Design And Development Of Presence System System Using Rfid Based On Raspberry Pi

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Abstract—Presence of students of the Master of Telecommunications Engineering Study Program majoring in Electrical Engineering Semarang State Polytechnic is currently still managed and carried out manually. This does not rule out the possibility of errors in managing data attendance and cheating students in faking their presence, and also with the development of science and technology that is currently completely automated. From this background, it was made the Presence Using RFID Based Raspberry Pi System where the PBM became Admin to be able to access all the attendance data of the S2 Telecommunications Engineering students. Student attendance recording is done by PBM by opening a MySQL database that has been created and stored, then processed and adjusted to existing student data as student ID. The end result obtained is a tool and system that are integrated automatically and also precisely, so that students are required to arrive on time so that they do not get the Compensation if they have passed the deadline and PBM admin can manage the recapitulation data through the website including student data, data lecturer, course data, room data, lecture schedule, attendance activities, and print reports in PDF format. The trial was carried out in the Computer Lab of the Semarang State Polytechnic Applied Science Master. The conclusion is that this tool and system is able to educate students to come and have a scheduled presence and can also record attendance automatically.

Index Terms— RFID, Database, Raspberry Pi 3, Website, Presence.

1. Preliminary

Recording attendance is important in teaching and learning activities to determine the attendance level of students in participating in teaching and learning activities. The number of educational institutions that still use the system of recording attendance manually raises the attendance data obtained is not valid and easy to manipulate. To solve the problem of recording attendance, then created a student attendance system tool automatically using the Raspberry Pi-based RFID as a mini PC as well as a server and ACR122U as an RFID Reader. The recording of attendance that has been done by students will be saved directly to the server, and the results of the attendance record will be accessible and known through the web managed by the PBM admin.

This presence system will operate automatically, starting with the lecturer tapping the RFID card and then attending the student to attend according to the lecture schedule that has been arranged. This presentation system can record attendance conducted by students, when the student performs the exact time according to the lecture hours will be considered to be present, if the student takes> 15 minutes attendance will be considered late and if the student does not attend attendance will be considered absent (alpha).

2. Theoretical Basis

2.1. RFID (Radio frequency identification)

RFID (Radio frequency identification) is a technology that uses radio waves to identify a particular object. RFID will send data from tags containing serial numbers which are then read by the RFID reader to be processed to a computer or the like which will show the identity of the object. In general, an RFID system consists of three basic components, namely tags (containing microchips and transponders), readers (containing decoders and transceivers), and databases. RFID operating systems have characteristics in radio frequency selection. The frequency is determined by the communication speed and the reading distance to the tag. In general, a high frequency indicates that the reader is close to the tag. From the type of reader application can also choose the type of frequency used. Certain applications are more suitable for one type of frequency compared to other types because radio waves have behavior that varies according to the frequency of radio waves.

2.2. Raspberry Pi

Raspberry Pi is a mini PC that has output ports to display digital desk, camera, audio and digital input output ports. Raspberry Pi has 2 types of boards namely type A

and type B. The difference is in RAM and LAN ports, if type A has RAM = 256 Mb and without a LAN port (ethernet), if type B has RAM = 512 Mb and there is a LAN port. Raspberry Pi uses the Raspbian Linux Operating System (OS) distro that runs from the SD card on the Rasberry Pi board. OS is stored on the SD card, as well as for the OS boot process.

2.3. Python

Python is a multipurpose interpretive (direct) programming language with object orientation methods, simpler than C language because it is equipped with automatic memory management (pointers) to make it easier to understand syntax. Python can provide speed and quality to build multilevel applications (Rapid Application Development) due to libraries with standard modules such as NumPy, SciPy, and others. This makes Python very easy to learn for beginners.

2.4. Web Server

A web server is software that provides services or services to clients to receive HTTP and HTTPS requests from known clients. The client in question is a web browser (such as: Internet Explorer, Google Chrome, Mozilla Firefox). After that, the web server will send the request requested by the client in the form of a web page, which generally takes the form of an HTML document.

2.5. Database Server

Database is a collection of user data that is stored into one that is integrated using certain methods. Database servers are software that provide database services and become data centers that have been stored by users. Database or Database can be created and processed using a computer program, namely software (software). The system used to manage and call database queries is called the Database Management System (DBMS).

2.6. TCP / IP

Transmission Control Protocol / Internet Protocol (TCP / IP) is a data communication standard used by the internet community in the process of exchanging data from one computer to another on a network. This protocol is a collection of protocols (protocol suites) so that it cannot stand alone. This protocol is also the most widely used protocol today.

3. Implementation Activites

3.1. System Architecture

Determination of system architecture is very important in making tools and influencing the results obtained. Attendance recording unit using RFID based on Raspberry Pi will record the presence of lecturers and students in accordance with lecture hours by taping an RFID card to an RFID reader then forwarding it to the

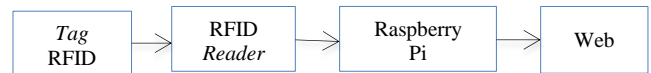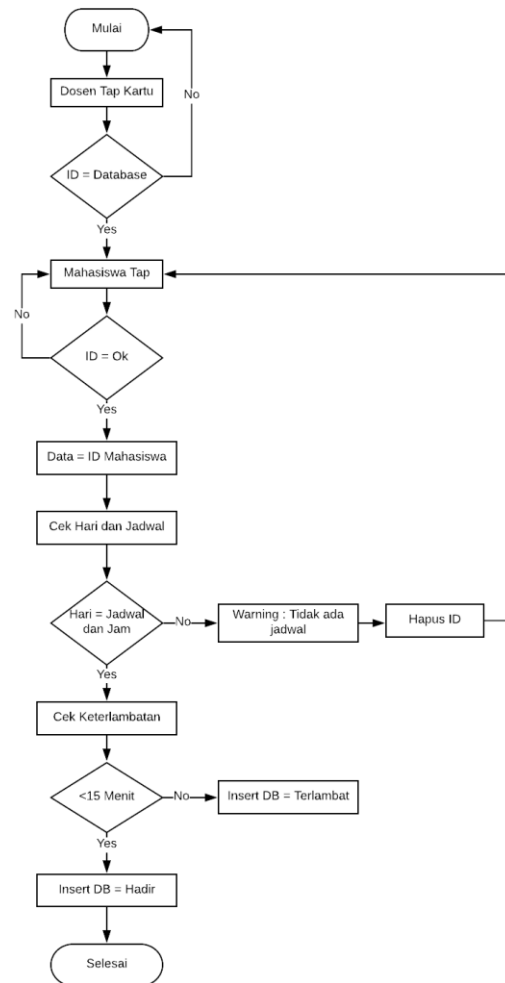Raspberry Pi which is the server and can be displayed via the web.

Fig 3.1 System Diagram

3.2. Flowchart

Flowchart The RFID-based student attendance system at Semarang State Polytechnic's Applied Science Magister Building is shown in Figure 3.2 for the whole process of the system.
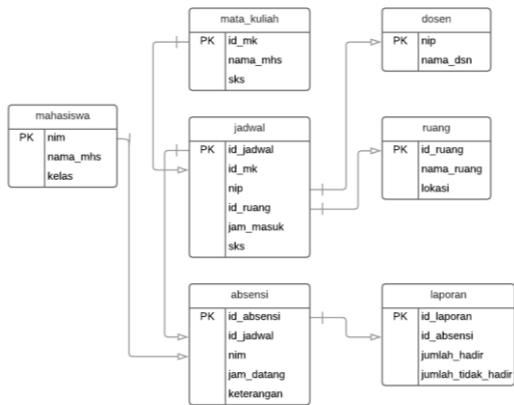

Picture 3.2. Flowchart Presence System

3.3. Data Modeling

Data modeling is a technique for managing and documenting data systems.

3.3.1. System Design with ERD

The relation design in the Attendance Record System database can be seen in Picture 3.3.

Picture 3.3 Entity Relationship Diagram Presence Record System

3.3.2 System Design with UML

The usecase of the picture above explains that the attendance recording system must be activated first by the lecturer followed by students using an RFID card that is brought closer to the RFID reader. This system also features a data recapitulation feature to facilitate information retrieval related to student attendance. The following is the Use case diagram of the attendance recording system:
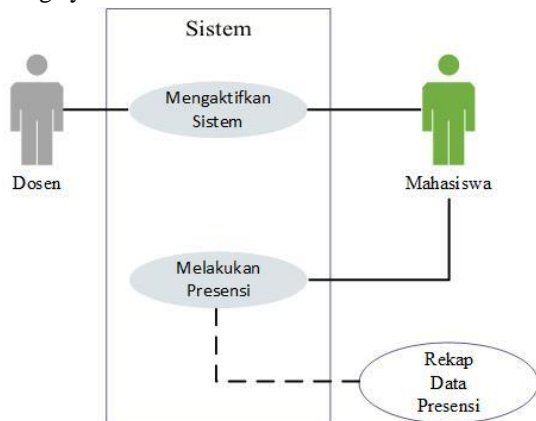

Fig 3.4 Use Case Presence Record System

3.4. Database Design

In making student attendance systems, a database is needed as a place to store data. Making this database uses a MySQL database with the name "student presence".

Table 3.1 Database of student presence

No	Name Table
1	Presence
2	Day
3	Lecturer
4	Schedule
5	Class
6	Report
7	College Student
8	Courses
9	Room

3.5 Design of Web System Presence

The design of the web display is the design of the display used to make a display on the student attendance web system. There are menu bar forms on the web as follows:

1. Dashboard Form
2. Student Data Form
3. Lecturer Data Form
4. Course Data Form
5. Room Data Form
6. Lecture Schedule Form
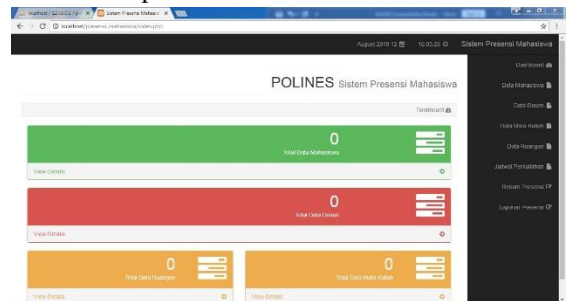7. Form of Presence Record
8. Presence Report Form

Fig 3.5 Dashboard Web Display

4. **Discussion And Analysis**

4.1. Testing RFID

Testing on RFID is carried out in three stages such as testing the distance of the card read by the reader, the speed of reading and the position of the tag.

The stages of RFID testing :

1) Testing the distance of the read card by the reader

The read card distance test by the reader is done by students . The results of the distance reading from the card and reader can be seen in Table 4.1.

Picture 4.1 Testing the distance of the read card by the reader

Table 4.1 Result testing the distance card and reader

Distance tag with reader (cm)	Result testing
1	Read
1.5	Read
2	Read
2.5	Read
3	Read
3.5	Read
4	Read
4.5	Not Read
5	Not Read

2) Reading Speed Testing

This speed reading test tag by the reader is done by using the stopwatch manually, that is by starting and finishing manually. The results of testing the reader speed reading time to the card is an average of 2 seconds.

3) Tag Position Testing

The results of testing the reading of the RFID tag code simultaneously, side by side and reading tags are stacked when interacting with the RFID reader, the tag code cannot be read by the RFID reader.

4.2 Web Display Testing

The initial page display is a display of the student attendance system website which is a website that can only be accessed by the administration of data processing student attendance at the Semarang State Polytechnic campus which is the PBM section. This website address can be accessed locally on the PBM computer, shown in Picture   4.2
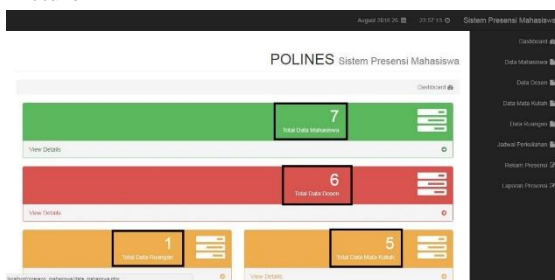

Fig 4.4 Initial Web View

This initial appearance displays four important components used in the process of recording attendance. Presented in the form of a panel that displays the number of each that corresponds to the amount available.

4.3   Analysis

4.3.1.   RFID Reader Analysis

Based on the tests as shown in Table 4.1, the reader reading distance obtained is between 0-4 cm. While based on

testing various possible positions it does affect the success of reading by the reader. This is influenced by the transmitting pattern of electromagnetic waves from the reader.

4.3.2.   Web and Database Analysis

The web program that is designed can work well and can do all activities regarding managing both adding, changing, and deleting data. All these activities can only be done by an admin, PBM. Admin has the right to process master data and attendance data.

5.   Conclusion

1)   Student attendance recording system using Raspberry Pi-based RFID serves as a substitute for manual attendance which is still done to be more valid and as a use of student cards as well as attendance cards. This system successfully works by utilizing RFID devices in the 13.56 MHz (HF) frequency range using ACR122U as an RFID Reader and RFID card.

2)   Attendance recording system using Raspberry Pi-based RFID as a modern student presence tool has succeeded in becoming a means of presence that makes it easy for all parties to start from the lecturer without the need to call each student in the class, making it easier for students without the need to write a manual to record their attendance, and PBM or the administration section becomes easier in processing data the presence of students by minimizing errors that can occur when using a manual system. With the website used as a means of monitoring, processing, editing and deleting data that is in the presence system and print attendance data recapitulation as needed in pdf form from the website.

6.   References

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