Presence System and Lecture Planning using QR Code with Mobile Devices

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Abstract: During lectures at the University of Sumatera Utara, student attendance is one of the important indicators for achievement. Student attendance record in attending a lecture has a minimum limit of 80% of the total meetings so that the student can take the final semester examination. Currently, the student attendance process in the University of Sumatera Utara is still carried out with conventional methods. In this study, we developed a web application for the student attendance system in University of Sumatera Utara using the Quick Response (QR) Code technology that can process student attendance and permit student absence from lectures in the Department of Electrical Engineering, University of Sumatera Utara.

1 INTRODUCTION

Lecture activities are one of the main activities of students that must be attended regularly when taking a course. During lectures at the University of Sumatera Utara, student attendance is one of the important indicators for achievement. Student attendance record in attending a lecture has a minimum limit of 80% of the total meetings so that the student can take the final semester examination.

Currently, the student attendance process in the University of Sumatera Utara is still carried out with conventional methods starting from taking attendance sheets from department employees, carrying attendance sheets in the ongoing class, giving attendance signatures by each student, and collecting the attendance sheets to the employee. In addition, department employees still need to upload student attendance data manually into academic information systems so that they can be processed digitally.

This method has weaknesses such as the range of student attendance, loss or damage to attendance sheets, errors in entering attendance data by employees, and the use of a relatively long time so that the overall presence process becomes inefficient. At present, there are several alternatives available for these problems including the use of fingerprint attendance tools, presence using RFID (Radio Frequency Identification) technology, and biometric presence tools. However, these alternatives are perceived as impractical and economical, especially for application on campus due to the high cost required, the complexity of installation and maintenance and the need to re-register the identities of all students.

In this study, we developed a web application for the student attendance system in University of Sumatera Utara using the Quick Response (QR) Code technology that can process student attendance and permit student absence from lectures in the Department of Electrical Engineering, University of Sumatera Utara.

2 MATERIAL AND METHODS

In general, a system where lecturers and staff of the Department of the Electrical Engineering University of Sumatera Utara can provide access to attendance to students by displaying or printing QR Codes through web applications so that each student can perform attendance processes by scanning the QR Code immediately using the application on mobile devices. Information obtained from the reading of the QR Code and the location, and time of students do the scans will then be sent to the database of student attendance systems as a sign of student attendance.

2.1 Current Presence System

The presence means to indicate whether someone is present in the class or not. Presence system is a system used to record attendance lists of each member of the agency. The presence system records the identity of members of the agency and the time of entry and exit of its members. Presence systems also have the ability to provide accurate reports.

In lecturing activities in the Department of Electrical Engineering, the University of Sumatera Utara the system must be able to include an attendance sheet which aims to obtain student attendance data in each subject. Presence sheet is a form of a paper containing the name, student number (NIM), subject, signature date, and column. Presence data will then be entered or sent manually one by one to the USU information system database through the information system website provided. The collected data will be calculated and will be used as a condition for whether students can take the semester final examination with a minimum attendance limit of 80%.

2.2 Student Presence System using QR Codes

Computerized presence systems have now been developed with many different types of software and methods. The system developed also varies from web-based, fingerprint, android, and biometrics. In research conducted by Ermatita et al. (2015), explained that the presence system using a QR code reader could improve the efficiency of student attendance at Sriwijaya University with 56% of respondents expressing agreement (Ermatita, 2016). In addition to the presence, this system can also display lecture schedules for lecturers and students.

By using the BYOD concept (Bring your own device), this system has a high-efficiency value in the use of hardware. This is evidenced by each student being able to attend presence using their Android mobile phone. Lecturers can enter the system using NIP data and passwords that have been determined by the developer. By entering the system, the lecturer can display the QR Code for student attendance and see a list of students who have attended attendance at the lectures brought by the lecturer. While for department employee users can only see the results of student attendance recapitulation. Another study conducted by Adi Purnama (2014), with the title "Student Attendance System Using Mobile QR Code (Case Study of Widyatama University)" explains the presence system with QR Code technology can

shorten student attendance by 10 minutes 59 seconds with a cost of zero rupiahs (Purnama, 2014). Both of these studies have proven that there is an increase in time and cost efficiency by using the QR Code on student attendance systems, reducing the occurrence of fraud in the student attendance process, and alleviating the workload of department employees in handling student attendance.

However, these two studies still have many limitations so that they cannot be used in different conditions, especially to be applied in the USU Electrical Engineering Department. The limitations include, among other things, in the authentication system, it does not provide data security features in the QR Code so that the range of duplication of the QR Code can be done by students, as well as limitations in semester processing and classes in the student attendance system, so that it will be difficult to reuse in the next semester with different class arrangements and different courses.

2.3 Web Application

A web application is an application that is accessed using a web browser through a network such as the internet or intranet. Web applications are computer software applications that are encoded in languages supported by web browsers (such as ASP, Perl, Java, JavaScript, PHP, Python, Ruby, etc.) and depend on the browser to display applications. The ability to update and maintain web applications without having to distribute and install software on the possibility of thousands of client computers is a key reason for its popularity: Easy information access, Server setup is easier, Information is easily distributed and free platform, information can be presented by web browsers on any operating system.

2.4 Quick Response (QR) Code

Quick Response Code often called *QR Code* or *QR Code* is a kind of two-dimensional symbol developed by Denso Wave which is a subsidiary of Toyota, a Japanese company in 1994. The purpose of this QR Code is to convey information quickly and also get responses quickly. The QR Code was originally used for tracking vehicle parts for manufacturing. But now, it has been used for commercial purposes aimed at mobile phone users. QR codes are developments from barcodes or barcodes that are only able to store information horizontally while the QR Code is able to store more information, both horizontally and vertically.

The QR code is usually a small white square with black geometric shapes (can be seen in Figure 2), even though now many have been color and used as product brands. Information encoded in the QR Code can be a URL, telephone number, SMS message, V-Card, or any text. The QR code has obtained international standard ISO / IEC18004 and Japan JIS-X-0510 [QR Code, 2018; Ariadi, 2011; Muharram, 2009)

In general, this system is designed to process student attendance when attending a lecture. Lecturers or department employees can create QR codes as student access to attendance using an android application which then sends data to the server using the API. The data obtained will then be stored in the database that already exists on the system. Student attendance data can then be seen by lecturers and department employees using web applications that have been designed. So that with this system the student presence process is not done conventionally anymore and can reduce the level of errors caused by human error. In general, the presence system diagram that will be designed can be seen in Figure 1 and Figure 2 below:
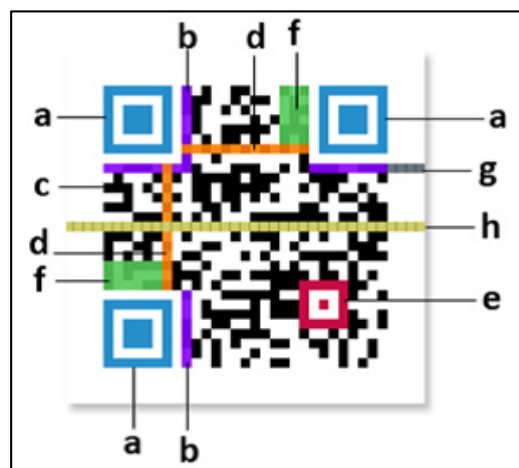

Figure 1: Example of a QR Code

Figure 2: Anatomy of a QR Code

2.5 System Design

At this stage, the web application is designed for authentication, processing semesters, classes, class schedules, QR codes, student presences, and student absentee permissions through a browser that can be accessed by lecturers and department employees (Figure 3) (Rama, 2013; Fielding, 2000)

3 RESULT

The user interface in a web application is used as an intermediary for user communication with the system. This user interface display is designed based on a previously designed activity diagram. The design of the user interface during log authentication can be seen in the following Figure 4.

In the login interface, the user is required to enter an email and password that has been registered previously. If the user does not remember the password they have, can use *forget your password* feature which will send a password reset link to the registered email. When the login process is successful, then the main system page will appear which can be seen in Figure 5.
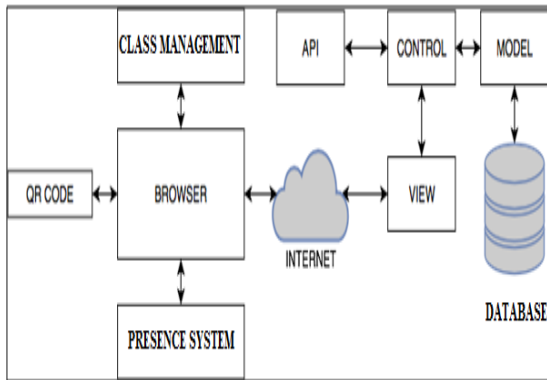
Figure 3: Web Application Architecture and API for Student Presence Systems Using QR Code
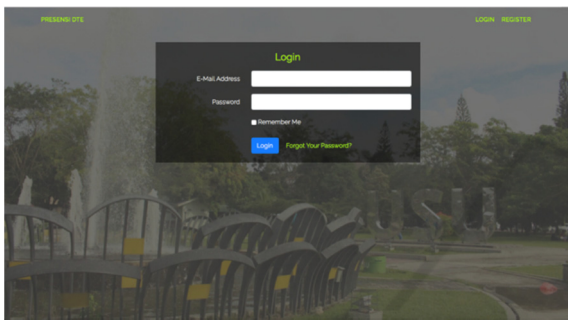

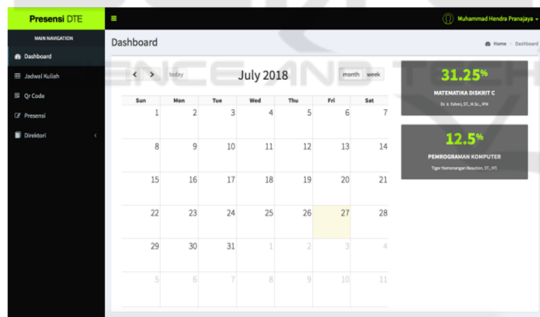Figure 4: The Login Authentication Interface

Figure 5: Display of the Web Application Main Page Interface

For the interface display to create a QR code can be seen in the following figure 6. In this user interface, the user can make a QR code and see the total QR code that has been made previously in a particular class.

The process of creating a QR code is done by selecting the class, and the duration of the student's attendance can be received by the system which is 15 minutes in default. Then the user can press the generic button so the QR code will appear as shown in the following figure 7.

The system will display the QR code along with class information, lecturer and number of lecture meetings. In addition, there are three buttons provided including the full-screen button to display the QR code on the full screen, the print button to change the QR code into the format .pdf for further printing, and the attendance list button to see the attendance results performed by students in the class with the interface display seen in figure 8.

In the student presence interface, there is a list of students who attend a lecture and the results of their attendance at each meeting. The results of student attendance can be displayed in three colors, namely red indicates absence, and yellow indicates permission and green indicates attendance. Besides being displayed on the screen, student attendance results can also be displayed in the PDF image by pressing the print button. Departmental employee users will see a letter icon indicating that the user has access to follow-up permits made by students. If department employees press the icon, the student permission interface will appear. Where on the interface, department employees can accept or reject the permission given by students. If the department employee receives permission, the student will be counted in attendance, while if he refuses permission, the student will be counted absent. The interface to follow up on the student's permission can be seen in the following figure 9.
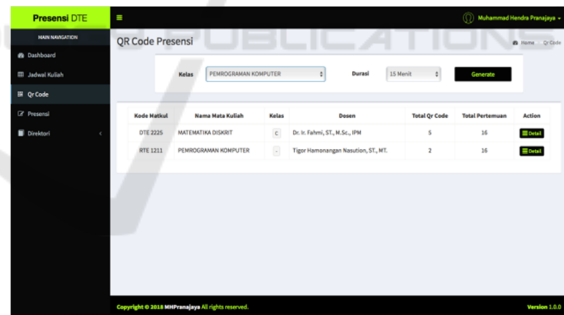

Figure 6: Display Interfaces for Creating QR Codes
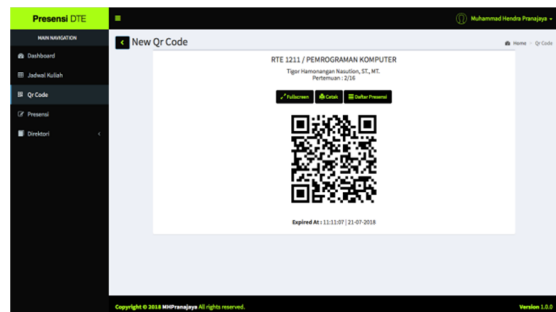

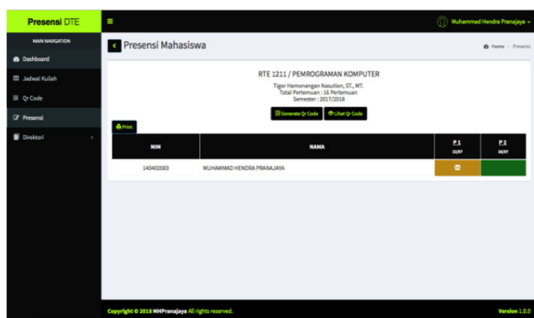Figure 7: Interface Display Result of QR Code Creation

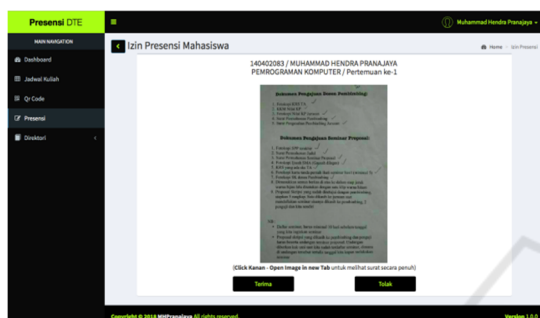Figure 8: Interface Display List of Student Presence

Figure 9: Display of Student Permission Interface

4 CONCLUSION

We have successfully developed a web application for the student attendance system in University of Sumatera Utara using the Quick Response (QR) Code technology that can process student attendance and permit student absence from lectures in the Department of Electrical Engineering, University of Sumatera Utara. The system allowed lecturers to create QR code, distributed it among the student for presence confirmation process. All result data then will be stored in the server for further purpose and analysis. Additional person locator feature (Fahmi, 2018) can be added to make the system become more powerful.

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