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Research paper



Digital Event Attendance Application for an Efficient Recording

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Abstract

In universities, there are many events that have been organized to the student. This event helps the student to improve their knowledge and skill. By attending the event, student shows that they are not only academically concerned but also curriculum-oriented. Normally, the event attendance is manually recorded using a piece of paper and a pen. This way, it is not systematically enough and so inefficient. There are many problems arise when using the manual recording. As an alternative to overcome the difficulties, Digital Event Attendance System for Students is developed as an alternative to the manual recording. This proposed system makes use of One-Time Password (OTP) as a security tools during for student registration and Quick Response (QR) code algorithm for students to authenticate and record their attendance. In conclusion, digital event attendance system for student is much more efficient, accurate and systematic than manual recording. This system also will contribute in improving the event attendance system for students because of having the security element and also the good authentication technique.

Keywords: *Digital Attendance; QR Code; One Time Password; Event Recording.*

1. Introduction

Traditionally, recording event attendance for students has been tedious, troublesome and slow, as it uses the manual and traditional way of monitoring the attendance of the students as regards to the event. The attendees need to queue to wait for their turns in order to check their name and matric number, also to sign using a pen and paper as a proof of their attendance in the event. The queues of students in registration area cause delay in monitoring the attendance. Manual recording usage is still applicable although they are not systematic and efficient enough to record the attendance of students in the event. However, with many tools and technologies available, event attendance system can be modernized. This paper proposes an Event Attendance System. It comes with a web based system and a mobile application to record the attendance of students at the event systematically, accurately and effectively. It implements security element using One Time Password (OTP) and authentication mechanism based on the Quick Response Code (QR code) [1]. The student registration is based on One-Time Password. For recording the attendance, this system implements QR code in assisting the authentication procedure.

2. Related Works

This section surveys through into previous research on android platform for management application in order to discover the relation between android application and event management [2-5]. We start our survey with some management applications where its concept has been acknowledged useful for the building blocks of our application. An event management application in [6] has similar responsibility to project management in its creation, planning, and development of small or large scale events. This application helps to maintain the users account and its various details. This application being as a platform to know the events, to apply for the events, and this application automatically generates Token Number [7] to the students via SMS during the registration of students including scheduled timings [8].

One Time Password via SMS in [9] describes a method of implementing two factor authentication using mobile phones. One time passwords or OTP are used (as the name indicates) for a single session or transaction. The advantage of this application compared to the similar software is using of highly complex and non-return encryption algorithm, which relationship between user and network security is fully guaranteed and the high flexibility of the software, enabling it to different communication methods such as SMS and USSD.

A much more related Android application called Online Banking Authentication System using Mobile-OTP with QR code [10-11]. This authentication system used Mobile OTP with the combination of QR-code which is a variant of the 2D barcode. One interesting point is that the application can prevent Phishing attacks by examining the random number (RN) before to verifying the information of the transaction. If any changes to the random number (RN) and the information of transaction is detected, the generation of OTP can be stopped by discretion of the user.

3. Methodology

This project has been developed on a Windows operated hardware and an Android Phone simulator. The major software used are Android Studio, Java JDK and Firebase. The whole project can be divided into two main tasks that are user (student) registration and user (student) authentication and sign their attendance.

Figure 1 shows the framework design for student registration of our Event Attendance Application which involves One Time Password authentication. Firstly, student must enter country code and also phone number. Server will save the registered phone

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number. Then, the database will do mobile phone number lookup. Once the database has found the mobile phone number, it will inform the server that the mobile phone number does exist. Next, server will send One-Time Password to the mobile phone in the form of SMS. After the mobile phone has received the One-Time Password, student will enter the OTP to verify the student registration.



Fig. 1: Framework for Student Registration

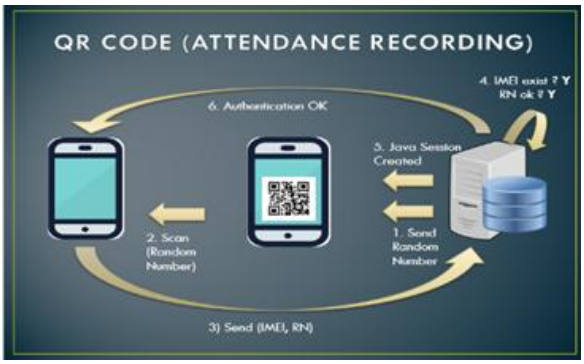


Fig. 2: Framework for Attendance Recording

Figure 2 shows the use of QR code algorithm for attendance recording. Database creates random number after the lecturer generates the QR code. Student will scan the QR code that contains the random number. Then, the mobile application will capture the International Mobile Equipment Identity (IMEI) number as well as the random number from scanning of QR code. IMEI is a unique number to identify GSM, WCDMA, and iDEN mobile phones, as well as some satellite phones. Next, mobile application will send the IMEI number and random number to the server. After that, server will check either IMEI number exist or not. If it does exist, server will check the random number as well. Then, Java session is created. Lastly, server will tell the mobile application (user) that authentication has succeeded/failed and attendance will be recorded and save into the database in case of successful authentication.

4. Results and Discussion

The system is implemented into a real prototype and integrated with software based service for the end-user. The system testing is performed to test the whole system for the functionality and credibility of the system been developed. This section discusses the implementation, deployment, and the results of the entire application.

4.1. Deployment and Configuration

In the deployment stage, we set up the hardware requirement and then we test it to verify whether it is suitable and compatible with the project requirement. The deployment makes use of Android studio, JavaScript and Firebase database in building the mobile application. Therein, exists an OTP Server which is integrated with Firebase One Time Password for the purpose of student authentication.

4.2. Interfaces

The interface is a main part of android application where it depicts the professionalism of the designer and friendliness of an application. The main page allows a lecturer or student to access the event attendance application. With the correct password, lecturer is allowed to manipulate the data (add, update and delete event), and manage the event (add, view, update delete event). To access the information as a student, just click on user button. If the student has not yet sign up, a registration page will appear as shown in Figure 3, otherwise the student will be directed to the main student page. Registration module is where the idea of one-time password is implemented.

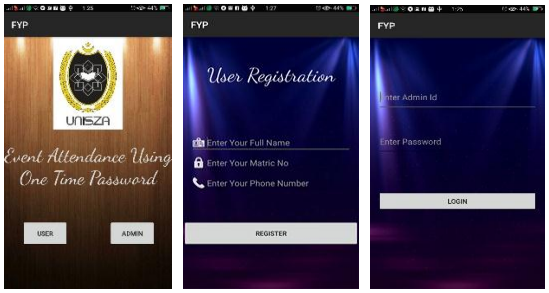


Fig. 3: Lecturer/Student Administration

Figure 4 shows the implementation of One Time Password, which its description can be found in Section 3. Figure 5 shows that lecturer can add, update and delete event. Lecturer can also generate QR Code based on event created. Whereas, student can view the event that has been added by lecturer and scan the QR Code for authenticating themselves and hence record their attendance into the database.

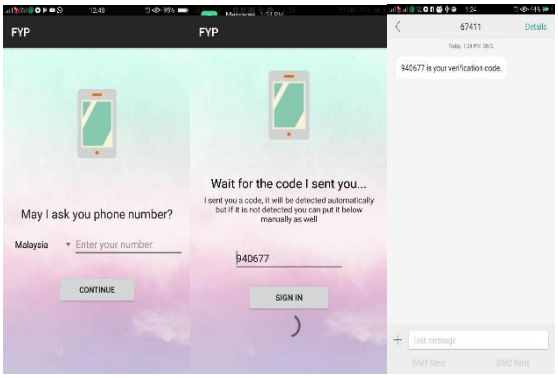


Fig. 4: Implementation of One Time Password



Fig. 5: Event Management by Lecturer

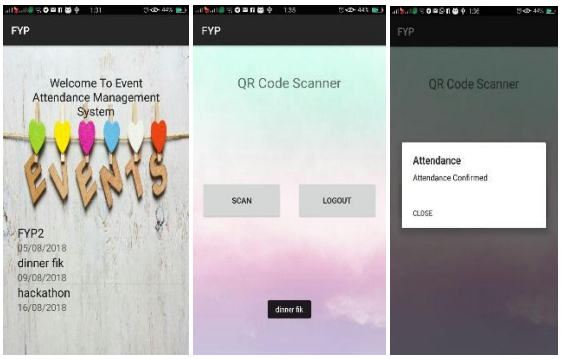


Fig. 5: Managed Student

4.3. Testing

Product testing involves many different types of test that checks if user requirements were met. Module testing is used to test each feature of the application given the input and expected output of the application. In this project, this application has been tested using two techniques, which are black box testing and white box testing which focuses on the design, interfaces, basic functionality, and security. Integration testing involves the verification and validation processes of our application after integrating with other devices in the environment. For this purpose, the following test cases were designed and have been carried out.

Table 1: Test Case for Login, Register and Log Out

Test Case 1 Test Case Name: Login, Register and Log Out Application: Event Management Application			
Step	**Procedures**	**Expected Result**	**Result**
1	Insert lecturer username and password.	Save the insert data into database.	Success
2	Insert correct username, password for login.	Verify the lecturer.	Success
3	Click 'Register,' 'Login' button.	Application redirect lecturer to Login page after register and Main page after login.	Success
4	Repeat step 2 and 3 for login using false username, password.	Application display error message.	Success
5	Log Out Account.	Log out redirected to Login page.	Success
Precondition		No credentials are currently login.	
Post-condition		The lecturer's name, username, and password is saved in database.	

Based on Table 1, only authenticated lecturer and verified lecturer can access to the application.

Table 2: Test Case for Event List

Test Case 2 Test Case Name: Add, Update, Delete and View Event List Application: Event Management Application			
Step	**Procedure**	**Expected Result**	**Result**
1	Insert event information.	Save the insert data into database.	Success
2	View Success insert data.	List view all data.	Success
3	Delete Event data.	Deleted from list view.	Success
4	Update Event data.	Updated from list view.	Success
5	Click 'Insert,' 'Update' and 'Delete' button.	A toast of event added/update/delete successfully will appear.	Success
6	Empty any of field in Event form.	Display alert message requires filling the field.	Success
Precondition		Lecturer is currently login.	
Post-condition		Event details saved in database updated details is updated in database and deleted details removed from database.	

Based on Table 2, Test Case for Event List, only lecturer can insert Event information, view and delete Event information.

Table 3: Test Case for QR Code Generator

Test Case 3 Test Case Name: Generate QR Code, View attendance Application: Event Management Application			
Step	**Procedures**	**Expected Result**	**Result**
1	Generate QR Code by clicking 'Generate' button.	Save the id of QR Code that has been generated.	Success
2	Long click at event to go to generate QR Code page.	Application redirect to QR Code Generator page.	Success
3	Empty the field that need enter text to generate.	Display alert message requires filling the field.	Success
4	Insert text to Generate QR Code.	The insert information will be saved in the database.	Success
5	Insert different text to produce different QR Code pattern.	The masking pattern of QR Code will change based on input text.	Success
6	Lecturer click at view attendance button.	Lecturer can view all the name of student that has scan the QR code for an event.	Success
Precondition		QR Code can be generated for every event.	
Post-condition		QR Code details is saved in the database.	

Based on Table 3, Test Case for QR Code Generator, only lecturer can generate QR Code for each event.

Table 4: Test Case for One Time Password

Test Case 4 Test Case Name: Student Security One Time Password Application: Event Management Application			
Step	**Procedure**	**Expected Result**	**Result**
1	Student Click Button 'Login Using OTP'.	Directed to One Time Password page.	Success
2	Select country and input number phone and click button 'Continue'	Send verification code.	Success
3	One Time Password code send to student via SMS.	Student accepts the code.	Success
4	Student get the code and will be detected automatically.	Code and phone number verified.	Success
5	Student get the code but not detected automatically.	Student can input the code that has been sent at SMS manually.	Success
Precondition		No credentials student being verify.	
No credentials student being verify.		Student is verified as per session.	

Based on Table 4, student must authenticate the number phone to pass the security of One Time Password. Unique generated code will be sent to the student via Short Message System (SMS), and the student will be verified for the session.

Table 5: Test Case for Attendance

Test Case 5 Test Case Name: Attendance Application: Event Management Application			
Step	**Procedure**	**Expected Result**	**Result**
1	Student click Image Button 'Scan'.	Directed to Scan page.	Success
2	Student place the camera at generated QR Code to scan the attendance.	A toast of event name will appear based on the QR Code that is being scan.	Success
3	Student scan the QR Code.	Student will get alert dialog 'attendance confirmed' if event name is	Success

		same and Student id is exist.	
4	Student scan the QR Code but he is not registered to the event.	Student will get alert dialog 'user is not registered' if phone number is not exist.	Success
5	Student scan the QR Code but event name is not same.	Student will get alert dialog 'You went to wrong event' if event name is not same.	Success
Precondition		Student number phone verified.	
Post-condition		Attendance of student is saved.	

Based on Table 5 Test case for Attendance, student needs to scan the QR code that has been generated by the lecturer by using QR Code Scanner to save the student attendance.

5. Conclusion

Event Attendance System Using One Time Password (OTP) has met its objective by providing information to student about event in universities and save the attendance of students to the event. This project will help all event management to spread information and attract students to involve in universities event. For the future works, this project hopefully develops further with an addition of group online chat between lecturer and all students, and more with benefiting application to easy the management of an event. This project expected to have a secure event management application using One Time Password and QR Code. This project also will provide an easy access for the lecturer, admin and student involves reaching for the information about the event. Last but not least, Event Attendance Application will help the students by spreading information about an event and saves students and lecturer time while taking attendance.

Acknowledgement

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