Prototype of College Student Attendance Using Radio Frequency Identification (RFID) at Musamus University

Nasra Pratama Putra¹, Stanly Hence Dolfi Loppies², Reza Zubaedah³
¹²³ Department of Information System, Faculty of Engineering, Musamus University, Jl. Kamizaun, Merauke, Indonesia

E-mail: nasrapratama@unmus.ac.id

Abstract. Student attendance in the classroom is one indicator for lecturers in learning activities. At Musamus University, student attendance has been managed digitally. The system is known as SIMAKAD. The weakness of SIMAKAD in doing attendance is in the process of entering data. Student attendance data can be inputted by the lecturer after completing the manual signature process by students. This can cause errors in entering data into the system. Whereas in the industrial revolution of the 4.0 era, the transformation of digital data in education was needed. For example, with the presence of Radio Frequency Identification (RFID) technology. The student attendance prototype using RFID was designed as a solution to solve problems in entering student attendance data at SIMAKAD. RFID technology can identify each student while attending college through reading the student TAG ID. By adding Internet of Things (IoT) capabilities, the results of reading student IDs will be sent directly through the internet and stored in a database server. The database can be directly used by lecturers as monitoring attendance of lectures. So no need to use manual absence.

1. Introduction

University is a place of learning for students. So students are an important aspect of a university[1]. In Merauke Regency there is a state university named Musamus University. In improving the quality of services to students, Musamus University has used an academic information system since 2014. The presence of an academic system at Musamus University can be an internal factor in ensuring university quality[2]. The information system is called SIMAKAD. SIMAKAD can serve a variety of things, from registering new students to managing student learning processes.

In the learning process, there are several things that need attention. First is the presence of students in following the lessons. Second, the ability of students to interact. Third is an evaluation of the material that has been received by students[3]. All three processes are managed by SIMAKAD properly. But there are still some weaknesses. Weaknesses that occur are in the management of student attendance data in class.

Attendance data is an indicator of teachers in knowing student discipline[4]. Student attendance recording system is still done through more than one stage. The first stage is the teacher submits a manual absence to the student. After class hours, the teacher can enter attendance data into SIMAKAD. This can cause errors in data input by the teacher. The first mistake is wrong in entering student attendance. The
second mistake is an error in choosing the date of college. Problems in managing student attendance data can be solved by adding a number of automation devices. Like adding an RFID device for student identification in class.

The use of RFID in supporting attendance information systems is not new. At PT. Skyputra Pancasurya has a similar research design[5]. But the main difference with this research lies in the case study. In this study, the use of Internet of Things (IoT) technology is also a differentiator. Identification data from student IDs will be sent to the database server using the esp8266 module. So when the teacher has opened the class through the system, students can directly mark the ID to the RFID reader. The teacher no longer needs to enter student attendance data into the system. The teacher also does not need to worry about mistakes in entering data again.

2. Theoretical Review

2.1. Student Attendance

Student attendance activity is one of the academic activities in the implementation of face-to-face activities of the lecture process at the College level. In accordance with the assessment rules set by the University that one important element in determining the final grade of each student in each course that is followed is the value of attendance[6]. Incorrect input of student attendance will greatly affect the calculation of the value of the eligibility of student participation in the final semester exams as well as the final grades of students themselves. In general, student absence can be divided into three parts: (1) absences, namely absences without clear explanations, with reasons that cannot be justified; (2) permission, absence with information and certain reasons that can be accounted for, usually accompanied by a letter of notification from parents; and (3) illness, absence due to health problems, usually accompanied by a letter of notification from parents or a letter of illness from a doctor.

2.2. RFID

RFID technology is technology that can send identities in the form of digits used by radio waves. RFID has been used in every company and is useful to support inventory. RFID has the advantage of a barcode that is the data will be read automatically regardless of the reading direction. Passing material that has access with access speeds of hundreds of tapping per second as seen on paper cartoons.

![Figure 1. RFID Reader RC-522](image-url)
Tapping RFID made from chips made from silicon has a very simple identity function that has been put together in a single design. The ability of an RFID reader can read and write as shown in Figure 1. Store data storage to support encryption and access control[7]. The specifications of the RFID reader RC-522 are explained in table 1.

| Specification          | Value          |
|------------------------|----------------|
| Working current        | 13 – 26mA/DC 3.3V |
| Standby current        | 10 – 13mA/DC 3.3V |
| Sleeping current       | <80uA          |
| Peak current           | <30mA          |
| Frequency of work      | 13,56MHz       |
| Protocol               | SPI            |
| Working temperature    | -20 – 80º C    |
| Storage temperature    | -40 – 85º C    |
| Max SPI Speed          | 10Mbit/s       |
| Communication speed    | Max 10Mbit/s   |

2.3. IOT

ETT EPOSS defines, that IoT is a network formed by objects that have an identity, in cyberspace by operating in that space by using the intelligence of devices to connect and communicate with users, social and environmental contexts. Internet of Things is a concept that has the function of extending connectivity to the internet that is connected continuously. The elements needed to form the Internet of Things (IoT) are sensors, connectivity and small devices. As the example in Figure 2 shows the use of RFID in IoT-based medical technology.
Various kinds of benefits from the Internet of Things environmental monitoring, infrastructure management, sensor equipment, health, education etc. By 2019, IoT products and the IoT market will develop. The emergence of IoT is able to bridge the machines that produce data by utilizing sensors, on mobile devices and other smart devices to collect information in realtime.

2.4. Information system

Information system is a system that unites the needs of operational and management interactions in a business group and provides reports required by certain parties. An information system is a collection of rules from an organization that is useful for providing information supporting decision makers. Some forms of information systems in the real world can be geographic systems, intelligent systems or data mining[8][9][10].

3. Methodology And System Design

3.1. Prototype Method

The system development method used is to use the prototype approach method. Prototyping is a software development method that is widely used. Prototype is built to define needs. The steps in designing the system that the author uses in the mechanism of system development with prototype are as follows:

a. Identify user needs
   Get ideas and what users need and want for the system to be built. This system is expected to be able to automate the security of cabinets and to find out the identity of the infocus borrower.

b. Build a prototype
   Prototyping is made by making a preliminary design in the form of context diagrams, DFD Level 0, database tables, display designs, and also block diagrams that focus on presentation for users.

c. Prototyping Evaluation
   In this stage the user checks whether the prototyping has been built according to his wishes. If it is appropriate then step 4 will be taken. If not prototyping is corrected by repeating steps 1, 2, and 3.

d. Coding
   In this stage the agreed prototyping is translated into the appropriate programming language.

e. Test the system
   When the system is ready to use, it must be tested before use. This test is done with Black Box where the test focuses on system functionality to see whether the input and output that are designed are in accordance with what is expected by the user.

f. System Evaluation
   The user evaluates whether the finished system is as expected. If yes, step 7 is done. If not, repeat steps 4 and 5.

g. Using the system
   Software that has been tested and accepted by users is ready to use.

3.2. System Analyst Design

The main purpose of building this system is to improve the weaknesses of SIMAKAD. The weaknesses that have been mentioned before are manual inputting absent by students. While the form
designed is to use RFID. So the student attendance data directly entered into the system. The input process is adjusted to the course that is activated by the lecturer so that it is dynamic. This is useful for teachers who do extra hours or change teaching hours.

The following is the architecture of the device to be used. In figure 3 can be seen using NodeMCU which has ESP8266. The use of this controller is intended so that the equipment of reading the Student ID Tag can be connected via the internet and sending data to the database.

Figure 3. Device Architecture

After the design of the hardware is made, it continues to the design of the system to be built. The following figure 4 will explain the equipment algorithm in sending data to the database.

4. Result dan Discussion

4.1. Implementation result

In accordance with the flowchart, each student can identify attendance if the teacher has activated the class through the system. To activate the class, the teacher must choose the subjects to be taught. The date and time settings when the class is opened automatically adjusts to the system. Figure 5 shows how the teacher activates the RFID reader by selecting classes first.

After class is activated, students can read the ID tag. ID Tag reading is done by attaching a student ID card to the reader no more than 3cm. Figure 6 shows the process of reading the ID Tag.

After the RFID reader gets the student ID Tag data, the reader will send the data to the database server. Figure 7 shows the reader results that have been stored on the database server. If we pay attention, if students have not read the data on the reader or students do not exist, then the status can be changed by the teacher.
Figure 4. Flowchart System

Figure 5. Open Class by Teacher
4.2. Discussion

Based on the results of testing equipment and systems, we can find several interesting things to discuss. Even though the equipment is running well, the use of RFID still feels ineffective. This is because students can still commit fraud by entrusting their ID Tags to their friends. But the advantage of using RFID is its low cost both in terms of algorithms and materials.

5. Conclusion

A system has been designed that is able to read student attendance using RFID. A student's status can also be changed by a student if he is absent due to illness or permission. The ability to read RFID is very fast and lightweight to send to the database server. So the conclusions that can be drawn with the presence of this prototype can solve problems in SIMAKAD.
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