

Student Attendance System Using An Android Based Mobile Application

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Abstract—The emergence of internet of things (IoT) in the digital era arises the need to substitute the traditional attendance records in the universities. Frequently, students record of attending classes is being carried out traditionally on a piece of paper, where the sheets were circulated among the students in the class. This method can deter the students' focus during the class and the time taken to record attendance increase significantly to the masses. Hence, an attendance system on mobile application using Android platform was developed. The attendance system connected to a database that stored student information and attendance records. In addition, the user interface displayed the attendance records in an attractive approach and ease to managed by lecturers or system administrators.

Keywords— Internet of things, attendance system, mobile application, Android platform

I. INTRODUCTION

Smartphones are by far the most significant consumer invention of the 21st century. Mobile applications are what made the smartphone very useful. In addition, smartphones are vastly gaining popularity due to the availability of various technology such as global positioning system (GPS) and biometric sensor. There are many advantages of using mobile applications based in education perspective that can be considered nowadays. For example, manual recordings of students' attendance using paper can be time-consuming and vulnerable to loss [1]. Furthermore, it takes time for the university administration to manage and process attendance records. Using a mobile attendance system it eliminates the disadvantages using manual system.

Currently, student attendance records at most universities/colleges/schools use conventional methods to make the students sign the attendance during lectures. In most cases, the manual paper-based attendance method requires many steps such as writing names on piece of paper, signing on the attendance sheet, saving the records in a file; and manual calculating the percentage of attendance per week/month/semester. Hence, all these steps require duplication records, time and human efforts in taking attendance with a strict attendance policy. This manual method needs to be taken in every classes for each semester. Moreover, for large class sizes, this is very time-consuming.

Therefore, this paper describes the university's student attendance system based on the Android mobile platform. The proposed system aims to increase the efficiency in recording the students' attendance and provide easy-managed tool for the university administration to track the students attendance. The rest of this paper is organized as follows. An overview of several previous studies on methods implemented for the student attendance system using

Android mobile application is explained in Section II. Section III discusses the overall process for developing the student attendance system using Android. In Section IV discusses the results of the student attendance system tested by students in a single class. Lastly, the works is concluded in Section V.

II. LITERATURE REVIEW

Many approaches to solve manual attendance system have been proposed to be deployed for academic institutions [1-3]. Instead of students to physically sign the attendance sheet, smartphones able to replace the needs of paper sheets. Smartphones equipped with latest technologies can be utilized together with mobile application to record the attendance.

An attendance tracking system was proposed in [1], for automated attendance recording system for students in university. The system was developed using a mobile Android application to replace the traditional attendance that requires students to physically sign the attendance sheet. The goal of the framework is to facilitate lecturers in recording students' presence using Android smartphones. Furthermore, the attendance records can be retrieved, previewed or printed in presentable way. Figure 1 depicts the student attendance system that consists of local storage, web storage, a server and connected smartphones. The attendance report can be send throughout the email, short message service (SMS), Excel and pdf files directly to the students.

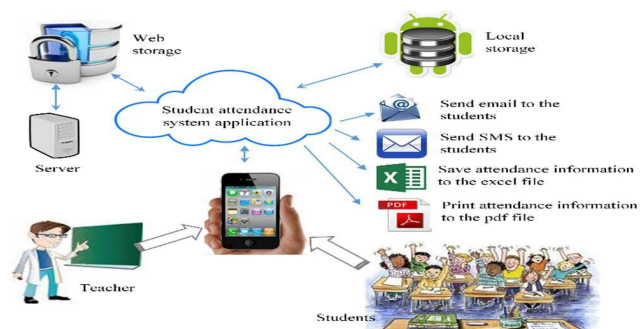


Fig. 1. Student attendance system proposed in [1].

Meanwhile in [2], bluetooth technology embedded in smartphones was utilized in class attendance application called *Muffin*. Smartphones installed with *Muffin* was connected to an Arduino Uno boards to send the logged data and then forwarded to an application install in a desktop. The Arduino board was bundled with Bluetooth module.

Presence list, terms coined by authors in [3], is the basis in tracking the students' attendance and exercises. The list was generated using the radio-frequency identification (RFID) between the students' and teachers' identification cards. The cards were based on the MIFARE classic or DESFire chip-based that able to recognize students' registration to list of subjects. Using these cards, the students' logged onto the application installed to a computer, provided the means of contactless application. Figure 2 depicts the attendance system that includes server, database, wireless fidelity (Wi-Fi) router, computer, smartphone and near-field communication (NFC) tag. Authors in [4-5] proposed similar RFID technology for students' attendance system.

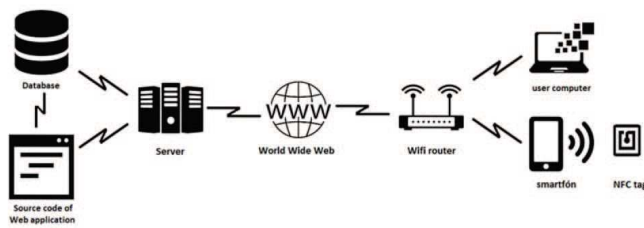


Fig. 2. RFID based technology for contactless attendance system [3].

As the technology advanced, there are many features that are introduced to the smartphones. Therefore, the researchers in [6] fully utilized the features that are provided by the smartphones. An Android application for mobile platform utilizing GPS was developed to track employees. Identification of the employees was based on the fingerprint sensor and voice recognition to replace the manual identification tagging using electronic cards. An administrator system was connected to the Android smartphones through the application server, as shown in Figure 3. Apart from monitoring, the administrator can generate report by retrieving the employees' record kept in the application server.

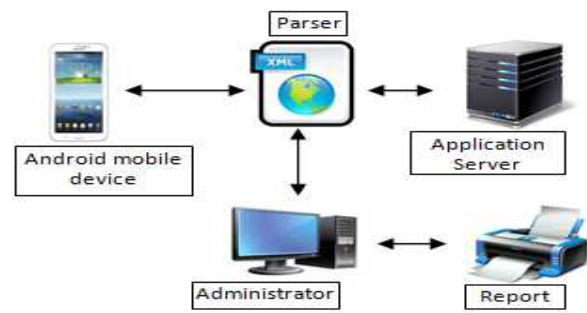


Fig. 3. Attendance system using GPS [6].

Using the same approach [7-8], researchers in [9] automated the students' attendance recorded using voice recognition. The records were updated and maintained in SQLite database so that the administrator can generate reports on the absentees. Then, an email notification sent to the respective parents, thus creating communication bonding between faculty members and parents.

In [10], apart from the fingerprint scanner, Wi-Fi technology was used for the authentication and attendance monitoring in workplaces. A Java-based mobile application was developed to authenticate the bio-metric fingerprint. In addition, the employees' smart identification (ID) card were connected to the Wi-Fi zone to ensure their presence. The system can also calculate the employees' working hours through time counter. Table I summarizes the previous works on mobile application and attendance tracking systems that had been developed. The findings are also compared for the pros on the advantages of the work and the cons for the arguments to the studies. By that, the best method to develop the project on the mobile application can be emphasized.

III. STUDENT ATTENDANCE SYSTEM DEVELOPMENT

An attendance system proposed in this paper comprising of several components as depicted in Figure 4. It contains of mobile device connected to the server and database. An admin user interface (UI) was developed for monitoring by the university's administration.

TABLE I. SUMMARY OF PREVIOUS RESEARCH ON STUDENT ATTENDANCE SYSTEMS

Author & Year	Research	Finding	
		pros	cons
M. M. Islam et al., 2017 [1]	<ul style="list-style-type: none"> Using Android technology. The course teachers can take attendance easily by the designed mobile application. 	Advanced version of the traditional attendance system	There are a lot of time consume for the teacher to mark the student attendance.
Z. Vantová, J. Paralič, and V. Gašpar, 2017 [3]	<ul style="list-style-type: none"> Generate contactless attendance evidence using student RFID cards and teacher cards. 	The time to record the attendance is fast.	Students can mark as present when they are not present at a class.
Ashlin Jinushia R. et al., 2020 [4]			
Danijel Mijić et al., 2019 [5]			
B. Soewito et al., 2017 [6]	<ul style="list-style-type: none"> Utilize GPS, microphone and fingerprint scanner that available on a smartphone. 	Fully utilize the technology available in phone and advanced application.	The time needed to develop the apps is took longer than others.
J. Dhalia Sweetlin et al., 2016 [9]	<ul style="list-style-type: none"> Attendance tracker using voice recognition. 	Customize voice templates with a user-friendly interface	Lack of accuracy and misinterpretation
H. Adal, N. Promy et al., 2018 [10]	<ul style="list-style-type: none"> Mobile application was developed to ensure the attendance of the employees using bio-metric fingerprint authentication. 	Fingerprint-based systems provide additional security	Not all mobile phone has the fingerprint sensor.

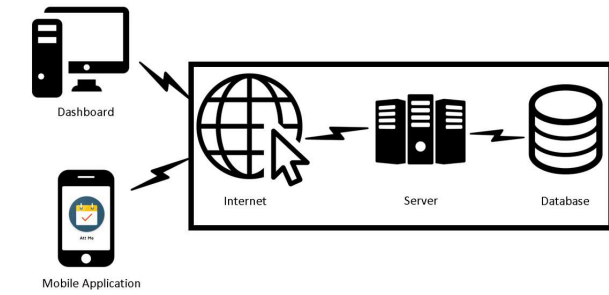


Fig. 4. Proposed students attendance system.

The attendance system UI was developed using Android Studio, which based on JavaScript. The layout editor helps the development even faster by dragging the required components into the interface. This reduces the need to write the layout in extensible markup language (XML) from scratch. However, developers have the flexibilities to change the requirements based on needs. Figure 5 depicts the example of the components in the attendance system using Android Studio, while Figure 6 shows the excerpted of the JavaScript.

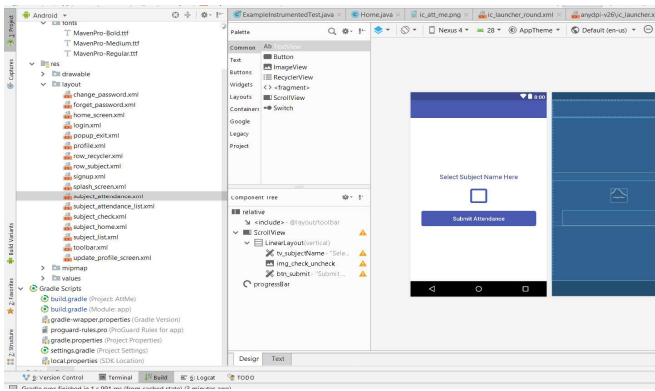


Fig. 5. User interface development using Android Studio.

```
@Override
protected void onCreate(Bundle savedInstanceState) {
    super.onCreate(savedInstanceState);
    setContentView(R.layout.subject_attendance);
    if (getIntent().getExtras() != null) {
        sSubjectName = getIntent().getStringExtra( "subjectName");
        sid = getIntent().getStringExtra( "id");
    }
    // TODO :- Initialization
    init();

    // TODO :- onClick
    onClick();
}

private void init() {
    progressBar = findViewById(R.id.progressBar);
    relative = findViewById(R.id.relative);
    tv_toolbar_text = (TextView) findViewById(R.id.tv_toolbar_text);
    tv_toolbar_text.setText("Attendances");
    toolbar_img_1 = (ImageView) findViewById(R.id.toolbar_img_1);
    toolbar_img_1.setVisibility(View.VISIBLE);
    toolbar_img_1.setBackgroundResource(R.drawable.back_arrow);
    tv_subjectName = (TextView) findViewById(R.id.tv_subjectName);
    tv_subjectName.setText(sSubjectName);
}
```

Fig. 6. JavaScript of the check-in component.

The attendance system was connected to database in order to store the attendance captured by the attendance system. Database was connected through an application programming interface (API) that allows the data transfer between the database and the attendance system. This research proposed to use MySQL Workbench, a database tool, to keep track the students' information such as student's

name, student's ID, email, phone number among others. The database also tracks the details of the subjects and related lecturers for a particular semester. Attendance system schedules can also detect student id and time stamps when attendance check-in by students. Figure 7 shows the database structure of the attendance system.

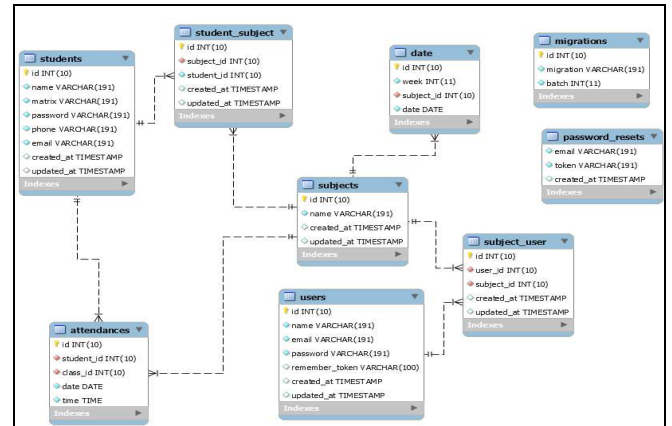


Fig. 7. Structure of the attendance system database.

Finally, Amazon Web Services (AWS) was used to create a virtual cluster of computers accessible via internet. AWS offers many features and one of them is the database. The scripting language at the server side has been developed using hypertext preprocessor (PHP) to connect to the attendance system, creating a database-driven web sites for the university's administration. By all the elements involved, the IOT concept to the university's attendance system can be achieved.

IV. IMPLEMENTATION RESULTS AND DISCUSSIONS

The attendance system operability and effectiveness was carried out by deploying the system in one of the class in Universiti Teknologi MARA. Selected students were required to download and install the attendance system into their smartphones. The students had registered with the required information, as shown in Figure 8. Once registered, the students were able to log into the attendance system. Upon each successful student registration, their records such as student ID, name and matrix number were fetched by the server and stored in the database. Figure 9 depicts the students' information table in the database.

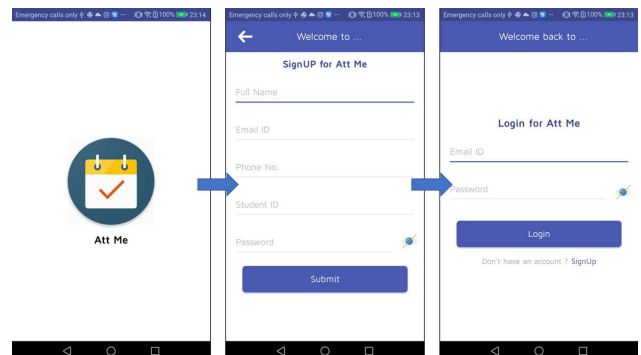


Fig. 8. Registration and login page.

id	name	matrix	password	phone	email
128	Dina Aziemah binti Nor Izuddin	2015183777	dina	0100183777	dina@gmail.com
129	Fatin Shafiqah binti Suhaimi	2015180599	fatin	0100180599	fatin@gmail.com
130	Khairul Azrael bin Dahari	2015217212	ayie	0100217212	ayie@yahoo.com
131	Mohd Zuhaimi Bin Mohd Khairuddin	2015183385	zul	0100183385	zul@yahoo.com
132	Mohd Iqbal bin Azizah	2015183517	iqbal	0100183517	iqbal@yahoo.com
133	Mu'az bin Roslan	2015100085	muaz	0100100085	muaz@yahoo.com
134	Muhammad Naqub bin Muhammad Zamir	2015162569	naqub	0100162569	naqub@yahoo.com
135	Muhammad Alim bin Fiezel Razif	2015145129	alim	0100145129	alim@yahoo.com
136	Muhammad Faris bin Sapuri	2015141069	faris	0100141069	faris@yahoo.com

Fig. 9. Student table in the database.

Once login to the attendance system, the students were able to browse and view three interfaces namely, *My Subject*, *My Attendance* and *All Subject* pages. Students were required to register the subjects for the semester by completing the subject registration in *All Subject* page, as shown in Figure 10. Then, the students can view their registered subjects and its attendance records respectively.

Figure 11 depicts the user interface flow of check-in attendance by a student. Upon submitting the attendance for a particular registered subject, the record will send to the database that contains the student ID and the subject code, as shown in Figure 12. The records were shown properly to a dashboard, as in Figure 13, as it further managed by the universities administration.

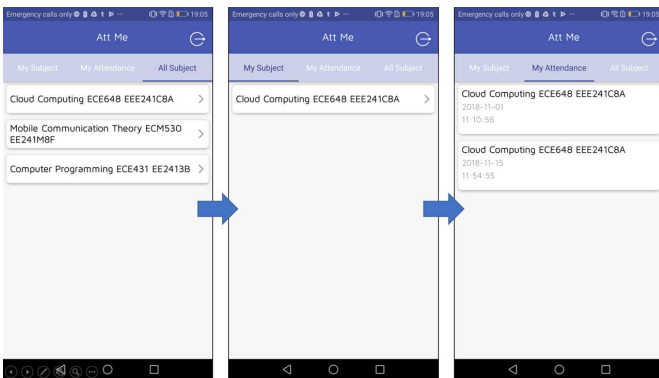


Fig. 10. Subjects and individual attendance record.

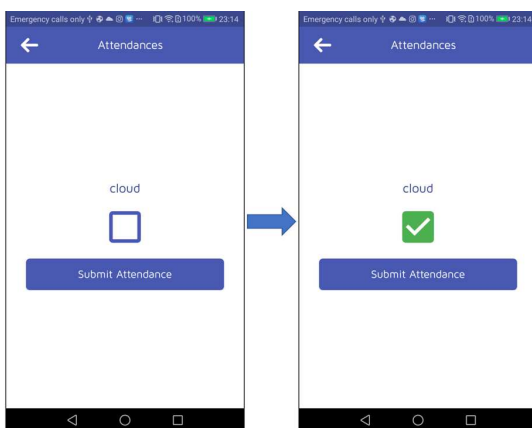


Fig. 11. The attendance check-in user interface.

id	student_id	class_id	date	time
208	94	6	2018-11-19	10:23:51
209	90	6	2018-11-19	10:23:59
210	78	6	2018-11-19	10:24:04
211	83	6	2018-11-19	10:24:14

Fig. 12. The student attendance record.

Names	Student ID
alif fatihi abdul fatah	2015125391
Muhammad Amir Zahidin Bin Zainal Abidin	2015127113
Muhammad Zahid Bin Tajuddin	2015141241
muhammad ashraff bin abdul raffar	2015145061
Muhamad Aniq Ayadi bin Kamaluddin	2015152383

Fig. 13. Students record for subject registration.

V. CONCLUSION

This paper presents the development of student attendance system using an Android based mobile application and IOT. The traditional method of taking attendance can be replaced by the proposed attendance system application. The proposed application can increase the efficiency of managing student attendance records. The proposed attendance system is suggested to further improve by using more accurate signing such as fingerprinting, face recognition and others suitable technology.

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