

Password Code and Fingerprint Based Security Using Relay

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Abstract: This project focusing on security system and the implementation is more to industrial site such as manufacturing plant or site that have a mega machine that must turn on and shut down carefully. By using a password and fingerprint scanner can reduce the chance to fatal injury because of only the person in charge that can turn on or off the system. Electrical engineer protection using user changeable password based and fingerprint scanner to trigger the circuit breaker. A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by overload or short circuit. Its basic function is to detect a fault condition or interrupt current flow. A keypad and fingerprint scanner are used to authorize the input and a relay to open or close circuit breaker, which is indicated by a lamp.

Keywords: Password, Fingerprint Scanner, Protection

1. Introduction

1.1 General background

Electrical accidents are defined as any incident in which an electric current has an unanticipated consequence and causes injury, death, or damage to property. Misunderstandings between the technician and the general workforce are to blame for many of the industrial site's fatalities. It is up to the engineer or maintenance expert to turn on or off the electrical lines in this project. Maintenance workers or engineer must scan a thumbprint and enter a password to turn on or off the electrical line, and if there is any fault in the electrical lines or network, technician can easily deactivate circuit breakers by entering an assigned or dedicated password, which will automatically deactivate the circuit breakers and allow them to carry out repair on the electrical line.

The circuit breaker with fingerprint recognition and password code is a technology that allows for the most targeted access. Injuries to engineer and other maintenance workers are on the rise due to electrical malfunctions. During the course of electric line repair, there may be an increase in deadly

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electric accidents for engineer owing to technical problems, equipment failures, and a lack of communication and coordination between the maintenance team and the electric substation team. The breaker can be constructed in such a way that it can function with the best legal character and thumb print to avoid such mistakes.

1.2 Problem statement

Back these few years, so many fatal injuries cause from electrical maintenance and equipment failures [1]. By providing self-assurance to guard engineers throughout upkeep paintings on excessive voltage installations. It is observed that fatal electric injuries to the engineer or technician are growing at some stage in the electrical line restore due to the dearth of verbal exchange and coordination between the upkeep group of workers and the electric powered substation staff.

A circuit breaker is an essential part of an industrial electrical system. It's used for both protection and switching. As a result, a circuit breaker's dependability is critical. Circuit breakers deteriorate over time and with the number of operations. This raises concerns about the dependability of circuit breaker operation. It is common practice to perform preventative maintenance on circuit breakers at regular intervals to ensure their reliability. Although the circuit breaker is healthy, the primary downside of this maintenance strategy is the extra downtime and offline use of separate testing equipment [2]. This raises the expense of circuit breaker maintenance.

Furthermore, in current practice, circuit breaker control is done by hardwired control logic, which increases the size of the circuit breaker's control and metering cabinet and inhibits Internet of Things integration. Because circuit breaker data is not available on the go, decision making is hampered. Currently, circuit breaker monitoring is done using proprietary systems such as Remote Terminal Units and SCADA. Because the backend implementation of the proprietary solution is not visible to the user, it raises concerns about the dependability and security of the strategic application [3].

1.3 Objectives

- a) To develop a relay system with fingerprint and password protection.
- b) To determine the system operation in a real time situation.
- c) To verify the performance of the operation via experimental

1.4 Scope

This project implements in Low Voltage Switchboard (LVSB) to turn on and off the system by authority person using fingerprint and numeric password. These requires several important parts such as fingerprint module, keypad, relay, bulb and Arduino Uno.

Emergency push button required to cut off the current and it do not need to scanning fingerprint and insert the password to trigger the relay because it just bypasses from AC current to relay and emergency push button.

The function of the bulb is to show that the current is flowing or not. If the bulb is light up it means the current is flowing, if the bulb does not light up the current is not flowing.

The password and fingerprint enrollment must set in the source code in Arduino and monitor it in serial monitor to detect the data of the fingerprint is successfully stored or not.

2. Methodology

This section will explain how the system works, Password code and fingerprint-based security using relay. The process will be support with aid of diagram to be more understandable. Some hardware will be used to make this project working properly.

2.1 Working principle of the project

This system must have the correct passcode and then place your finger at the fingerprint scanner. If they are correct, the LCD will appear 'Pass accepted' and the relay will work to let the current flow to the lamp. If the password is wrong or the password and fingerprint is wrong, the LCD will appear 'Wrong password try again' and the relay will not operate as well as the lamp because the current is not flowing.

In this project will place a button at every lamp and will cut off the current to turn off the lamp that we want. To turn off the circuit, place finger at fingerprint scanner enter the correct password then the circuit will turn off.

2.2 Block diagram

Figure 1 shown block diagram of the system which includes 4x4 keypad and fingerprint module is the input of the system. Firstly, must scan the fingerprint and then insert the password by using 4x4 keypad. It will send the input to the Arduino Uno and it will process the information as output. The output is the 16x2 LCD screen and the single channel relay. The LCD will display the password is accept or not. After the data is matched, it will trigger the relay to let the current flow to turn on or turn off the bulb. Lastly, the latch button act like emergency button, if the button is push, it will cut off the current to turn off the bulb.

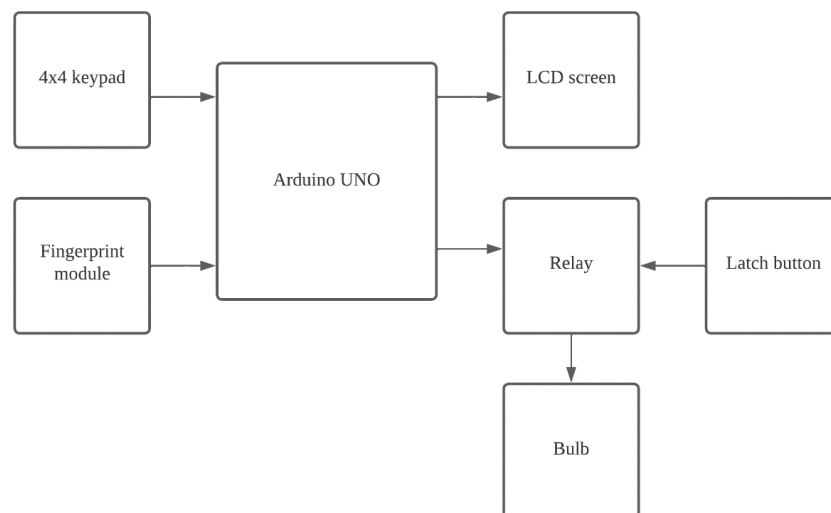


Figure 1: Block diagram of the password code and fingerprint based security using relay

2.3 Flowchart

This flowchart shows the flow of the whole system working parallel to the source code shown in Figure 2. It starts with the scanning fingerprint then insert the password. After it all match with the data in the coding, it will trigger the relay and let the current flow to turn on the bulb.

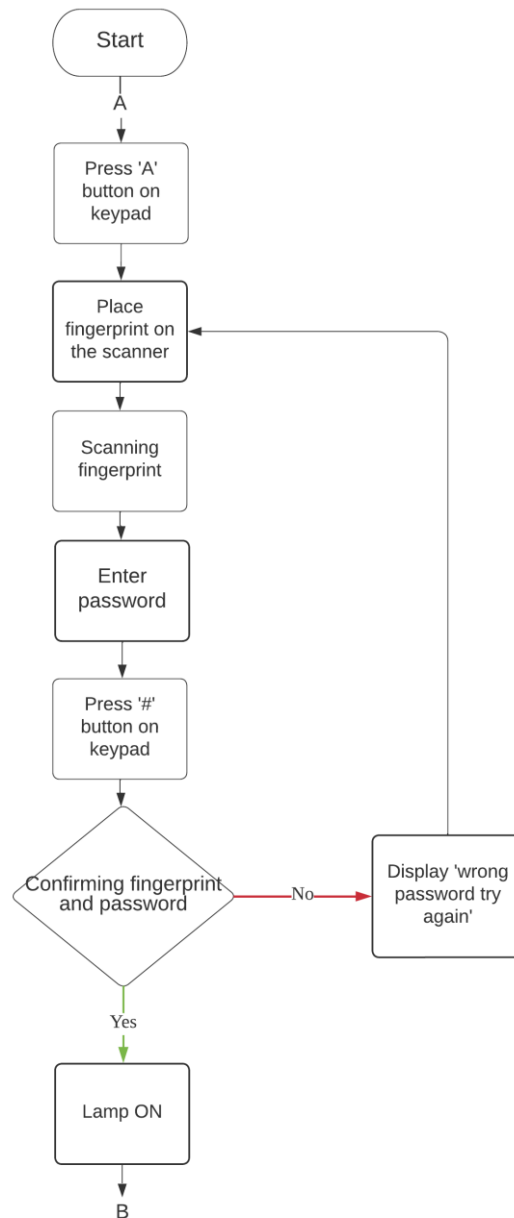


Figure 2: Flow chart of the password code and fingerprint-based security using relay if the lamp is on

This flowchart illustrates the overall system flow in parallel with the source code presented in Figure 3. The scanning of the fingerprint is followed by the entry of the password. When it matches the data in the coding, it will activate the relay and cut the current flow, turning off the light.

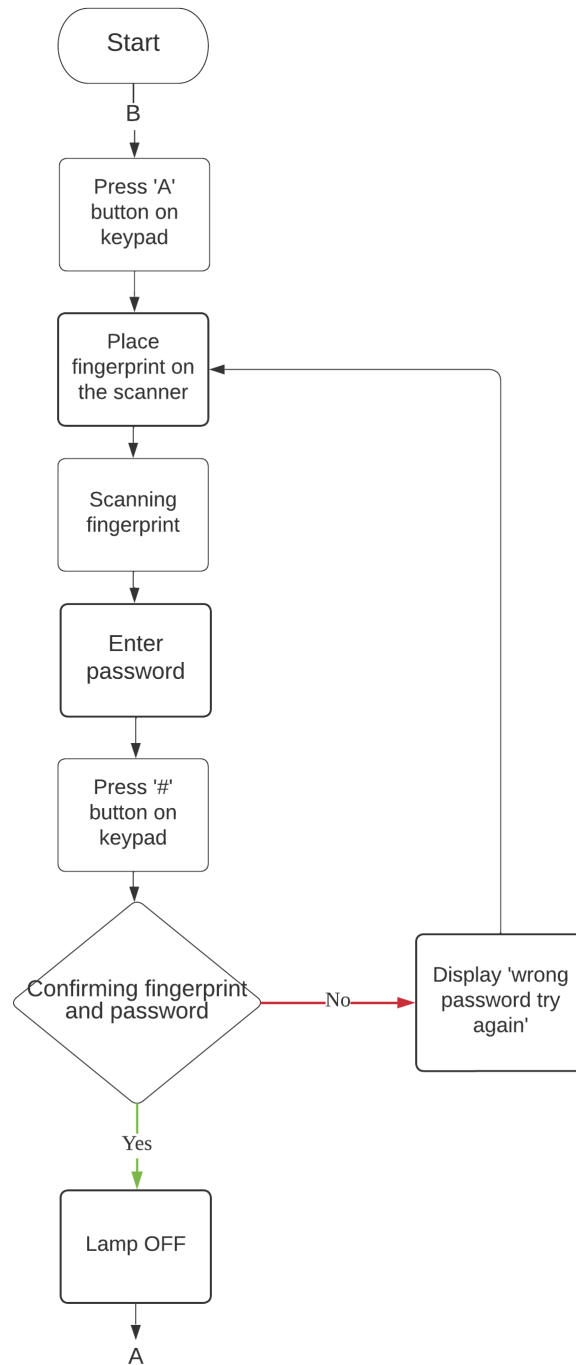


Figure 3: Flow chart of the password code and fingerprint-based security using relay if the lamp is off

2.4 Summary output of the system

This system will show 2 output which is display and the load based on detection the input of the fingerprint as shown in Table 1. On LCD display, it will show 'enter password' at first. After the fingerprint and password is correct the LCD will show 'pass accepted'. Lastly, Arduino will process the data and send the signal to relay, and it will let the current flow to switch on the lamp. If the password and fingerprint is incorrect the system will not operate so the lamp or load will stay turn off.

Table 1: Summary of system password code and fingerprint-based security using relay

Security output	Description of the operation.	Lamp output
Authorized	Arduino will process the fingerprint data that already stored in the memory to match with the coding.	Lamp on
Not authorized	The fingerprint data is not match with the data have been stored in coding.	Lamp off

2.5 Bill of materials

The total cost for the completion of this product prototype is accounted for RM 166.70. The components and other related materials are listed as following Table 2.

Table 2: Bill of material and project cost summary for prototype

No	Component	Quantity	Unit cost
1	Arduino UNO	1	RM 38
2	Fingerprint sensor	1	RM 50
3	4x4 keypad	1	RM 2
4	LCD i2c	1	RM 12
5	12 vdc lamp	1	RM 18
6	Single channel relay	1	RM 3
7	Jumper wire	3	RM 8
8	Breadboard	1	RM 12.70
9	Junction box	1	RM 11
10	Adapter 12V	1	RM 12
	Total	15	RM 166.70

2.6 Schematics diagram of prototype products

The system interface, Arduino Uno is powered by direct current (DC) power supply via DC adapter to turn on the led and power bank to turn on the Arduino Uno as shown in Figure 4. Fingerprint module is to recognize the user and the keypad is to put the password of the system. LCD is to display if the password is accepted or wrong password. The latch button act like emergency button can immediately turn off the load which is the lamp. The single channel relay uses to trigger the lamp if the password is correct.

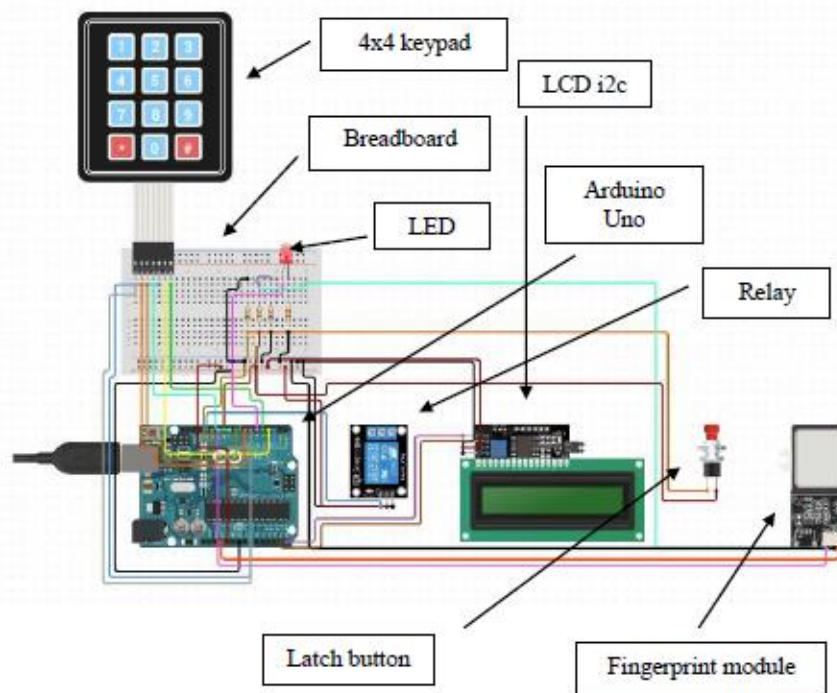


Figure 4: Schematics diagram of password code and fingerprint-based security using relay

3. Result and discussion

This chapter will discuss about the mechanism of the working principle in password code and fingerprint-based security using relay. This chapter elaborate the algorithm with details in every working part such as fingerprint recognition, password processing, display processing, relay and load working step.

3.1 Final hardware setup

The hardware setup of final product prototype is assembled according to the schematic design as illustrated in subchapter 3.7. These contains all of the components that listed as in bill of materials and all the connection is follow with the coding setup in Arduino Uno to run the system. Figure 5 shows the final hardware setup.

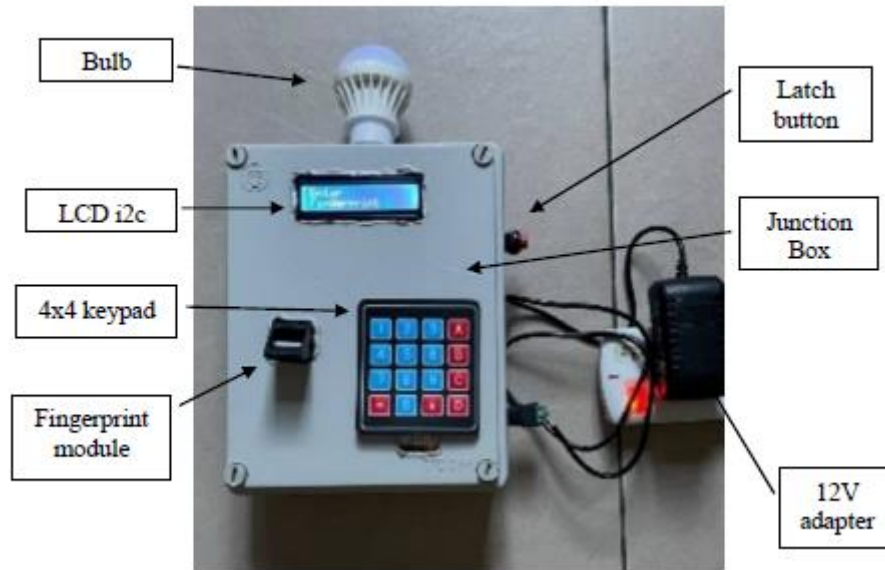


Figure 5: Final hardware setup for password code and fingerprint-based security using relay

3.2 Fingerprint enroll into Arduino Uno

Fingerprint module must connect to Arduino and the source code in register fingerprint must upload into Arduino Uno as shown in Figure 6. Then, the fingerprint module is detected and it ready to enroll a fingerprint. First, enter the ID that we want to save in number and only can choose number 1 to 127.



Figure 6: Fingerprint module is ready to enroll

Place finger on the fingerprint module and wait until the image of fingerprint is taken. After that, place finger for second time to matched with the first fingerprint. The image of the fingerprint will convert into data and it will be stored in Arduino Uno as fingerprint ID number 1 as shown in Figure 7.



Figure 7: Image of fingerprint successfully stored in Arduino Un

3.3 Set the password for password code and fingerprint-based circuit breaker

The initial password size is only 4 characters, and it can choose anything from the 4x4 keypad that connected with Arduino. It only can set in programming source code and upload it to Arduino such as shown in Figure 8. So, '1234' is the password that set in this system.



Figure 8: Set password for password code and fingerprint-based security using relay

3.4 Switch on the system

Switch on the plug to let current flow to supply to the bulb. Power bank is needed to supply current to the Arduino Uno. After that, if the bulb is turn on, it shows the current is successfully bypass to the system. Figure 9 shows the system is turn on.



Figure 9: The bulb is successfully turn on

To turn on the Arduino Uno, must connected to power bank to supply the current which is 5 V. It is enough voltage to turn on the Arduino Uno and act as a microprocessor. This shown as Figure 10 below.



Figure 10: Power bank supply current to Arduino Uno

3.5 Scanning the fingerprint and insert the password

Press button 'A' to enter the ID The LCD will display 'enter fingerprint' Place the user's finger until the green light at fingerprint module turn off as shown in Figure 11. It shows the fingerprint data is matched with the stored fingerprint.



Figure 11: Fingerprint is scanning the user's finger

Figure 12 shows after the fingerprint is correct, LCD will display 'enter password' and then insert the right password that matched with the source coding. Then, LCD will display 'pass accepted' and then the lamp will turn on and off. The '#' button is the enter button after confirming the password. The LCD will display 'pass accepted' after the fingerprint and password is matched with the coding source in Arduino Uno.

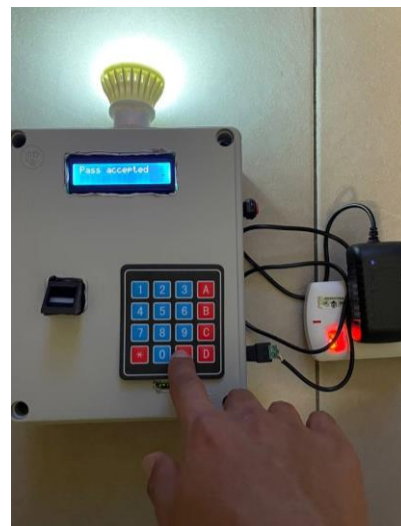


Figure 12: Fingerprint and password is matched; it triggers the relay and light up the bulb

3.6 Trigger the emergency push button

Latch button act like emergency push button to cut off the current to the load which is the bulb. It is implemented to have a safety feature to cut off the current flow even the fingerprint and password is not insert. The emergency push button place at the side of the junction box as shown in Figure 13.



Figure 13: Emergency push button is triggered to cut off the load

4. Conclusion

In this paper shows a conceptual implementation of password primarily based and fingerprint scanner security using relay control with a view to reduce the dimensions of the circuit breaker & facilitate the idea of as needed renovation technique. Moreover, this will get rid of the priority concerning security vulnerability of third-party gadget because the platform is open supply. Being a prototype conceptual implementation, future paintings can be achieved on implementation of open supply inferential engine so one can acquire recommendation on upkeep, integration with automatic upkeep management software program, development of open-source hosting server.

Acknowledgement

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