07
550<d≤700	17	15	53.13
700<d	15	26	36.59
d≤250	39	0	100

Table III: Accuracy Rate of LBP according to distance

Euclidean distance (d)	*True*	*False*	*Accuracy Rate (%)*
d≤40	15	0	100
40<d≤50	55	10	84.62
50<d≤60	82	49	62.60
60<d≤70	27	22	55.10
70<d	0	4	0

Priority ordering for 3 algorithms was arranged according to accuracy rate for each interval. In test results, 123, 89, and 85 false recognitions were detected for Eigenfaces, Fisherfaces and LBP, respectively. By the help of the developed filtering system, the number of false recognitions decreased to 65. Out of 40 implemented attendance monitoring tests, 10 were conducted with 1 face photo of each student in database in Step-I, 20 were conducted when the number of face photos increased up to 3 in Step-II, and 10 recognition processes were conducted with more than 3 face photos in database in Step-III.

Table IV shows the obtained results.

Table IV: Mean Percentage Accuracy Rate

Steps	*True*	*False*	*Accuracy Rate (%)*
Step- I	38	17	69.09
Step- II	94	36	72.31
Step- III	67	12	84.81

The most important limitation of tested attendance monitoring process is decreased success with increasing distance between the camera and students. The results regarding students sitting in front seats are more accurate in comparison to results regarding students sitting in the back. Secondly, the accuracy rates may have decreased due to the blurring caused by vibration while the photo was taken. Thirdly, in some cases one part of the student's face may be covered by another student sitting in front of him/her, which may hamper a successful face recognition process. Since the classroom photos are taken in uncontrolled environments, the illumination and pose could, to a large extent, affect the accuracy rate. The developed filtering system minimizes these effects. To increase accuracy, pose tolerant face recognition approach may also be used [16].

5. Conclusions

The present paper proposes a flexible and real-time face recognition-based mobile attendance management system. A filtering system based on Euclidean distances calculated by Eigenfaces, Fisherfaces Table IV shows the obtained results, and LBP has been developed. The proposed system eliminates the cost for extra equipment, minimizes attendance-taking time, and allows users to access the data anytime and anywhere. Smart devices are very user-friendly to perform classroom attendance monitoring. Teachers, students, and parents can use the application without any restrictions and in real-time. Since the internet connection speed has been steadily increasing, high quality, larger images can be sent to the server. In addition, processor capacity of the servers is also increasing on daily basis. With these technological developments, the accuracy rate of the proposed system will also be increased. Face recognition could be further tested by other face recognition techniques, such as Support Vector Machine, Hidden Markov Model, Neural Networks, etc. Additionally, detection and recognition processes could be performed on smart devices once their processor capacity is sufficiently increased.

References

[1] L. Stanca, "The Effects of Attendance on Academic Performance:Panel Data Evidence for Introductory Microeconomics," J. Econ. Educ., vol. 37, no. 3, pp. 251–266, 2006.
[2] P.K. Pani and P. Kishore, "Absenteeism and performance in a quantitative module A quantile regression analysis," Journal of Applied Research in Higher Education, vol. 8 no. 3, pp. 376-389, 2016.
[3] U. Thakar, A. Tiwari, and S. Varma, "On Composition of SOAP Based and RESTful Services," IEEE 6th Int. Conference on Advanced Computing (IACC), 2016.
[4] K.P.M. Basheer and C.V. Raghu, "Fingerprint attendance system for classroom needs," Annual IEEE India Conference (INDICON), pp. 433-438, 2012.
[5] S. Konatham, B.S. Chalasani, N. Kulkarni, and T.E. Taeib, "Attendance generating system using RFID and GSM," IEEE Long Island Systems, Applications and Technology Conference (LISAT), 2016.
[6] S. Noguchi, M. Niibori, E. Zhou, and M. Kamada, "Student Attendance Management System with Bluetooth Low Energy Beacon and Android Devices," 18th International Conference on Network-Based Information Systems, pp. 710-713, 2015.
[7] S. Chintalapati and M.V. Raghunadh, "Automated attendance management system based on face recognition algorithms," IEEE Int. Conference on Computational Intelligence and Computing Research, 2013.
[8] X. Zhu, D. Ren, Z. Jing, L. Yan, and S. Lei, "Comparative Research of the Common Face Detection Methods," 2nd International Conference on Computer Science and Network Technology, pp. 1528-1533, 2012.

[9] V. Gupta and D. Sharma, "A Study of Various Face Detection Methods," International Journal of Advanced Research in Computer and Communication Engineering vol. 3, no. 5, pp.6694-6697, 2014.
[10] P. Viaola and M.J. Jones, "Robust Real-Time Face Detection," International Journal of Computer Vision, vol. 57, no. 2, pp. 137-154, 2004.
[11] L. Masupha, T. Zuva, S. Ngwira, and O. Esan, "Face recognition techniques, their advantages, disadvantages and performance evaluation," Int. Conference on Computing, Communication and Security (ICCCS), 2015.
[12] J. Li, S. Zhou, and C. Shekhar, "A comparison of subspace analysis for face recognition," International Conference on Multimedia and Expo, ICME '03, Proceedings, vol. 3, pp. 121-124, 2003.
[13] T. Ahonen, A. Hadid, and M. Pietikainen, "Face description with Local Binary Patterns," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 28, no. 12, pp. 2037-2041, 2006.
[14] T. Ahonen, A. Hadid, M. Pietikainen, and T . Maenpaa, "Face recognition based on the appearance of local regions," Proceedings of the 17th Int. Conference on Pattern Recognition, vol. 3, pp. 153-156, 2004.
[15] R. Samet, S. Sakhi, and K. B. Baskurt, "An Efficient Pose Tolerant Face Recognition Approach", Transactions on Comput. Science XXVI, LNCS 9550, pp. 161-172, 2016.
[16] R. Samet, G. S. Shokouh, J. Li, "A Novel Pose Tolerant Face Recognition Approach", 2014 International Conference on Cyberworlds, pp. 308-312, 2014.