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The 3rd International Conference on Computing and Applied Informatics 2018 IOP Conf. Series: Journal of Physics: Conf. Series 1235 (2019) 012039 IOP Publishing doi:10.1088/1742-6596/1235/1/012039 1 The Student Attendance Controlling by Using RFID (Radio Frequency Identification) to Increase the Time Optimization and Accurate of Data Poltak Sihombing 1, Jos Timanta Tarigan2, Asrul Khair3, Humuntal Rumapea4 1,2,3 Faculty of Computer Science and Information Technology, Universitas Sumatera Utara, Jl. Dr. Mansyur No.9, Medan. 4 Faculty of Computer Science, Universitas Methodist Indonesia, Jl. Hang Tuah No. 8 Medan. Email:poltakhombing@yahoo.com1 Abstract.

RFID (Radio Frequency Identification) is a wireless technology which uses to a purpose of identifying and tracking an object via radio waves to transfer data from an electronic tag, called RFID tag. In this paper, the using of RFID for an accurate student attendance tracking controlling is developed. Integrated with an Arduino Uno microcontroller and sensor to read student's RFID tags.

Each tag contains a unique identity (ID) that mapped to a single student ID in the database. We have tested in classroom of Computer Science Department, Universitas Sumatera Utara. The result shows that the average total time taken to record the attendance of a class with 50 students are around 40 seconds, compared to approximately 200 seconds (3.33 minutes) total time when using a conventional method. The system also able to record effectively with no error during our test. 1.

Introduction The user identification system is one of the most important topics in computer applications [1]. In addition to biometric identification, the use of card based authentication is also a commonly used method eg with RFID [2,3]. RFID offers a fast, reliable, and inexpensive authentication process using radio frequency [3,4].

RFID is an automatic identification technology used to retrieve or store data to RFID tags without physical contact [5,6]. The RFID system consists mainly of RFID Tags, RFID Readers, Middleware and Backend databases. The RFID tags are uniquely and universally identified by an identification sequence, governed by the rubrics of Electronic Product Code (EPC) [7].

A tag can either be passively activated by an RFID reader or actively transmit radio signals to the reader [8]. RFID reader, through its antenna, is capable of detecting tags in its vicinity. The reader, whose effective range is based on its operational frequency, is designed to operate at a certain frequency.

Operational frequency of RFID reader ranges from 125 KHz – 2.4 GHz [9]. The Middleware is responsible to transmit the data from the reader to the backend management system [10]. It consists of hardware components (cables, and connectivity ports) and software components. The back-end stores and process all data sent by the reader [11].

While it is considered as a new technology, the implementation of RFID has been an explored subject in recent years. Protocols to allow RFID as a more secure method to perform authentication have been developed [12]. The use of RFID as a method for contactless payment has been explored. The 3rd International Conference on Computing and Applied Informatics 2018 IOP Conf.

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doi:10.1088/1742-6596/1235/1/012039 [2] implemented for quite some time. MasterCard Contactless and Intellitix are two of major example of RFID-based payment system proposed a method to implement a door lock system [13]. Its RFID based system which allows multiple RFID to open a door lock means user can actively add or remove a key without accessing it [14,15].

This paper proposes the use of RFID System to create a more efficient tracking system. System description This paper proposed consists of three parts: (A). RFID Reader, (B). RFID-to-Microcontroller Connection, and (C). Microcontroller Programming. 2.1 RFID reader Figure. 1, consists of three main components; RFID card (transponder), RFID reader, and the host of computer controller. RFID card contains unique RFID tag.

The data contained in the tag is passed to a host computer which contains our student data. Figure 1. RFID reader set up 2.2. RFID -to-microcontroller connection Our RFID reader is integrated to a microcontroller. Since the scanner itself is a non-programmable

hardware, we need a middleware to communicate with the back-end system.

To do this, we integrate our scanner to an Arduino Uno based microcontroller, as shown in Fig. 2. Figure 2. RFID is integrated to microcontroller 2.3. Microcontroller programming We need to create the program of the microcontroller to act as a middleware between the scanner and the back-end system. The main purpose is to send the data from scanner to our back-end system. It uses a C based programming language. It has its own Integrated Development Environment.

The 3rd International Conference on Computing and Applied Informatics 2018 IOP Conf. Series: Journal of Physics: Conf. Series 1235 (2019) 012039 IOP Publishing doi:10.1088/1742-6596/1235/1/012039 3 2.4. Attendance tracking controlling This application consists of two parts: Desktop Application and Database Server Application. The desktop application is designed as our interface to interact with the system.

It has two main objectives: setting up new UID-Student ID data and storing student activity based on scanner activity. Our tracking controlling system is built using these set of rules: 1. Class is started right after the lecturer scan his/her UID for the first time. It is finished right after the lecturer scan his/her UID for the second time.

If the lecturer accidentally performs the second scan before the class is closed, he/she can cancel the last scan from the desktop application from the laptop. 2. Student is tracked as attendant if he/she scanned his/her UID during the setup process. Otherwise, the system will reject the input. 3. Any UID other than registered student or lecturer will be rejected. Fig. 3 depicts the flowchart of the student attendance tracking controlling system.

It is also important to notice that the current system does not able to store the scanning result offline. Figure 3. Flowchart of the student attendance tracking controlling The 3rd International Conference on Computing and Applied Informatics 2018 IOP Conf. Series: Journal of Physics: Conf. Series 1235 (2019) 012039 IOP Publishing doi:10.1088/1742-6596/1235/1/012039 4 3. The experimental set up and result 3.1.

RFID reader system RFID reader system is designed as a combination between the MFRC522 and Arduino Uno microcontroller. MFRC522 used to scan and read the RFID tag at 13.56 MHz When the scanner successfully read the tag, it will pass the information to the microcontroller. 3.2. Microcontroller programming We have developed the program of the microcontroller to pass the data to our computer.

This microcontroller is connected to our computer via USB. When the micro-controller

successfully read the data, it will then pass the data to the computer. 3.3 Back-end software development To test our RFID project, we created a desktop application using C# Programming Language using Visual Studio as our IDE as shown in Fig. 4. Its purpose is to simulate a student database as the back-end of our tracking controlling. Figure 4. Application development using C# 3.4.

The student attendance tracking controlling The first step to implement the system is to register every RFID tags that will be used in our test. To do this, we chose SET UP button on main menu to enter the Setup form. Before we can perform the scanning, we have to enter the Port Number and Baud Rate. These values may vary based on the available port and device. Figure 5.

The student attendance tracking controlling The 3rd International Conference on Computing and Applied Informatics 2018 IOP Conf. Series: Journal of Physics: Conf. Series 1235 (2019) 012039 IOP Publishing doi:10.1088/1742-6596/1235/1/012039 5 We have tested our project in a normal classroom as shown in figure 5. There are 50 students of computer science department, Faculty of Computer science and Information Technology, Universitas Sumatera Utara. Figure 6.

The result of attendance tracking controlling Figure. 6 depict the testing reader on monitor. The recently scanned student will appear on the monitor. The test shows the scanner successfully acknowledges each tag. There was no error in the trial and we successfully recorded every activity performed by the scanner. Our test shows that this solution reduces the time needed to track student's attendance compared to the conventional method.

The average time for each student to scan its RFID is less than a second. We test our system in a class in our campus, which design is arranged as shown as the figure 7. Figure 7. Common class design in this research The next step is to observe the effectiveness of the system.

We found one possibility of fraud that may occur while using this solution; student may scan two or more tags to fake someone else's attendance. However, we found out that this problem can be solved by using a sound-based alert (such as a beep sound) when the sensor is recognizing a tag. This will allow teacher/lecturer to figure out the amount of tags read by the scanner when a student tries to authenticate. Table 1 shows the result of the study.

Table.1 Results of the study Method Number of Students 10 20 30 40 50 Manual (second) 40 80 120 160 200 RFID (second) 20 30 35 38 40 The 3rd International

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doi:10.1088/1742-6596/1235/1/012039 6 Figure 8 depicts the comparison of time consumption of manual entry and RFID technology.

This research has tested on a sample of 50 students, a common classroom capacity in our department. We compare our current system, manual entry by teacher, with our proposed RFID-based solution. Figure 8. The comparison of time consumption The implementation of RFID technology has definitely quickened the process of recording attendance.

The traditional method of recording attendance involves individual manual entry take a time consuming process. On average, based on experiment, the total time taken to record the attendance of a class of 50 students by manual entry method took approximately 200 seconds (3.3 minutes). This implies that approximately 4 seconds per student was required to record their attendance.

This time duration includes visual and written authentication, after which the teacher/lecturer records the attendance. While using RFID, there is no requirement to do a visual confirmation. This reduce the time to 2 seconds per student for a class of 10 students. Moreover, since all students may walk to the scanner at the same time, the scanning process is reduced to 0.8 second per student (40 second for 50 students).

In comparison (in figure 9), the total time taken for recording the attendance of 50 students using Manual entry and RFID technology is 50 seconds and 200 seconds respectively. 4. Conclusions and future works In this paper, we successfully implemented RFID based student attendance tracking system. Not only the system can simplify and reduce the cost of attendance tracking (both time and money), but it also capable to create a more accurate and efficient data.

Concluding from the observation we've made during the test session, we found that this solution is both effective and efficient compared to a conventional attendance tracking method. While our current test is limited to a local classroom, we would like to explore the possibility to implement our solution as a standard in many, if not all, education institution. In the future, we would like to expand this project as part of our Smart Class Research.

The tracking system will be integrated to other system, such as academic database. By using collecting the data from student's attendance, relating those data with the class subject and curriculum, we intent to find a thorough control over the education system

in our campus.

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