Home Security And Access System Prototype Using Fingerprint

Muh. Fahrurrozi[1], Lalu Puji Indra Kharisma[2]

[1,2]STMIK Syaikh Zainuddin NW Anjani, East Lombok, West Nusa Tenggara

Email : [1]f4.rozi@gmail.com, [2]lalupujii@gmail.com

Abstract

A sense of security and easy access in managing the house is a must that every home must-have. With advances in technology, it makes it easy for us to manage and maintain the security of our homes, one of which is by utilizing an embedded system in home management using fingerprints. Fingerprints are used as the main key to access the house to provide a sense of security, convenience in managing the house and minimizing cases of theft that occur in houses that still use conventional keys. based on trials carried out the use of fingerprints is easier to use than using an ordinary key with a success rate in the test, namely 100% in a clean and not wet state, 40% in wet fingerprints and 0% in dirty fingerprints or dusty.

Keywords: *Home Security, Finger Print, Embedded System.*

1. Introduction

Home is a place of refuge from all kinds of things like rain, heat and any of the evils. Everyone wants to have a safe and comfortable home to live in. Home security is one of the most important things in life. Every human being needs more security guarantees in their place of residence. Various kinds of developments in the field of technology are designed to provide security and even protect their assets, so it is hoped that a security system designed can provide a sense of security and comfort[1]. In addition to this, of course, the security system that will be designed can reduce the crime rate that occurs in the community, especially the crime of theft [2]. That's why A sense of security and convenience in managing the house is something that is very important to be considered and created when building a house, the house as a place to live has an important and vital role in our daily lives, how is it that a house is a place that we use as a place to live, a place to gather with family and where we store the valuables we have. so that the management of the house and the security of the house is one of the main priorities that must be considered. so that the house has good security so that it can provide a sense of security to the owner, it is necessary to create a good security system with easy access so that the house can be managed properly. The security system that can be used is to combine the embedded system with the fingerprints that we have. The fingerprint is one of the unique identities that every human has, but every human fingerprint is not the same as other humans. Because No human fingerprints are the same and are grouped into 3 types, namely arch, loop and whorls patterns, while the other patterns are variations of patterns that arise concerning the three basic fingerprint patterns [3]. Fingerprint characteristics are a combination of the pattern of the hill (ridge) and valley (valley). The shape of the hills and valleys is a combination of genetic factors and environmental factors that lead to skin formation in the fetus, however, The formation of fingerprints on the skin itself is a random event. This is one of the reasons why does every finger of a person have a different fingerprint different from others, even in identical twins [4]. In this study, we tried to make a prototype of a home security system by utilizing an embedded system for access to the house. the system to be made will be installed on the door of the house and the gate of the house. Security in access to open the door

is a factor that greatly influences the importance of the key role that can provide security on the door. The key is needed in a security system as a safety that can be used to open the door [5]. the hope is that this system can minimize theft mattresses that often occur in homes that still use conventional door locks. because one of the crimes of theft occurs because of the absence of a prevention strategy carried out by the apparatus and from the community, it certainly provides opportunities for perpetrators to commit crimes. This situation provides opportunities for perpetrators to commit crimes such as theft [6].

2. Research Methodology
In conducting research, the authors carried out several stages including:
2.1. Research Stages
a) Field Research, in the early stages the author conducted several methods including Observations, Design, Implementation.
b) Literature Review, at this stage the author reads literature related to research studies that have been carried out previously by several experts, from journals and books related to the research topic taken to support this research.
c) Stages of Analysis and Testing, in this section, the author selects several data samples.
d) Stages of Determination of Results and Research Resume.

2.2. Literature Review
a) Smart homes can also increase efficiency, comfort and security by using technology automatically [7].
b) An embedded system is a system designed for special purposes [8].
c) Arduino is an open-source electronics platform based on easy-to-use hardware and software. It's intended for anyone making interactive projects[9].
d) Sensor fingerprint FPM10A is modules that come with FLASH memory to store the fingerprints and work with any microcontroller or system with TTL serial. These modules can be added to security systems, door locks, time attendance systems, and much more [10].
e) System accuracy is calculated by comparing the number of correct diagnostic data with the number of test data [11].
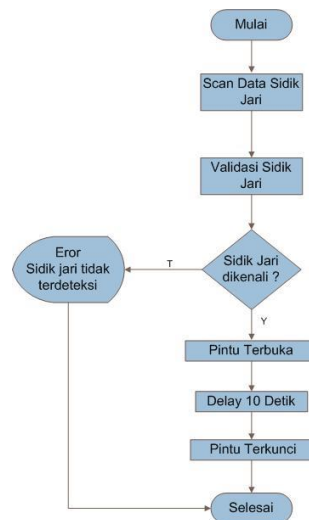
$$Akurasi = \frac{\sum Hasil\ Keputusan\ Benar}{\sum Data\ Uji}\ X\ 100\ \%$$

(1)

2.3. Design
The prototype system design made is divided into several parts including:
a) The design of how the system works
   The design of the workings of the prototype system is described in the form of a flowchart in Figure 1.

**Figure 1**. The Design of How The System Works

b) Hardware Requirement
The following are some of the hardware needed to create a prototype system including:
1) Arduino uno R3,
2) Sensor fingerprint FPM10A,
3) Relay 1 channel 5v,
4) Keypad 4x4 (Sealed Membrane),
5) Lcd 16x2 (Liquid Crystal Display),
6) Selenoid Doorlock,
7) Jumper Cable,
8) Adaptor AC to DC,
9) Switch ON/OFF,
10) Potentiometer mono.

c) Diagram Block System
The system block diagram tells the flow of input, process and output of the system created. An overview of the system block diagram can be seen in Figure 2.
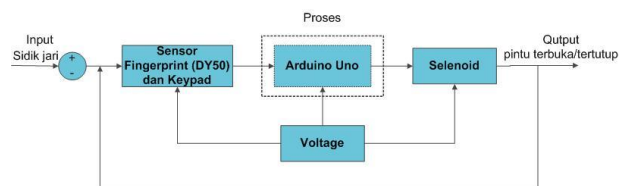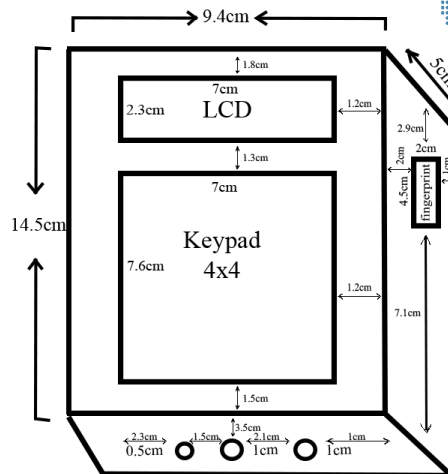

Figure 2. Diagram Block System

d) Design Hardware System
Design Hardware System describes the relationship between one hardware device with another to form the desired prototype. system design can be seen in Figure 3 and Figure 4.
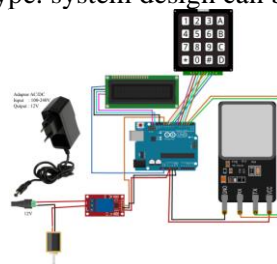
Figure 3. Design System

Figure 4. Design Hardware System

3. Results and Discussion

The implementation of the system prototype that has been designed can be seen in Figure 5

Figure 5. System Prototype

To use the system created can use the following steps :
Paste your fingerprint on the fingerprint sensor, then enter a 7-character password and press the fence button on the keypad to enter the admin menu. After entering the main menu, press the A button on the keypad to continue registration, enter the type ID that will be registered in the system and press the fence, then paste your fingerprint twice in stages to complete the registration. as shown in figure 6 to 9.
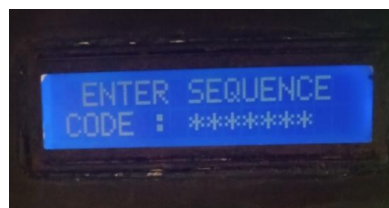
Figure 6. Login to Admin Menu

Figure 7. Admin Menu
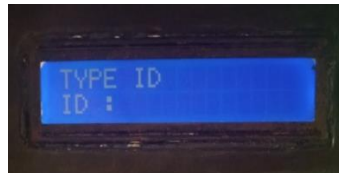
Figure 8. Input Fingerprint Information

Figure 9. Scan Fingerprint Information

Figure 10. Fingerprint Validation

Figure 11. Fingerprint Registration

4. Conclusion

The success rate of using this tool depends on the matching of fingerprints that have been stored on the system with the condition of the fingerprint when it is attached to the fingerprint scan. the condition of the fingerprint when it is attached to the fingerprint scanner greatly affects the success rate of validation. Changes in the condition of the fingerprint that are too significant will make the system not recognize the fingerprint that is attached even though it has been registered in the system. To test the extent to which the success rate and speed of the tool made in reading and validating fingerprint data, we provide 10 different examples of fingerprint data as test data and provide three different conditions for fingerprints already registered in the system, namely:

1) Fingerprints are clean and not wet
   The test results when the fingerprints are clean and dry provide a very high success validation with an accuracy rate of up to 100.
2) Fingerprints are clean and wet
   The test results when fingerprints are clean and wet provide poor validation of success with an accuracy rate of up to 40%.
3) Fingerprints are dirty or dusty
   The test results when the fingerprints are dry and dirty do not provide the expected level of accuracy, which is 0% because the fingerprint scan data stored in the system is different from the data entered, this is because the dirt attached to the fingerprint

causes the system to read the pattern of the fingerprint data. different finger with the data already stored in the system.

References

[1] Desnanjaya, I.G.M.N. and Sudipa, I.G.I., "The Control System of Kulkul Bali Based on Microcontroller", In *2019 5th International Conference on New Media Studies (CONMEDIA)*, IEEE, **(2019)** October**,** (pp. 244-250).

[2] Mubarok, A., Sofyan, I., Rismayadi, A.A., Najiyah, I. "Sistem Keamanan Rumah Menggunakan RFID, Sensor PIR dan Modul GSM Berbasis Mikrokontroler, Journal Informatika., Vol 5, No 1, **(2018)**

[3] Pollock, W.C. "Character Analysis From Fingerprint and Hands", New York: Press Inc. **(1971)**

[4] J. K. Author, "Sistem Biometrika: Konsep Dasar, Teknik Analisis Citra, dan Tahapan Membangun Aplikasi Sistem Biometrika". Yogyakarta, Andi Publisher, **(2009)**, pp. 255-264.

[5] M. Sirait, T. Kasmir "Design Of Open Door Access Security System Using Rfid (Radio Frequency Identification) And Sending Of Information To Phone", Journal Singuda Ensikom.Universitas Sumatra Utara., vol. 13, no. 37, **(2015)**, ISSN 2337-3237.

[6] M. Kemal Dermawan, "Teori Kriminologi", Universitas Terbuka, Jakarta, **(2000)**

[7] M. Grabowski and G. Dziwoki., "The IEEE Wireless Standards as an Infrastructure of Smart Home Network." Communications in Computer and Information Science 39: 302–9. **(2009)**

[8] S. Heath, "Embedded Systems Design". Oxford : Newnes Linacre, House, Jordan Hill, **(2003)**

[9] "Arduino - Introduction." [Online]. Available: https://www.arduino.cc. **[Accessed: 1-Des-2021]**

[10] Ada, "Adafruit Optical Fingerprint Sensor". [Online]. Available: https://learn.adafruit.com/adafruit-optical-fingerprint-sensor, **[Accessed: 1-Des-2021]**

[11] M. Sokolova dan G. Lapalme, "A systematic analysis of performance measures for classification tasks," Inf. Process. Manag., vol. 45, no. 4, **(2009)**

Authors

1st Author
Muh. Fahrurrozi
STMIK Syaikh Zainuddin NW Anjani, Lombok Timur, Indonesia

2nd Author
Lalu Puji Indra Kharisma
STMIK Syaikh Zainuddin NW Anjani, Lombok Timur, Indonesia