
PROTOTYPE OF PERSONAL SAFE SECURITY DEVICE USING AN ARDUINO UNO-BASED FINGERPRINT SENSOR WITH SMS NOTIFICATION

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Abstract As we know, a safe is a place to store money and other valuables and important items. Because the security of the safe is currently still minimal and still uses old security methods, making it easy for criminals to break into it or damage it, to prevent such crimes, adequate security is needed as well as sophisticated and modern tools in keeping up with current technological developments so that the security system is more secure. In this thesis, the author makes an alternative solution to the existing problem, namely a prototype of a personal safe security device using a fingerprint sensor that has the ability to protect a personal safe by being equipped with SMS notifications, thereby increasing security for users. The design and manufacture of a prototype of a personal safe security device using a fingerprint sensor with SMS notifications uses research and development (R&D), which is a process or steps to develop a new product or improve an existing product. The results, or output, of the tool that the author designed are a prototype of a personal safe security device using a fingerprint sensor with SMS notifications.

Keywords: Arduino Uno, Fingerprint, selenoid

1. Introduction

As is known, a safe is a place to store money and other valuable and important items. Because the security of the safe is currently still minimal and still uses the old security method, making it easy for criminals to break into it or damage it, to prevent such crimes, adequate security is needed as well as sophisticated and modern tools in keeping up with current technological developments so that the security system is more secure.

Safes are the most highlighted thing in the scope of the security system, because the function of the door is as the main access to enter and exit the room. The application of this program to the safe security system is automation as a positive impact of technological developments to replace the role of humans with a tool or machine; therefore, basically, the safe has been controlled through the program, so it is expected that each safe does not have to be guarded continuously. This system is also equipped with an alarm if there is an error in the procedure for using the tool.

This research was conducted to create a prototype of a safe security device using an Arduino Uno-based fingerprint sensor. To improve the security of storing money, goods, and important documents to make them safer and more secure. Based on the theory above, the author raises the title " PROTOTYPE OF PERSONAL SAFE SECURITY DEVICE USING AN ARDUINO UNO-BASED FINGERPRINT SENSOR WITH SMS NO-TIFICATION ".

2. Materials and Methods

2.1 research methods

The research method used is the development method that the author will use, which is the prototype model. The product to be built in this study is a prototype of a personal safe security device using a fingerprint sensor with SMS notification.

The stages of the prototype include:

a. Requirements gathering and analysis

The initial stage of the prototype starts with a needs analysis.

b. Quick design

The second stage is making a simple design that will provide a brief description of the system to be created. Figure 2.1 tool design.

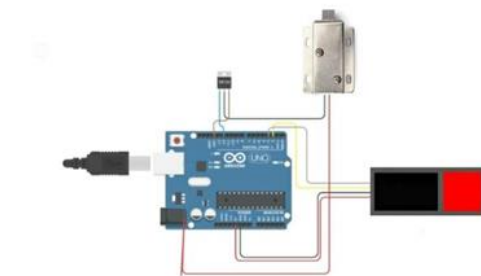


Figure 2.1 Tool design

- Physical fingerprint TX pin to TX pin of Arduino Uno
 - Physical fingerprint RX pin to Arduino Uno RX pin
 - Physical fingerprint pin 3.7 V to 3.3 V Arduino Uno
 - Physical fingerprint GND pin to Arduino Uno GND pin
 - The buzzer pin is positive to relay module No.
 - Connect the Buzzer pin negative to GND on the Arduino Uno.
 - The solenoid pin is positive to relay module No.
 - Solenoid pin negative to GND Arduino Uno
- c. Build prototype
- After the quick design is approved by the user, the next stage is the construction of the actual prototype, which will be used as a reference by the programmer team to create a program or application.
- d. User evaluation

After the prototype is made, the next stage is the evaluation by the user. At this stage, the system that has been made in the form of a prototype is presented to the client for evaluation.

e. Refining prototype

The refining stage is the stage of improving the prototype based on the results of client feedback in stage 4.

f. Implement

After the repair in stage 5 is approved by the client, the next stage is the implementation and maintenance stage.

1) Assembling the Safe Device

The safe assembly begins by cutting the plywood according to the desired size and then arranging the plywood to form a safe box. The next stage is to assemble all the



hardware needed in the safe. Figure 2.2. Safe assembly.



Figure 2.2 Safe assembly

Figure 2.3 Fingerprint configuration to Arduino.

2.2 Research Phase

2.1.1. Data collection

In this study, the author attempts to collect data from accurate information that can support the research process and results. The following are data collection methods, namely:

a. Observation

Direct observation was conducted in the field. The observation we conducted at BANK BRI, which uses a safe so that it can provide a real picture of what is needed

b. Literature Study

One of the data collection techniques used in this study is a literature study. Namely, by studying thesis books and journals according to the desired data. In this study, the author chose a literature study to collect references from theses on the Arduino Uno microcontroller and journals related to previous research that discusses the Arduino Uno microcontroller.

2.1.2. Data Analysis Techniques

a. Analysis data

Conducting an analysis of the problems that arise due to the rampant theft of goods that occurs, by collecting the data needed as study material, a security system is needed so that the owner of the goods can secure the goods. (Ardon arifam, 2021).

b. Tool planning flowchart

This planning stage is the doing stage Design planning includes designing simple tool models and, accordingly, designing tool models and component designs that will be used. The flowchart for the tool design stage can be seen in the image below.

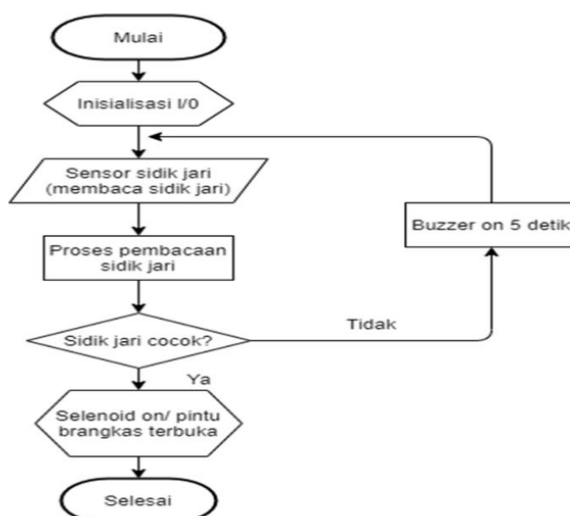


Figure 2.4 Flowchart

First, start by reading the fingerprint sensor, then the fingerprint reading process. When the fingerprint matches, then the solenoid is on or the door opens, and when the fingerprint does not match, then it will re-read the fingerprint.

c. Tool Design

Carrying out the design of the security system and tools that will be made in the form of a prototype, including the software and hardware requirements needed.

d. assembly

Assemble with the required materials, such as Arduino Uno, safe using plywood, fingerprint sensor, wood glue, and so on.

e. Coding

Create a tool in the form of a prototype using the programming language used by *Arduino*.

f. Implementation

After testing, the security system of the device will be implemented in the safe.

3. Results

3.1. Hardware implementation

3.1.1. Fingerprint Sensor Configuration

A fingerprint sensor is an electronic device used to capture digital images of fingerprint patterns. The results obtained from the fingerprint sensor will be sent to the Arduino to be received as data and forwarded to the GSM SIM8001 module so that it can be displayed via SMS. The SIM 8001 functions as a tool for sending SMS messages or making calls via a microcontroller. Figure 3.1 illustrates the fingerprint configuration to Arduino.



Figure 3.1 illustrates the fingerprint configuration to Arduino

3.1.2. Arduino configuration

Arduino is a microcontroller based on Atmega328 (datasheet). It has 14 input pins from digital output, where 6 input pins can be used as PWM output and 6 analog pins, a 16 MHz crystal oscillator, a USB connection, a 31 power jack, an ICSP header, and a reset button. Figure 3.2 Activating Arduino.



Figure 3.2 Arduino

3.1.3. Safe Configuration

A safe is a cupboard or box for storing items (such as money, valuables, jewelry, etc.) usually used to protect valuables from the danger of robbery/forced theft, which is made of plywood, and the locking system uses fingerprints. Figure 3.3. Safe display.



Figure 3.3 Safe

3.1.4. Assembly of Devices on the Frame

The assembly of the safe begins with cutting the plywood according to the desired size and then arranging the plywood to form a safe box. The next stage is to assemble all the hardware needed for the safe. Figure 3.4 Assembling the safe.

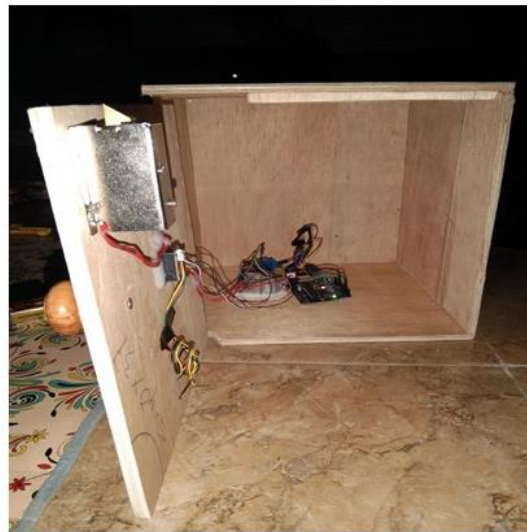


Figure 3.4 Safe Assembly

3.2. Software Implementation

software used in making a fingerprint sensor vault system with SMS notification with an Arduino device, namely with Arduino IDE as a database.

3.2.1 Arduino ide configuration

The Arduino IDE is software used to create and edit a program code, verify it, and upload the program code to Arduino. Figure 3.5. Arduino IDE

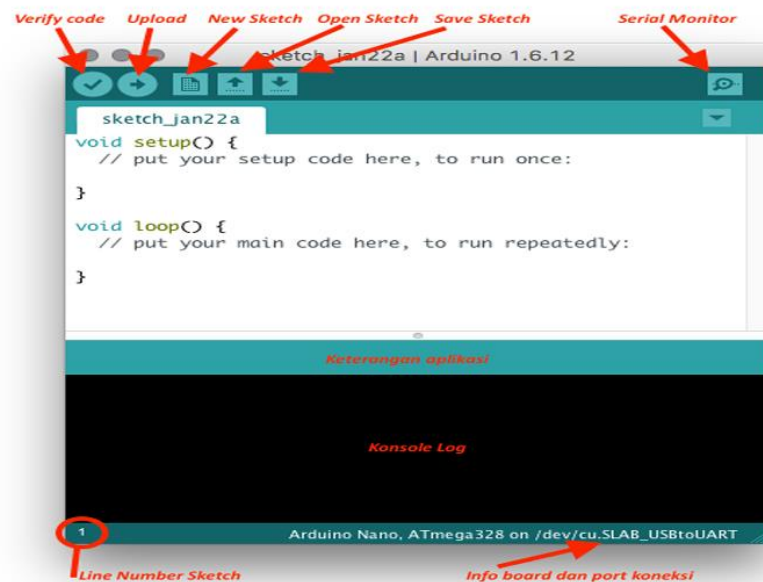


Figure 3.5 Arduino IDE

3.3. Tool Testing

Based on the results of the prototype creation that has been carried out, the following research results can be seen:

3.3.1 Tool design

In the design of this tool, we will be shown how the prototype of a personal safe using a fingerprint sensor looks from its inside and outside and several steps to use a personal safe using a fingerprint sensor for users. The shape of the safe from the inside and outside can be seen in Figure 3.6 and Figure 3.7.



Figure 3.6 framed form from the outside

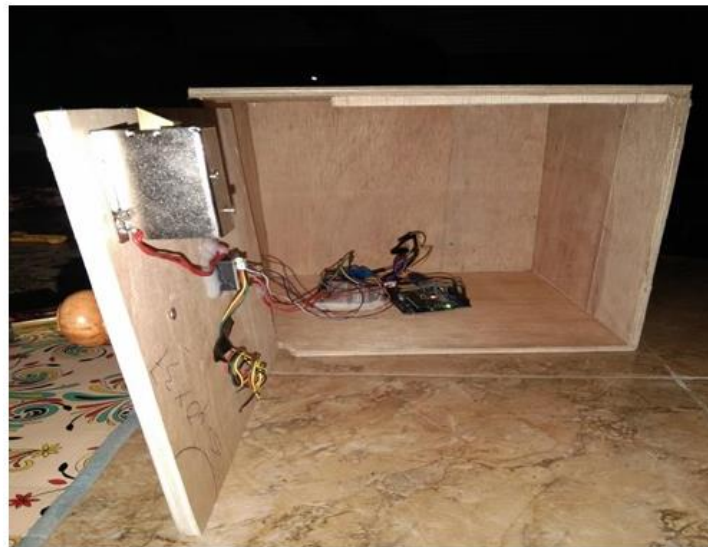


Figure 3.7 the form of the frame from the inside

3.3.2 Testing Results

a. Testing the device on the owner's finger

At this stage, it will be explained how to perform testing on the personal safe device and what tests are performed. Here are some procedures for using a personal safe device using a fingerprint sensor. Figure 3.8 testing the safe with a finger.

- 1) Turn on the device.

- 2) Place your finger on the fingerprint sensor.
- 3) The sensor detects your finger.
- 4) The door opens.
- 5) Done



Figure 3.7 Finger-safe testing.

- b. Testing the tool on someone else's finger
 - 1) Turn on the device.
 - 2) Place finger on the fingerprint sensor.
 - 3) Sensor does not detect finger
 - 4) Receive SMS notification
 - 5) Sensor fails to detect finger

4. Conclusions

Based on the test results that have been described in the previous chapters, it can be concluded that the tool can open a safe with a fingerprint sensor; the fingerprint sensor functions as a data input, the user's fingerprint is connected to a relay that controls the opening of the solenoid door, and the buzzer as an output will light up when access is rejected or unsuccessful. Implementation of a safe security site using Arduino-based fingerprints with fingerprints as input. So that the level of loss of goods or documents is smaller because only registered fingers can open it and via SMS notification for access if there is a break-in of the safe door.

References

- [1] Anton Yudhana, Sunardi, Priyatno. (2018). Perancangan Pengaman Pintu Rumah Berbasis Sidik Jari Menggunakan Metode Uml, Universitas Muhammadiyah Jakarta, jurnal teknologi Vol.10 No.2, ISSN : 2460-0288
- [2] Annisya, Linggahermanto, Robby Candra. (2017). Sistem Keamanan Buka Tutup Kunci Brankas Menggunakan Sidik Jari Berbasis Arduino Mega Jurnal Ilmiah Informatika Dan Komputer Vol. 22 No. 1, ISSN : 2089-8045
- [3] Alansanda and E. S. Julian. (2018). Prototipe Sistem Keamanan Pintu Dan Gerbang Rumah Berbasis Android, Jurnal Ilmiah Teknik Elektro, vol. 15, no. 2, ISSN : 1412-0372.
- [4] Eko Adji Saputro, Hani Alfiyah, Urip Roykhan Firdaus, Miftakhul huda, Qirom (2017). Sistem Pembuka Kunci Pintu Rumah Menggunakan Sidik Jari Dan Smartphone Android, Teknik Komputer Politeknik, Perpustakaan Poltektegal.
- [5] Eni Yuliza, Toibah Umi Kalsum. (2015). Alat Keamanan Pintu Brankas Berbasis Sensor Sidik Jari Dan Passoword Digital Dengan Menggunakan Mikrokontroler Atmega 16, Jurnal Media Infotama Vol. 11 No. 1, ISSN : 2723-4673.
- [6] Ferry Yuda Purnama, (2018). Pengembangan Media Pembelajaran Akses Kontrol Fingerprint Pada Mata Pelajaran Perekayasa Sistem Kontrol Program Keahlian Teknik Elektronika Industri Di SMK, Universitas Negeri Yogyakarta, Jurnal e-Resources
- [7] Sari, Winda Eka dan syahwin. (2022). Prototipe Sistem Keamanan Brankas Berbasis Arduino Menggunakan Android, Universitas Islam Sumatera Utara, Medan, Jurnal Teknik Informatika Vol.1 No.4, ISSN : 2829-7342.
- [8] Anifam, Very Kurnia Bhakti, Wildani Eko Nugroho. (2021). Rancang Bangun Sistem Keamanan Brankas Menggunakan Sidik Jari (Finger Print) Berbasis Arduino Uno Dengan Notifikasi Telegram (Doctoral dissertation, Politeknik harapan Bersama Tegal).
- [9] Okta Rea Arsyad, Kurnia, P. Kartika. (2021). Rancang Bangun Alat Pengaman Brankas Menggunakan Sensor Sidik Jari Berbasis Arduino, Universitas Islam Balita Jurnal Mahasiswa Teknik Informatika (JATI), Vol. 5 No. 1.
- [10] Muhamad Saleh, Munnik Haryanti. (2017). RANCANG BANGUN SISTEM KEAMANAN RUMAH MENGGUNAKAN RELAY, (Universitas Suryadarma, , Universitas Mercu Buana), Jurnal Teknologi Elektro, Vol. 8 No. 3, ISSN: 2086-9479