

A Study on the Location Based Automatic Attendance Check System with Smart Devices

Lee Yong Hui¹, Kim Hwan Seok², Kim Byung Hwan³

¹ Shinsung University, Chief of Information Service Center,
DaehackRo1 Jungmimyun, DanginCity, ChungNam, Korea. 343-861,
lyhkpi@shinsung.ac.kr

² Gangneung-Wonju National University, Dept. Information and Telecommunication
Engineering, 220-711, Korea, hskim8805@gwnu.ac.kr

³ Korea Polytechnic II, Dept. of Computer communication & Informaitoin
56, Munemi-ro 448beon-gil, Bupyeong-gu Incheon, Korea, 403-719
kbh1122@kopo.ac.kr

Abstract. With the development of mobile technology, attendance check has been digitalized, and digital check attendance system in connection with RFID system started to be used. However, it costs a lot to establish and maintain such a system. In this thesis was developed the student attendance check system which detects geographical locations of smart phones and processes attendance check through mobile or smart devices. The developed system continuously measured the distance of two users to analyze the changing pattern of distance values to judge attendance, instead of using the instantly measured instance of two users as the data used to judge attendance.

Keywords: Smart phone, RFID, Mobile

1 Introduction

In the case of the RFID card tagging based attendance check method[1-3], a tag device can process one student at a time. Therefore, it causes a long waiting line of course attendants and a lot of tagging time. To address the bottleneck issue, it is necessary to purchase multiple devices additionally. Nevertheless, it is impossible to process attendance simultaneously, and thus students should inconveniently process attendance before a class begins. Based on the idea that most students have a smart device, this study developed the automatic attendance check system which helps every student process attendance simultaneously through their smart phones. For the analysis of sample data, a software application was developed in Coffee Script language[4-5].

2. Attendance Check System in College and University

In most Korean educational institutes, whether or not students attend a class is typically judged by calling of each student listed in a roll book. Such a traditional way of checking attendance is 100% performed in primary and secondary schools, and is

applied to college and university. However, unlike classes in primary and secondary schools, some classes in college and university have hundreds of students. Therefore, there is the considerable difficulty with attendance check in higher educational institutes.

2.1 Attendance judgment method

For attendance judgment, this study developed the method of continuously measuring the distance of two users to analyze the changing pattern of distance values, instead of using the instantly measured instance of two users as the data used to judge attendance.

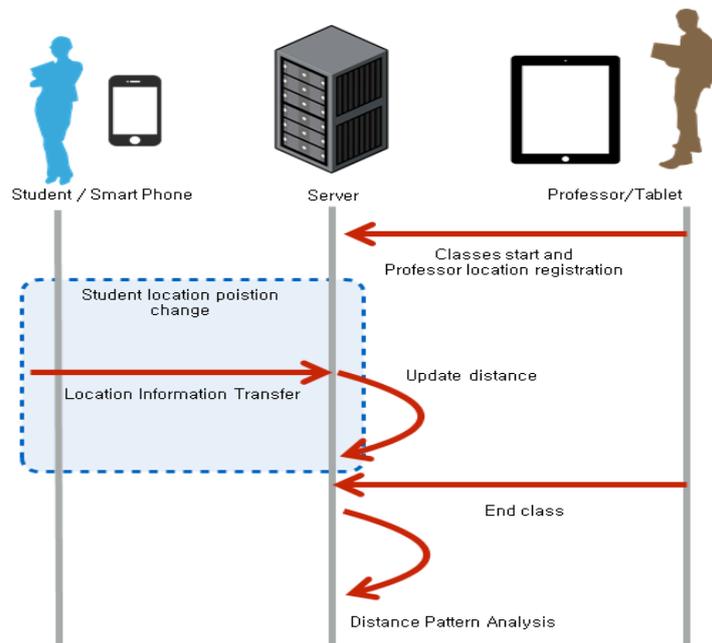


Fig. 1. Attendance judgment flowchart

Figure 1 illustrates attendance judgment flowchart. The environment necessary for attendance judgment consists of a professor, students, a server for attendance check, and smart phones or tablet PCs for a professor and students. The class procedure is presented as follows:

A professor uses a table PC (e.g., iPad, Android Tablet) to start a class. At this time, the location information of the professor is transmitted to a server in real time. When class attendants run a client application on their smart device, their location information is regularly sent to the server which measures the distance between the professor and a student and accumulates the measured data. When the professor finishes the class with its tablet PC, the system analyzes the changing pattern of distances between the professor and students, judges attendance, and thereby

calculates the interpreted data, including “attending”, “being late”, “leaving early”, and “being absent”.

2.4 The process of analyzing distance patterns

To calculate the interpreted data, it is necessary to perform the process of analyzing the continuous distance values. As for the smart phones the professor and students hold, their location data and error can change differently with the lapse of time.

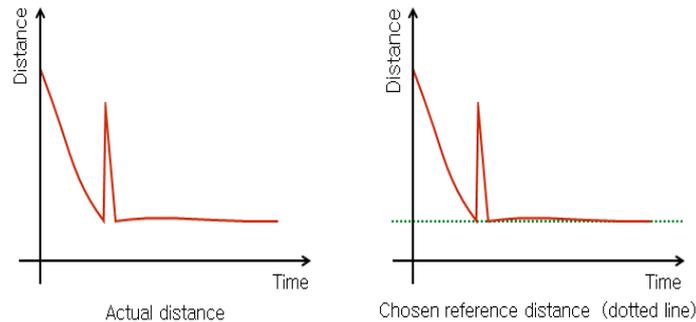


Fig. 2. Calculation of Base Error

Usually, after location data is calculated on the basis of the initial 3G or LTE signal, it is adjusted by wireless AP, GPS, and recently identified location values, and its information quality is improved. However, it can temporarily become irrational and include noise because of diffused reflection of GPS or AP signals. Although a temporary error does not occur, students can temporarily go to other places (e.g., rest room) during break-off time of a long-hour class. Accordingly, without a series of process of the continuous distance data between a professor and students, it is impossible to interpret them as valuable data (related to attendance judgment). The continuous distance data are interpreted through the process shown in Figure 2.

2.3 Test result

Table.1. An example of the regular expression for binary data analysis

Division	Pattern (regular expression)	Example
Attendance	0+	[0,0,0,0]
Lateness	1+0+	[1,1,0,0]
Leave early	0+1+	[0,0,1,1]
Absence	0+	[1,1,1,1]

For simplification of distance pattern, when a criterion distance is obtained, all things are removed in order to make the value between the continuous distance data and the criterion distance as 0. Such a process should be performed to ignore the mean error of the location acquirement data which occurred between two devices in the whole class. Table.1. An example of the regular expression for binary data analysis.

The student player with the device A simulated the action of attending a class normally(attendance). The student player with the device B simulated the action of being late(lateness). The player entered the classroom one minute after the class began. The student player with the device C simulated the action of leaving early and left the classroom(leave early). The student player with the device D simulated the action of leaving the classroom in the middle of the class(absence).

3 Conclusion

We developed the automatic attendance check system which uses the location information of students' smart phones to automatically check their attendance. The developed system was designed to measure the locations of each student and a professor, analyze the distance pattern and judge that a student attends a class, is late, leaves early, or is absent. According to the test in this study, some devices didn't show the result as intended, but it will be possible to overcome the problem through the application of error information and improvement of dithering algorithm. The test result revealed that if something to be improved is implemented and additional research is conducted, the developed system will be able to be applied to attendance check. In addition, since the system can be operated without any addition of equipment, it will contribute to generating high cost value.

References

1. S. Lee, H. Kim, "A Study on Implement of Attendance Management System using RFID Connected to NEIS", Korea Multimedia Society, pp.55-58, 2008.
2. Dongwook Shin, Taehwan Kim, Joongmin Choi, Jungsun Kim, "Automatic Attendance Check System using WiFi Signals based on Smartphone", Journal of KIISE, Vol.19, No.4, pp. 219-223, 2013.
3. Guna Kim, Mokdong Chung, "Student Attendance Management System based on RFID Application Framework", Journal of Proceeding KMMS, Vol.2008 No.2, pp. 552-555, 2008.
4. Mark Bates, Ronald Finkbine, "Programming in Coffee Script", Indiana University Southeast, New Albany, Indiana, Volume 39 Issue 3, pp. 25-25, May 2014.
5. <http://coffeescript.org/>