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Design Of Automatic Sliding Doors On Lab Net Centric Computing Assisted With Arduino Mega Using Radio Frequency Identification (RFID) Based On Local Area Network (LAN)

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ABSTRACT

The sliding door is currently still using the manual method by pushing it from the side by the arm so that many students pass into the Lab without knowing who accessed the door. For information on the use of the Lab room is very important. This study wants to provide a solution to these problems with a manual sliding door. The method in this study includes the analysis stage, the design stage, the implementation or implementation stage and the last one is the testing phase, the automatic sliding door in this study begins by detecting the card using RFID, when a card that already has access is detected, Arduino will command the servo motor to move the sliding door automatically and the LCD will show that it has simultaneous access with the green LED will light up. After the data from the RFID is read, Arduino will forward it to the web server via an Ethernet shield that has been connected using an RJ-45 cable then the server will forward it again to the database and then the database will be displayed on a website with a local area network network.

1. Introduction.

Technological developments have progressed which are able to facilitate human needs with very high accuracy and speed. Along with the development of these technologies, the role of communication equipment and control equipment as support in increasing production in an industry is getting bigger. Controlling electronic equipment has resulted in highly advanced methods along with technological developments. With these advances in technology, communication is not only used between humans, but between humans and means of control [1,2].

At Ibn Khaldun University, the Faculty of Engineering and Science, the Informatics Engineering Study Program, has four specializations, each of which has its own laboratory room, one of which is the NCC Laboratory. The NCC Laboratory has a sliding door which currently still uses the manual method by pushing it from the side by the arm, making it less efficient for sliding doors that are always open and forgetting to close them again, so that many students pass into the Lab without knowing who is entering. and whoever comes out. For that information on the use of the Lab room is very important. The NCC Lab Room also has items and hardware in the Lab which can certainly cause losses. Losses can be caused because all students can enter and leave the room which is always open and forget to close the door again. The formulation of the problems in this study are (i) How to design an automatic sliding door controller? And (ii) How to get the results from the automatic sliding door system test. After knowing the formulation of the problem in this study, the objectives of this study are (i) to be able to know the design of automatic sliding doors using Arduino Mega 2560 and RFID and (ii) to be able to know the results of testing the automatic sliding door system.

2. Research Methods

This research method is a prototyping model method to compile an idea that is directed and related to the aims and objectives. At this stage, it is explained how the stages of making automatic sliding doors. In this method using a flowchart as an explanation of the workflow. The flow of the methods used in this research is

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as follows:

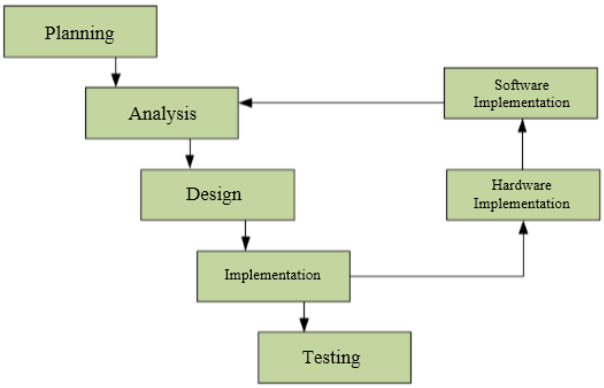

Fig 1. Research Methods[6]

3. Results

At this stage, it will be discussed according to the research flow to be used, the research flow that will be used is prototyping.

a. Analysis

In the process of analyzing how it works, it will explain how the system works in this study. Figure 2 will explain the analysis of how it works on this system.

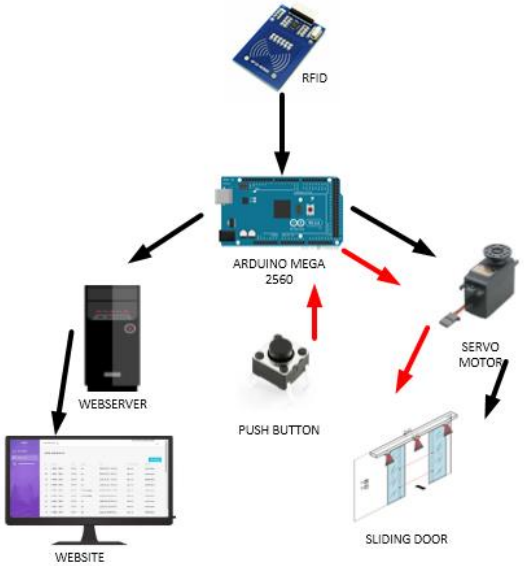

Fig 2. How The System Work

Figure 2 explains how the automatic sliding door works in this study, starting with detecting the card using RFID, when the card is detected as having access, Arduino will command the servo to move the sliding door automatically. After the data from the RFID is read, Arduino will forward it to the server via the Ethernet shield then the server will forward it again to the database and then the database will be displayed on the website.

b. Design

At this stage, several designs related to research are carried out. The following are several stages of the automatic sliding door design in this study.

1) Schematic diagram

The device used in the schematic diagram of the whole system is as shown in Figure 3 showing the circuit divided into 4 stages.

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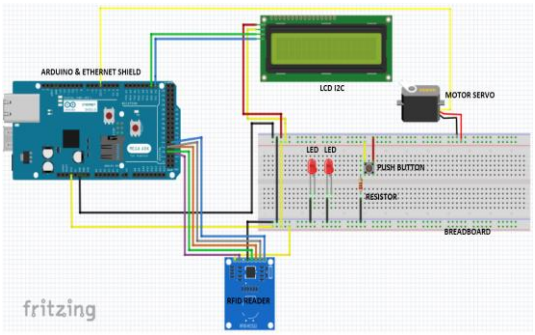

Fig 3 Hardware Schematic Circuit.

In Figure 3 it is divided into several stages, namely, the first stage is the Rfid schematic circuit with the Arduino Mega 2560, the second is the Arduino Mega 2560 schematic circuit with an I2C LCD, the third is the Arduino Mega 2560 with a servo motor.

2) Network Design

Network design shows the process of the devices being connected to each other and can communicate with each other according to the programming instructions that have been made[8,9]. In this system the Arduino Mega 2560 receives data connected to the RFID[7], giving instructions to the servo motor and Ethernet shield connected to the switch to send data to the website. Arduino Mega 2560 can be accessed via a laptop or personal computer connected with a UTP cable to see the automatic door usage information display[11]. The network design in this system is shown in Figure 4

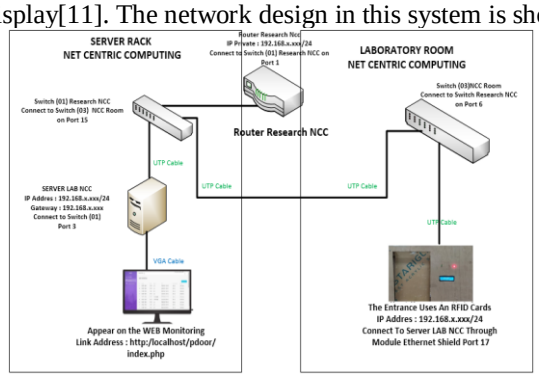

Fig 4. Network Design

In Figure 4 is a network design that will be made on a series of automatic sliding door tools by displaying information on the web that has been created. The series of tools is connected to the switch 03 NCC room with the ip address 192.168.xxx.xxx which is connected using a utp cable on port 17. after being connected to the switch 03 NCC room, then the switch is connected to the switch 01 Research NCC is unmanageable and connect it using a utp cable , the door server is connected to the NCC Research 01 switch to send incoming student and lecturer data with the ip address 192.168.xxx.xxx, then the server will display the results of the device through the monitoring Web display that is connected using a VGA cable. access with a web browser via http: //localhost/pdoor/leport.php.

c. Implementation

1) Implementation RFID To Arduino

The first implementation stage of the tool is connecting RFID with Arduino Mega 2560. In order for Arduino Mega to be connected to RFID, it is necessary to embed a source code into Arduino Mega 2560. Arduino IDE software which can be downloaded for free from the official Arduino website

The next process is to connect the Arduino Mega with RFID using a male to female jumper cable, connect the jumper with the pin on the Arduino according to what has been previously determined, connect the other side of the jumper cable to RFID. The snippets of the Arduino program source code are as follows.

```
#include <MFRC522.h>
```


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```
#define SS_PIN 53 //SDA rfid mfrc522
#define RST_PIN 49 //rst rfid mfrc522
int data = ((mfrc522.uid.uidByte[1]) + (25112017)) ;
for (byte i = 0; i < mfrc522.uid.size; i++) {
Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
Serial.print(mfrc522.uid.uidByte[i], HEX);
content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
content.concat(String(mfrc522.uid.uidByte[i], HEX));
Serial.println();
content.toUpperCase();
if (content.substring(1) == "C4 C0 DD 79")
}
```

2) Web Implementation

1) Implementation of Student Report Web Interface

At this stage, it is to implement the web as an output which functions to display incoming student and lecturer reports.

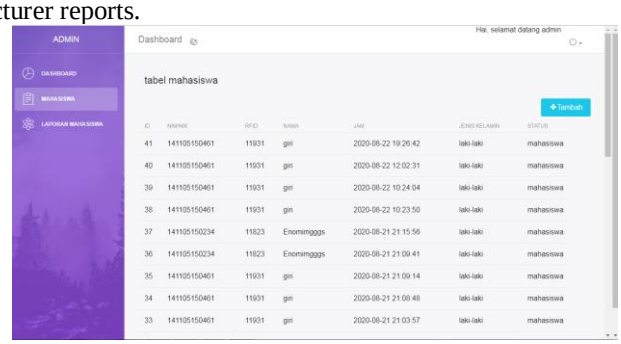

Fig 5. Student Table Interface

2) Student Data Web Interface Implementation

At this stage, it is to implement the web as an output which functions to display information on registered student data.

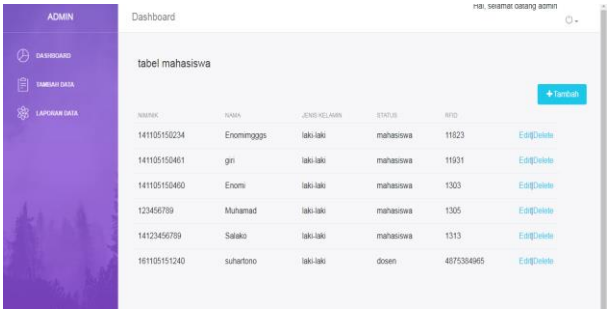

Fig 6. Student Data Interface

3) Implementation of the Web Interface adds student data

At this stage, it is to implement the web as output which functions to display information to add student data

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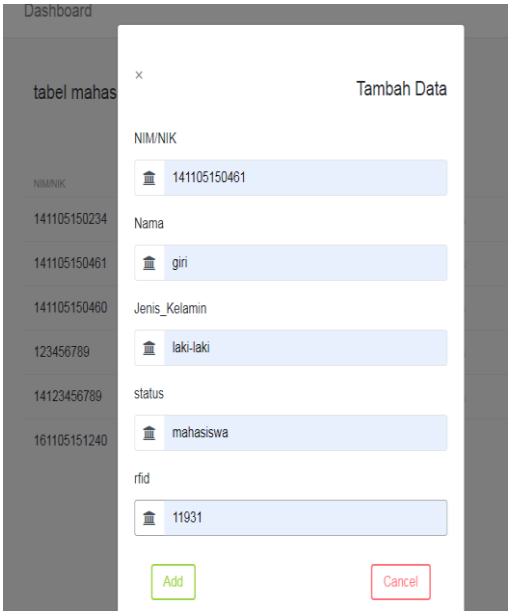

Fig 7. Interface Add Student Data

d. Testing

1) RFID Function Testing

In this research, rfid is as input. In testing the RFID is placed near the door. The results of this test are that RFID can read cards that have access to it. For the results of the RFID test, it can be seen in Figure 8 of the RFID testing.

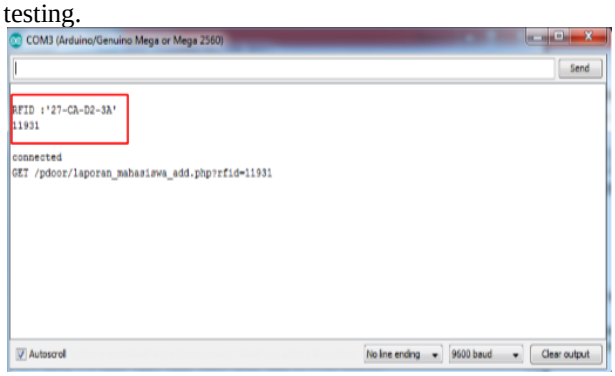

Fig 8. The RFID Testing

2) Web Testing Using Black Box

This stage is to conduct Web testing using a black box. Black box testing is carried out on Web pages so that the resulting Web matches expectations and the results are valid. The following is the black box testing with Equivalence Partitioning that will be carried out, which will get results in the form of a Web that matches expectations.

a) Black Box Testing on the Login page.

Black box testing is carried out on the login page, with the aim that the resulting login page matches expectations. The following is the test table from the login page.

Table 1

Testing Interface Login

No.	Test Name	Test Case	Expected results	Conclusion Testing Result	conclusion
1.	Leave all login data fields blank, then click the "Login" button	*Username* : - *Password* : -	The system will deny login access and display the message "Username and Password must be filled in".	According to expectations	Valid
2.	Fill in the Username "admin" then the Password is left blank	*Username* : admin *Password*	The system will deny login access and display the message "Username and	According to expectations	Valid

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No.	Test Name	Test Case	Expected results	Conclusion Testing Result	conclusion
	then click the "Login" button	: -	Password must be filled in".		
3.	Leave the Username blank then fill in the "admin" Password then click the "Login" button	*Username* : - *Password* : admin	The system will deny login access and display the message "Username and Password must be filled in".	According to expectations	Valid
4.	Fill in the Username and Password that does not match the data then click the "Login" button	*Username* : Admin1 *Password* : Admin1	The system will deny login access.	According to expectations	Valid
5.	Fill in the Username and Password according to the data in the database then click the "Login."	*Username* : admin *Password* : admin	The system will receive login access.	According to expectations	Valid

In table 1 is a black box testing table on the web login page. From the tests that have been obtained, the results are the appropriate and valid login page. The following is the test on the login page of several simulations from table 1.

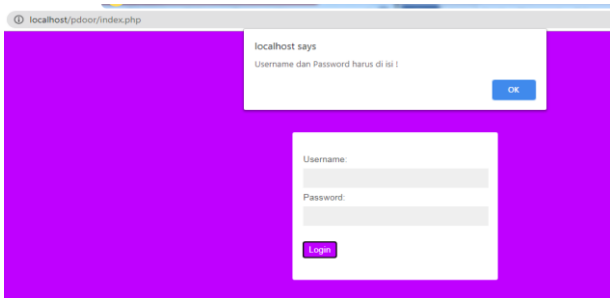

Fig 9. Validated Web login page test Failed

b) Black Box testing on adding student data.
Black box testing is carried out on adding student data with the aim that the resulting student page is as expected and valid. The following is the test table from the student table page.

Table 2.
Black Box testing on the student data addition page

No.	Test Name	Test Case	Expected results	Conclusion Testing Result	conclusion
1.	Adding student data by clicking the add button then filling out the form on the "student table" page	NIK / NIM: 141105150461 Name: giri Male gender Status: Student RFID: 11931	The system will receive new student data and display it in the student table	According to expectations	Valid

In table 2 is the black box testing table on the student table page. From this test, the results obtained are the student table page as expected and also valid

Fig 10. Student data input interface

c) Black Box testing on the student report page

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Black box testing is carried out on the student report page, with the aim that the resulting student report page matches expectations and is valid. The following table 3 tests from the student report page.

Table 3
Black Box Testing on the student report page

No.	Test Name	Test Case	Expected results	Conclusion Testing Result	conclusion
1.	Students attach, access the RFID Card to the RFID Reader with the ID that has been registered in the database	ID : 11931	The system will display on student reports	According to expectations	Valid
2.	Students attach, access the RFID Card to the RFID Reader with an id that has not been registered in the database	ID : 1256	The system will not display on student reports	According to expectations	Valid

Table 3 is the black box testing table on the student report page. From this test, the results obtained were the student report page as expected and also valid.

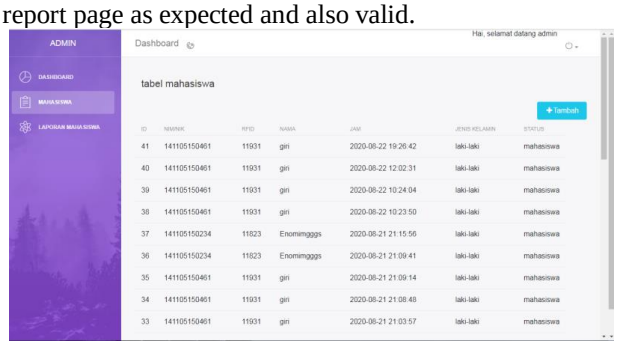

Fig 11. Student Report Testing Interface

4. Conclusion.

Based on the research conducted, the results and discussion in the previous chapter, the following conclusions can be drawn: (1) Design of this Automatic Sliding Door (i) Using Radio Frequency Identification as input. (ii) Ethernet Shield as data sender. (iii) Web As a monitoring interface. (2) This test has two types of testing, namely testing how to work where the tool can be used by attaching the rfid card to the rfid reader, then rfid sends data to arduino and arduino sending data to the servo motor to open and close doors automatically, and Ethernet. Shield will send data to the webserver with an RJ-45 cable which will be displayed on the website. And this web testing uses a black box with the expected results.

5. References

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