KnE Social Sciences

Knowledge E
Engaging minds

Conference Paper

Design of Automatic Door System with Fingerprint

Ratu Amilia Avianti

Program of Mechanical Vocational Education, Engineering Faculty, State University of Jakarta, Jakarta, Indonesia

Abstract

This research of an automatic door system be controlled with fingerprint sensor for access. The method used in this research is a development method to design, assembly, and test motion sensory performance. Tools needed to assembly the automatic door are a fingerprint sensor, and a microcontroller. The results of testing this tool is the creation of an automatic door that is sensory-based that integrated fingerprint sensors and motion sensors for close and open the door.

Keywords: automatic door, fingerprint sensor, microcontroller

Corresponding Author:

Ratu Amilia Avianti

avianti.raa@gmail.com

1. Introduction

Various control systems have been designed over the years to prevent access to unauthorized user. The main aim for providing locks for our home, school, office, and building is for security of our lives and property. It is therefore important to have convenient way of achieving this goal.

Automatic door system have become a standard feature on many different types of buildings and homes. They are becoming popular every day to develop an effective electronic devices which provide security. Home security has been a major issue because of the increase in crime rate and everybody wants to take proper action to prevent unauthorized user.

The main parameters for accessing usability can be summed up as follows; simplicity for user, feeling of resistance, speed of authentication, and level of valve rejection rate.

2. Methods and Equipment

🔓 **OPEN ACCESS**

2.1. Methods

This study is research and developmental research.

The data which is been received by the finger print ZFM-20, then given to the Microcontroller (ATmega328P), which understands in ASCII format, to depending upon the received set of character operations are performed. After that, the data ASCII format is received by motion sensor *Passive Infrared Receiver* (PIR) HC-SR50 for on or off the stepper motor. The stepper motor movement that connected to horizontal motion door. Output this system is movement stepper motor to open the door or close it.
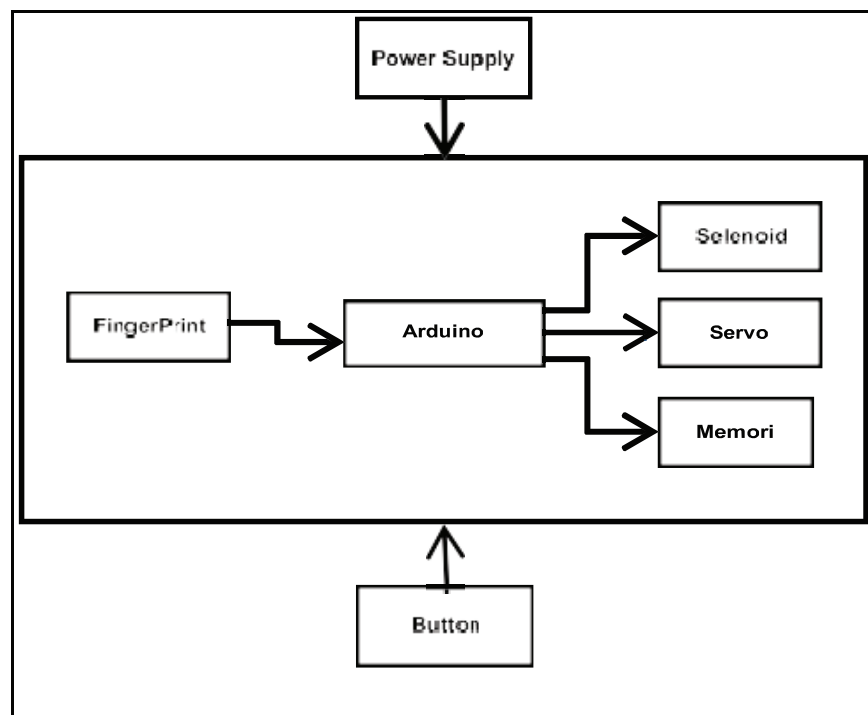

Figure 1: Block Diagram Automatic Door.

2.2. Equipment

2.2.1. Fingerprint ZFM-20

Figure-1 describes the system of *Fingerprint* ZFM-20 serial module. The Serial Modul Fingerprint ZFM-20 is a fingerprint with optical sensor, which can detect and verificate a fingerprint mode. Process the fingerprint sensor start of DSP chip to image rendering, than to calculate a feature-finding. The finish process is searching a existing data in memory.
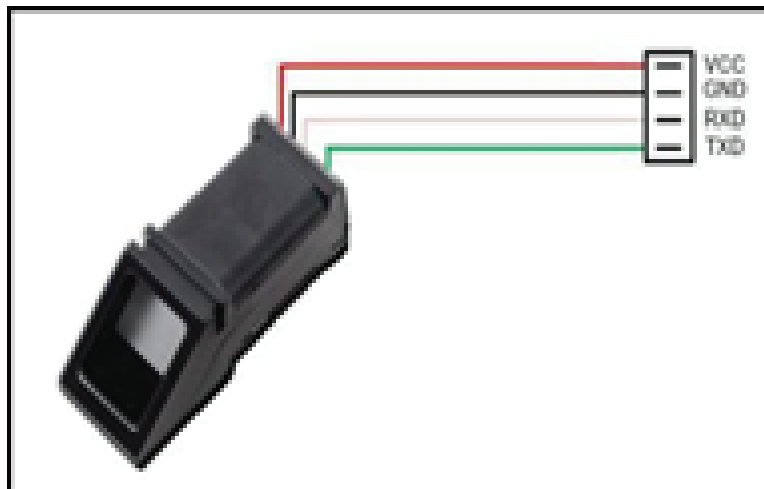
Figure 2: Fingerprint ZFM-20 [1].

Figure 3: Motion Sensor PIR HC-SR501 [2].

2.2.2. Motion sensor PIR HC-SR501

Figure 2 describes the *Passive Infrared Receiver* (PIR) for Motion Sensor. This sensor can detect the passive emission energy infrared which is owned by every object. One of the objects that has a passive emission energy infrared is the body of a person. In addition, any heat energy emitted by objects above zero degrees will be detected by this sensor. Components of PIR are Fresnel Lens, IR Filter, Pyroelectric sensor, amplifier, and comparator. Therefore PIR is useful for detecting movements around with infrared

technology. PIR HC-SR501sensor can be adjusted for its sensitivity level and delay duration. The voltage used is 5 volt DC.

2.2.3. Atmega 328P Microcontroller

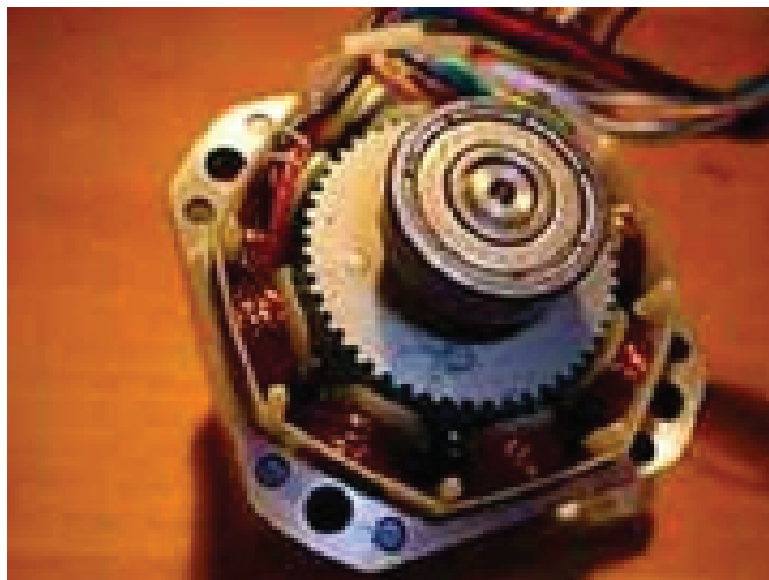**Figure** 4: Atmega328P Microcontroller [3].

Figure 5: Stepper Motor [4].

Figure 3 describe The Atmega 328P Microcontroller. The Atmega 328P Microcontroller is one type of the Arduino IDE that used which is used Integrated Development Environment (IDE) software. Arduino IDE can be operated by computer berbasis Java dan program C++.

A microcontroller serves as the brain of a mechatronic system. Like a mini self-contained computer, it can be programmed to communicate with both the hardware of the system and the user of that system. Even the most basic microcontroller can perform simple math operations monitor digital inputs, control digital outputs and gives efficient output. As the computer industry has evolved technology has also associated with microcontrollers.

2.2.4. Stepper motor

Figure 4 describe a stepper motor. The stepper motor is an electromechanical device whose function is to convert electrical power into mechanical power. Also it is a synchronous electric motor that can divide a full rotation into an expansive number of steps. The motor's position can be controlled accurately and efficiently without any feedback mechanism, as long as the motor is carefully sized to the specific application. Stepper motors are similar to earlier motors but has additional capabilities. The stepper motor makes the motor to take shaft turn an accurate distance when a pulse of electricity is provided. The stator has eight poles while the rotor has six poles. The rotor requires 24 pulses of electricity to move the 24 steps to make one complete revolution.
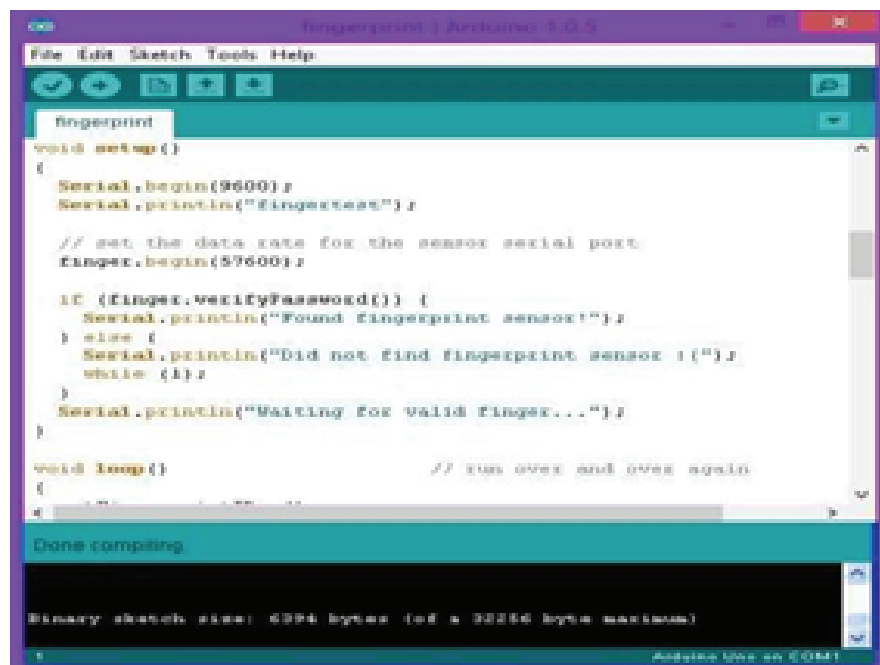
3. Results

Figure 6: Software for Microcontroller.

Table 1: Performances of Motion Sensor.

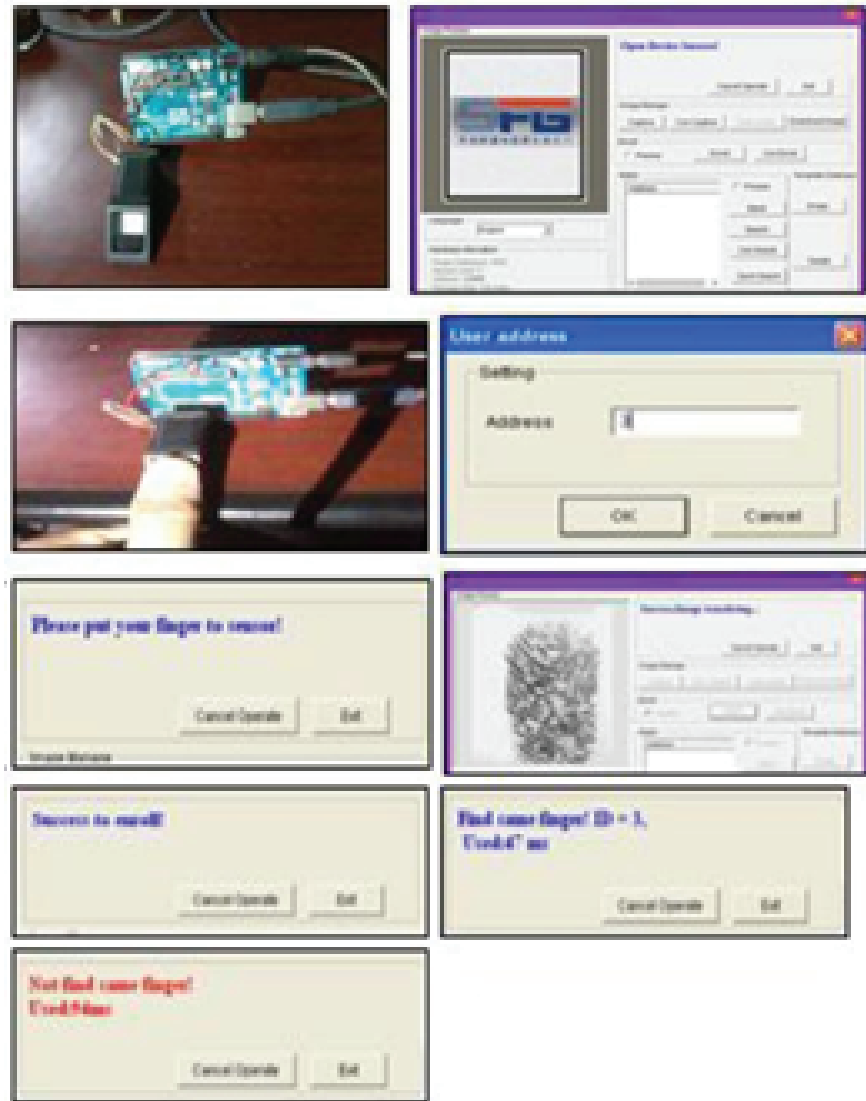| Num.	distance	Delay time	Sensitivity	Stepper Motor
1	1 m	1 second	Fast	Rotate
		1 minute	Fast	Rotate
2	2 m	2 minute	Fast	Rotate
		1.5 minute	Fast	Rotate

Figure 7: Result of Fingerprint Test.

Table 2: Performances of Stepper Motor DC and Door.

Num.	Name	Start value	Motion Motor	Door
1	Relay 1	0	Stop	Close
		1	Clockwise rotate	Opened
2	Relay 2	1	Counter Clockwise rotate	Closed
		0	Stop	Closed

4. Discussion

This work was supported by Competitiveness Growth Program. The main parameters for assing usability can be summed up as follows; simplicity for user, feeling of resistance, speed of authentication, and level of valve rejection rate.

The fingerprint is a simple tool for controlling door access by a large number of people.

5. Conclusion

Design step has gotten result to the components characteristic and arrange the program. Assembly Step has gotten result a physical form. Testing performance step has already proved the performance as expected.

This paper gives basic idea of how to control home security. So the implementation rate is inexpensive and it is reasonable by a common person. With the fingerprint connection in microcontroller permits the system installation in more easy way. The system has been successfully designed and aimed to control the door condition using a fingerprint and a stepper motor. We will implement the hardware and software for automatic door system.

Funding

Acknowledgement

Conflict of Interest

The authors have no conflict of interest to declare.

References

[1] Davide Maltoni, Dario Maio, Anil K. Jain, Salil Prabhakar. Handbook of Fingerprint Recognition 2nd.2009.

[2] Charles Platt. Encyclopedia of Electronic Components Volume 3: Sensors for Location, Presence, Proximity, Orientation, Oscillation, Force, Load, Human Input, Liquid and... Light, Heat, Sound, and Electricity, 1st Edition.

[3] R. H. Sudhan, M. G. Kumar, A. U. Prakash, S.A.N.U. R. Devi, and P. Sathiya, "Arduino Atmega-328 Microcontroller," *IJIREEICE*, vol. 3, no. 4, pp. 27–29, 2015.

[4] Matthew Scar. Motors for Makers: A Guide to Steppers, Servos, and Other Electrical Machines 1st Edition.

[5] Don Wilcher. Basic Arduino Projects: 26 Experiments with Microcontrollers and Electronics. 1st Edition.