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DESIGN AND DEVELOPMENT OF LOGIN SECURITY SYSTEM USING RADIO FREQUENCY IDENTIFICATION

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Abstract. *System security is important in information systems to prevent unauthorized users from accessing data. Login system applies security using encrypted passwords stored on RFID cards. This research designed login security system storing encrypted password using MD5 encryption into the Mifare Tag RFID card and equipped NFC reader to read data from RFID Card. By storing encrypted password characters on RFID cards, login system security is stronger and cannot be traced by unauthorized parties to log into systems. Some stage of system design are through study of literature, designing process flow, system algorithms, designing encryption methods and system interfaces, writing card module coding, card reading module coding, implementation, and system testing. The system login applied by scanning RFID card on the NFC reader, if the password on RFID matches then the user successfully logs into the system. Based on the testing of RFID Tag readings, the maximum distance from the reading of RFID Tag cards is up to 7 cm with a reading range of 0^0 to 30^0 with a success rate of 100% authentication. By using RFID Tag cards, increase security for logging into the system, because user cannot log in without having a card with the appropriate password.*

Keywords : System Login, RFID Card, Encryption, Security, Password.

1. INTRODUCTION

System security and data confidentiality are important in information systems to prevent unauthorized users from accessing data. RFID (radio frequency identification) is a technology that combines the function of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum, to identify an object [1]. RFID is used as a tool to automatically control a chain of activities [2].

Previous research has implemented RFID in the patient's medical record queue system, aimed at reducing patient queuing time when processing medical records at outpatient registration in hospitals, where RFID is used for patient's unique code. This unique code will automatically display patient data so that it does not require search time for patient files that can increase the patient queue time [3].

System logins as system access security are implemented through inputting passwords, where passwords are privacy and confidential. The current condition of using a login password is registered through the username and password data input on the system. Although the password has been encrypted but because it is manually inputted into the system, it is possible that the password can be tracked with a certain algorithm so that unauthorized users can track and successfully enter the information system. A risk will appear if the password entered during the system login is not encrypted or made with words that are easily guessed by other users. This is an opportunity for sniffers to track the password to log into the system. Cryptography aims to provide security services, including security to maintain passwords. The character of the password that is owned must be

confidential so that the character password cannot be traced by people who are not entitled or who have no interest. In terms of system access security, it is important to pay attention to security by encrypting the password on the login system before the data is sent to the server [4].

The use of RFID (radio frequency identification) replaces the 1-dimensional and 2-dimensional barcode system (quick response code) which is generally still widely used RFID (Radio Frequency Identification) as one of the flexible, easy to use and very suitable identification technology for automatic operation. RFID is a card (card) that can only be read (read only) or can be read and written (read / write), does not require direct contact or light paths to operate, can function in a variety of environmental conditions, and provide a level of data integrity high, and difficult to fake, so RFID can provide a high level of security [5]. This digital transaction system using RFID is more profitable compared to conventional transaction systems both in terms of effectiveness and security. The advantage is that it only requires one card to access all digital transaction data compared to the current one which requires a lot of cards to access it. With one RFID card this can make it easier for humans to access various digital data transactions [6]. RFID can carry out automatic controls in various fields such as retail, manufacturing, library, supply chain and medical applications that have applied RFID technology [3]. RFID implements electromagnetic sensors that read tags through certain frequencies. Other research related to sensors is implementing motion sensors, temperature sensors and sound sensors to automatically turn on the lights on the toilet and turn off the lights automatically when no one is in the toilet [7]. The research conducted is designing a login system security by storing encrypted password characters into radio frequency ID (RFID), using RFID cards and NFC devices to read data on RFID cards. Password characters are encrypted using the MD5 encryption method. By storing encrypted password characters on RFID cards, login system security is stronger and cannot be traced by unauthorized parties to log into information systems. The system login is done through scanning RFID cards on NFC devices, if the password on RFID is correct, then the user can log in to the system, otherwise cannot enter the system. There are three types of labels on RFID [8,9], namely 1) active RFID labels require a power source in the production process so that they are larger in size, and emit signals to label readers and are usually more accurate than passive RFID labels. Active RFID labels have strong signals that can be used in environments that are difficult to reach such as water, or long distances to transmit data. 2)Passive RFID label itself does not use internal electricity and relies on the RFID reader in sending data. Passive RFID labels are more suitable for use in warehousing environments where there is rarely interference and relatively short distances, because passive RFID labels do not use internal resources so passive RFID labels are smaller and cheaper to produce. 3). Semi-Passive RFID label resembles an active RFID label where the Semi Passive RFID label has internal resources but does not emit a signal to the RFID reader.

Based on the above description of the background, the issues to be raised in this research are as follows: (a) How to design login security system by using radio frequency identification stages ?, (b) How the maximum distance of reading RFID Card into NFC Card reader?. The purpose of this study are as follows: (a) to determine the stages required for design and development login security system by using radio frequency identification stages, (b) to determine maximym distance of reading RFID Card into NFC Card. The benefits of this research are as follows: (a) to complete the project on time so that its budget use becomes efficient, and (b) To apply the new technology gained related to identify unique code by implementing RFID Card. The limitations of the research problems are: (a) research was design and development application for login using RFID Card, MIFARE Card, and (b) password character stored in RFID Card with encrypted to MD5 algorithm.

2. METHODS

2.1 Flow Chart

The research phase consists of several stages: library research, designing process flow and login system algorithms, designing encryption methods and system interfaces, writing program code to write and read password characters to RFID cards, system implementation and system testing.

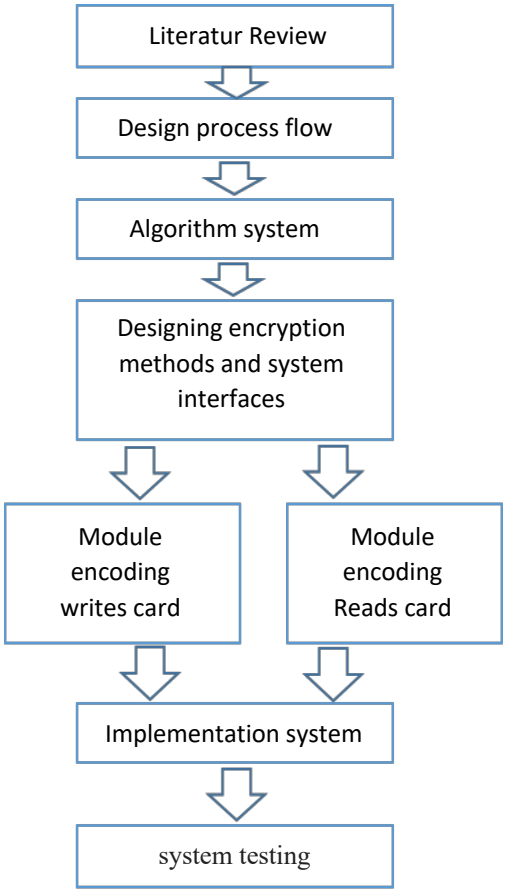

Figure 1. The Flow Chart of System Design and Development.

2.2 The Time of System Design and Development
The research execution time is 10 weeks.
2.3 Research Location
For the location of this research, it was taken in STMIK STIKOM Indonesia

3. RESULTS AND DISCUSSION

3.1 User Interface Screen Display
Main Menu User Interface as Figure 2 follow:

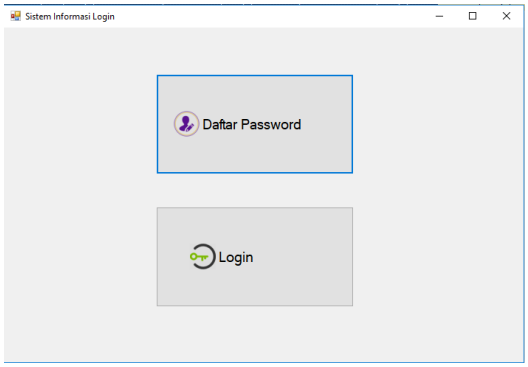

Figure 2. Main Menu User Interface

The main menu module consists of 2 parts, namely a list of passwords and logins. Register a password to register passwords and save passwords on the RFID card while the login functions to enter the system through RFID card scanning.

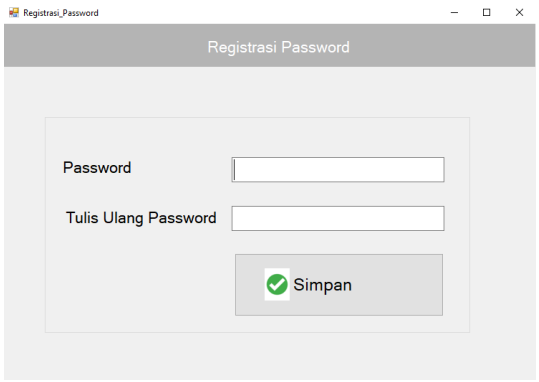

Figure 3. Password Registration Module

The password registration module functions to register passwords, encrypt these passwords and store passwords in the database and into the RFID card so that in the RFID card there is an encrypted password. In password registration, applying validation, the character password must consist of a combination of capital letters, numbers and symbols. The password character must be the same as the character in rewriting the password. The maximum number of password characters is 12 characters. The password validation display is as follows.

a. Display a combination of numbers, letters and characters.

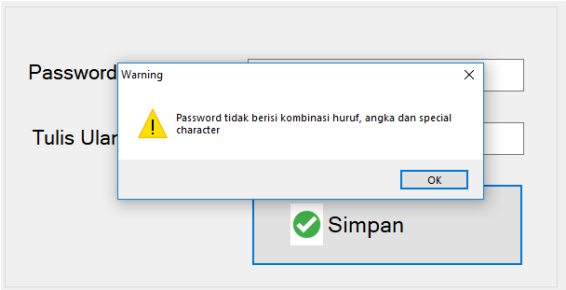

Figure 4. Validation of combination password letter, alphabet and character

b. Password validation maximum 12 character

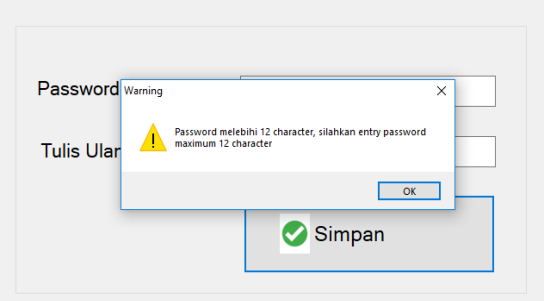

Figure 5. Password Validation maximum 12 character

c. Display password successfully saved in NFC Card

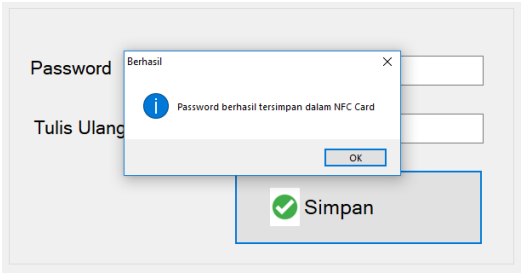

Figure 6. *Password* successfully stored in *NFC Card*.

Passwords that have been registered in the system are stored in the database in the form of data encryption, making it difficult to detect the character of the password used and increase security for logging into the system.

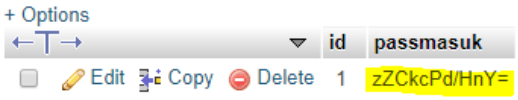

Figure 7. Encryption *password* result using MD5 algorithm

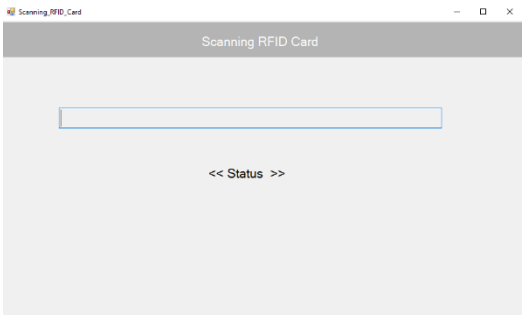

Figure 8. *Scanning RFID Module*

The RFID scanning module serves to scan RFID cards to read passwords on the card, then authentication and verification of the password is done to enter the information system.

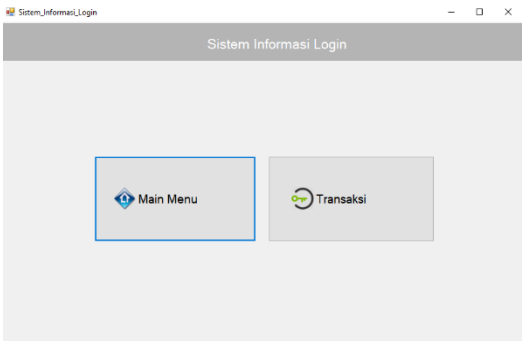

Figure 9. Information System Login User Interface

This module is the main menu module after the user has entered the system after verifying the password of the RFID card that was scanned on the NFC Reader scanning tool.

Testing Distance Between *Tag* and *NFC Reader* and Testing Result Angle *Tag* Relative to *NFC Reader* as Table 1 and Table 2 follows.

Table 1. Testing Distance Between *Tag* and *NFC Reader*

Tag Distance relative to *NFC Reader*	Frequency		
	Test1	Test2	Test3
1 cm	√	√	√
2 cm	√	√	√
3 cm	√	√	√
4 cm	√	√	√
5 cm	√	√	√
6 cm	√	√	√
7 cm	√	√	√
8 cm	-	-	-

Table 2. Testing Result Angle *Tag* Relative to *NFC Reader*

Angle Tag relative to NFC Reader	Frequency		
	Test1	Test2	Test3
5^0	√	√	√
10^0	√	√	√
15^0	√	√	√
20^0	√	√	√
25^0	√	√	√
30^0	√	√	√
35^0	-	-	-

4. CONCLUSION

The conclusion of this research is that the system design stages consist of literature studies, designing process flow, designing system algorithms, designing encryption methods and system interfaces, writing card module coding, card reading module coding, system implementation, and system testing. Testing the system by scanning an NFC Card Tag (RFID) card on a card reader, obtained the results of testing the maximum distance from the reading of the NFC Tag card is up to 7 cm with the reading angle range 0^0 until 30^0 with the success rate of the authentication process at 100%. By using an NFC card, increase security for logging into the system, because it is difficult to log in without having a card with the appropriate password.

5. REFERENCES

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