Simulation of Attendance Application on Campus based on RFID (Radio Frequency Identifiation)

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***Abstract*—RFID is one of wireless technology that can be used in various sectors of human life like military, school, sport, health, industry, security, animal, and other areas. RFID mainly consist of two important parts, the reader (combination of transceiver and antenna) and the tag (consist of unique number). The use of unique number inside the tag is very useful as an identity of an object or as tracking device.**

This paper explains the development of attendance simulation on campus using RFID that connected to the database and attendance information system. The automated attendance application makes the attendance process at campus more simple and well-structured. The simulation is using RFID tag to describe the student identity card. The reader connected to the attendance information system so all attendance data saved directly to the database and can be used to manage the information later. The attendance process done by putting down the tag near the reader and the unique data will be transferred directly to the database and showed at the attendance information system.

Keywords—attendance application; RFID; tag; reader; database; information system

I. INTRODUCTION

Radio Frequency Identification (RFID) is one of the wireless technology that use the detection of electromagnetic signal as an identification [1]. The frequencies used in RFID are consists of various types of frequency like low frequency, high frequency, ultra high frequency, and microwave [2]. The frequency will affect to the read range of the reader and the data rate. The higher frequency on RFID the longer read range ability the RFID has [3]. The use of the frequency is depends on the needs of the application. ID-12 is one kind of RFID that works on low frequency, which is on 125 kHz and works with EM4001 card type [4]. The use of low frequency RFID make the read range ability shorter, that's why this type of RFID is suitable for developing attendance application. Because of the short read range ability, the student need to bring their tag close to the reader to identify their presence [5]. The use of RFID as an attendance device make the attendance process fast, no paper record needed. Beside the use of RFID is saving the time for attendance process and students would have a reason to go to class, easy way to let parents know if a child is skipping class [6].

RFID consist of two important parts RFID reader (combination of transceiver and antenna) and RFID tag (consist of unique number) as on Fig.1. The RFID tag is used to save the important data of the beholder while the reader is used to read the data saved in the tag. This technology has an advantage, because its data transfer which is contactless and able to work in every environment [7]. Electromagnetic wave is used to transfer the unique data inside the tag to the reader. The tag is activated by the electromagnetic wave, so that the unique data inside can be read by the RFID reader. For passive tag is passively activated by an reader and for active tag, it can actively transmit RF signals to the reader [8]. There are three types of tags in use today, first is active tag (using power source within the tag), passive tag (obtain operating power from the tag reader), last semi passive tag (use internal power to monitor environmental conditions and require radio frequency energy transferred from reader-similar to passive tag) [9]. People often classified it as active and passive tag.

Fig. 1. Low frequency RFID reader and tags

The used of RFID as an attendance device already built in a lot of research [5][8][10][11][12], but there are only few papers that discussed the development of the system and the application its self. This paper only discussed part of the attendance research and focused on the attendance application based on RFID.

II. DEVELOPMENT OF ATTENDANCE APPLICATION

The proposed system consists of three main parts as on Fig. 2. The first is the RFID system as the attendance device, the second is attendance database, and the last part is attendance information system.

RFID system is connected to the user interface in the computer to display the result of the attendance process directly. It used to check whether the data inside the tag is transferred to the reader or not. The RFID system connected to the attendance database. Before using the RFID system, the

database must be developed first. The database used to save the data inside the tag, to save additional information associated with the data inside the tag and the attendance information system, and the process happened using the RFID system.

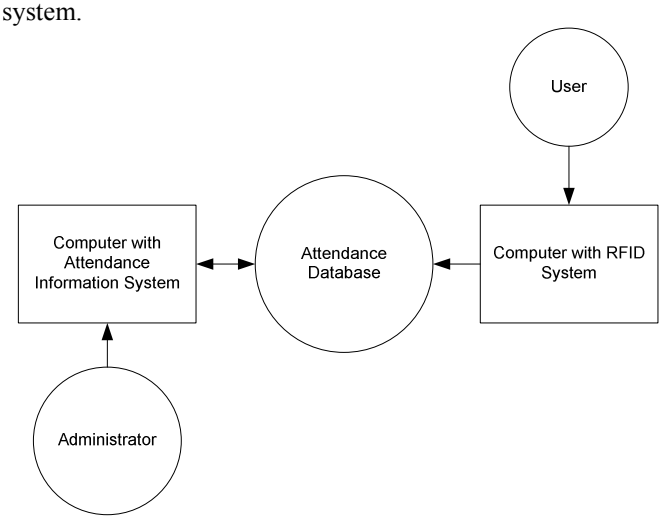

Fig. 2. Attendance application diagram

A. RFID System

The RFID system built with a low frequency RFID (125 kHz) with EM4001 card type tag. The tag is describes as student identity and the reader is describes as attendance device. Students need to bring their tag close to the reader to identify their presence. This situation used to minimize cheating process, because lecturer will see the student's face directly when they are doing the attendance process. To connect the RFID device with the user interface, this system used com to serial converter cable and serial to USB converter cable.

B. Attendance Database Management

The database built to save all data related to lectures system. The data saved include the all information about lecturer, student, and attendance process. The student's data must include the student identity which is unique number on tag RFID, student name, address, phone number, and all important data about the student. The lecturer's data include name, lecturer's identity number, address, and phone number. The attendance process's data include the course, the date of the attendance process, the hour of the attendance process, the student's name and identity number. The database built can be seen on Fig3.

The database built must be connected to the attendance information system using module connector. In this application it uses ODBC connector. To complete the connection, several codes must be added to the attendance information system source code. The module connector also needed to be added on the information system in RFID system part.

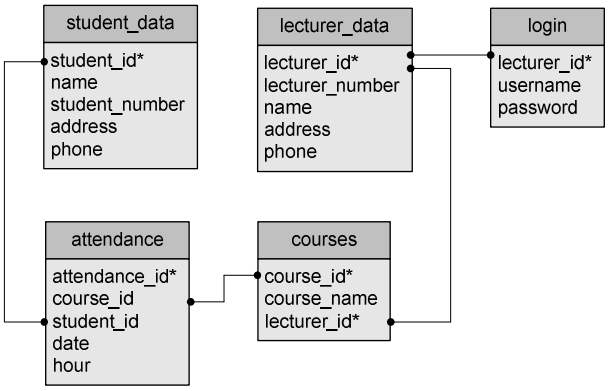

Fig. 3. Attendance Database

C. Attendance Information System

The attendance information system is the interface between users which are students and lecturer with the RFID system and the attendance database. The forms built in this information system are the start form, login form, menu form, lecturer form, student form, account form, attendance form, and in this case 5 courses of attendance process forms. The connection between one form and the other with RFID system and the database can be seen on Table I. The total forms used in this information system are 12 forms. Each form will be connected one another using menu editor.

TABLE I. TABLE OF APPLICATION FORMS

Table name	RFID System	Database System
Start form	-	-
Login form	-	√
Menu form	-	-
Lecturer form	-	√
Student form	√	√
Account form	-	√
Attendance form	√	√
Parallel processing form	√	√
Distribution of embedded system form	√	√
Real time operating system form	√	√
Digital system form	√	√
Design of microprocessor form	√	√

The user interface on RFID system are consist of start form for lecturer, login form for lecturer, attendance form for lecturer and 5 courses form for students. The lecturer must login to the application so that the courses will adapt to what the lecturer's handle. Every data insert to the form will be saved in database and connected one to another. The most important part is that the unique number on tag is used as the identity of the student, so that every student has different identity. The other form can be used without using the RFID system.

In this simulation, the information system consists of 2 lecturers, 2 students, and 5 courses to simulate the attendance process. The login form used to differentiate the courses handled by the lecturer. All information system is used by the lecturer, the student only need to bring their student card (tag RFID) closed to the reader when they want to do the attendance process.

III. Result and Analysis of The Simulation

This section describes the result and analysis of the simulation of attendance simulation on campus. The system must be able to read the unique data from the tag RFID and store the unique data directly to the database. The information in the attendance database must be able to use directly to the attendance information system.

To check whether the reader is able to read the unique number inside the tag we can use hyper terminal connection or serial monitor. The configuration used are baud rate 9600, 8 data bits, none parity, and 1 stop bit.

The result of the RFID system, information system and the database are connected each other. The result from the 12 forms built is like on Table II.

TABLE II. Result of Application Forms

Table name	Result
Start form	Working properly
Login form	Working properly
Menu form	Working properly
Lecturer form	Working properly
Student form	Working properly
Account form	Working properly
Attendance form	Working properly
Parallel processing form	Working properly
Distribution of embedded system form	Working properly
Real time operating system form	Working properly
Digital system form	Working properly
Design of microprocessor form	Working properly

The connection between one from with another form are working properly from starting the application process, logging in to the application, using the menu of the application, choosing the attendance list, and doing the attendance process.

The attendance application brought by the lecturer every time the course started. Lecturer starts the attendance process in the beginning of the course. Lecturer used the application form the start from, login form, menu form, attendance form, and course forms. The username and the password used to login effected on the lecturer's availability to use the attendance and the course forms (Fig. 4).

The given time for attendance process is 15 minutes and during that time the student only need to bring their student card and put it near the reader. The attendance process with RFID will automatically store the record of student attendance in database and use it on the attendance information system (Fig. 5).

The data recorded to the attendance table on database including the attendance id, course id, student id, date and hour. The data shown in the attendance interface are student number, student's name, the data and hour of the attendance process as on Fig.6.

The attendance process can be done automatically by using the student card and the reader. For student who doesn't bring the student card is still able to do attendance process by inserting their student id in the space given on the attendance interface (Fig.7).

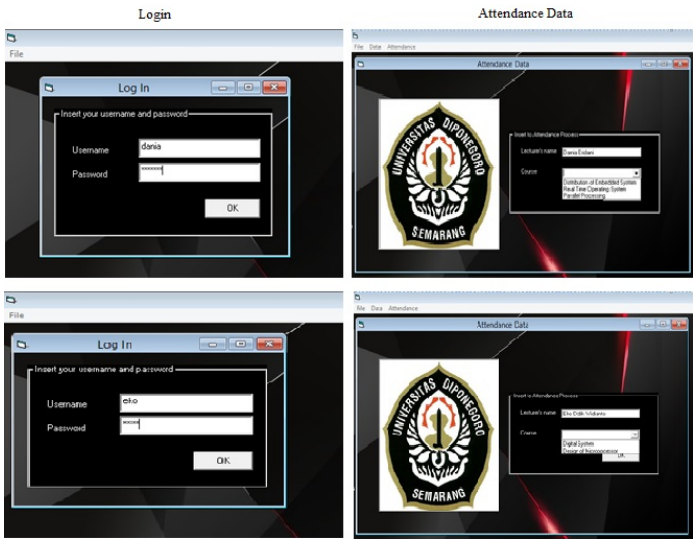

Fig. 4. Login and Attendance Form with Different Username

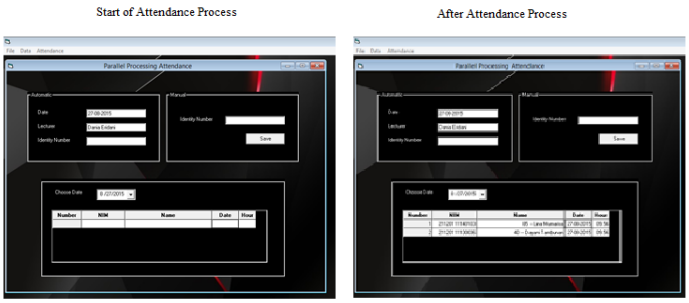

Fig. 5. Attendance Process

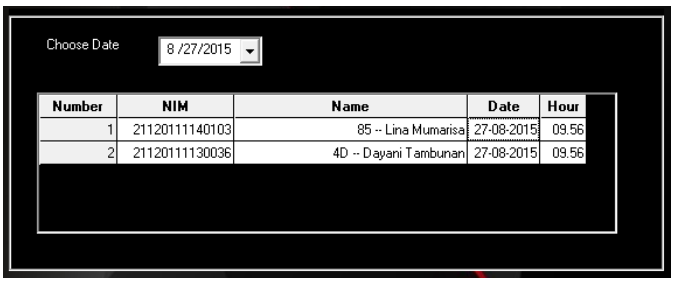

Fig.6. Interface of Attendance Process

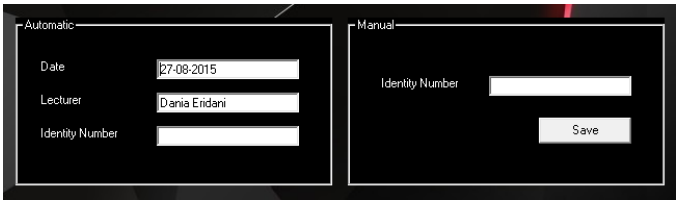

Fig.7. Automatic and Manual Attendance Process

By using the attendance application based on RFID the attendance process on campus became more efficient, fast, paperless, and minimize the cheating process by the student.

IV. Conclusion

The simulation of attendance application on campus planned using 2 lecturers, 2 students, and 5 courses. The reader of RFID was able to read the unique data inside tag RFID. The attendance application built from 12 forms that worked and connected properly one to another.

The using of RFID as the attendance process are more efficient, fast, paperless, and minimize the cheating process by the student compare to the attendance process using paper sheet and distributed to the class during the course.

Acknowledgment

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