

Student Attendance System Using Fingerprint and Raspberry Pi with Notification

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Article info: Received 03/02/2025, Revised 10/02/2025, Accepted 05/03/2025

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Abstract

Fingerprint is an application designed to meet the needs of fast data using fingerprint verification. A fingerprint attendance machine is a type of biometric attendance machine that uses the student attendance/attendance method by detecting fingerprints. This fingerprint attendance is designed with a Fingerprint Sensor, LCD, and notification components. The purpose of this final project is to design an attendance device with fingerprints and a web database as a means of attendance. This system uses a Raspberry Pi as the controller. The study used fingerprints that had previously been verified in the database. In testing this attendance system, there are four tests, namely LCD testing, which is based on the results of the LCD only displaying all forms of data as a display that is by the registered database, fingerprint testing, and 10 times fingerprint testing of 20 people can produce a read. 97.7% of this value can be attributed to the average success rate of the fingerprint. web testing based on the results that have been tested on the Selenium IDE tool with successful output and no errors, the web is available 2 seconds after the fingerprint The data will be stored directly in the web database. Application testing, based on the results of application testing, namely, after fingerprint data enters the web database and immediately notifies the parents' Gmail account of the information from the application that the student has taken attendance, and the parents can see the attendance data or information from the student.

Keywords: student, attendance, fingerprint, raspberry

1. Introduction

The student attendance system is an absolute benchmark for the learning system at Lhokseumawe State Polytechnic. Attendance serves as a means of information for lecturers regarding the discipline of students in their courses, thus ensuring more effective assessments. Attendance systems that still rely on conventional signatures are considered ineffective in supporting learning and engagement. Various problems arise, including some students using friends to sign their attendance sheets, students forgetting to sign their attendance sheets, lecturers forgetting to bring attendance documents, or a lack of internet connection for online attendance. A fingerprint sensor is a device characterized by a high level of accuracy and biometric technology. Biometric identification techniques for user authentication are more secure and easier to use than passwords. Among the various techniques available, fingerprint sensing combines convenience and security. Compared to remembering "strong" passwords and the possibility of adding tokens, fingerprints can be a viable option. By utilizing a microcontroller and fingerprint sensor to record student fingerprints, it is hoped that an attendance system with high accuracy and user-friendliness can be created [1][2].

2. Methods

A block diagram is a diagram of a system, where the main parts or functions represented by blocks are connected by lines, indicating the relationships between the blocks. Block diagrams are widely used in engineering for hardware design, software design, and process flow diagrams. Previous research on fingerprint-based fingerprinting [3][4].

The design of an attendance system, which served as a guide for this research [5]. The block diagram for the student attendance system research using fingerprints and a Raspberry Pi with notifications can be seen in the Figure 1.

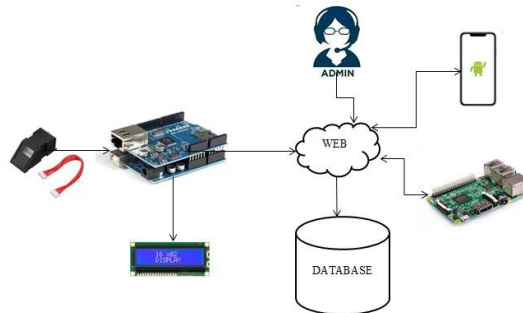


Figure 1. System Blok Diagram

A. Designing a fingerprint circuit on an Arduino sensor

The Arduino sensor for the fingerprint circuit on the board has GND on GND, 5 Volts on VCC, Pin 2 on RX, and Pin 3 on TX. Figure 2 show the Fingerprint Circuit Design.

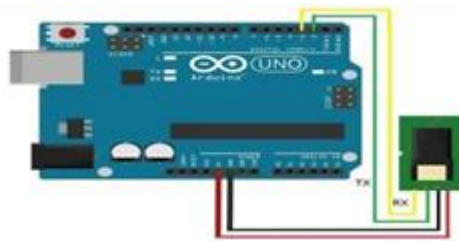


Figure 2. Fingerprint Circuit Design

B. Designing an LCD Circuit on an Arduino Sensor

The Arduino sensor for the fingerprint circuit on the board is connected to GND, 5 Volts to VCC, A4 to SDA, and A5 to SCL. Figure 2 show the LC Circuit Design.

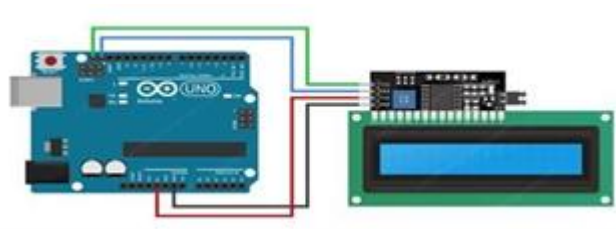


Figure 3. LC Circuit Design

C. Raspberry Pi GPIO Circuit Design

The Raspberry Pi module used has General Purpose Input/Output pins.

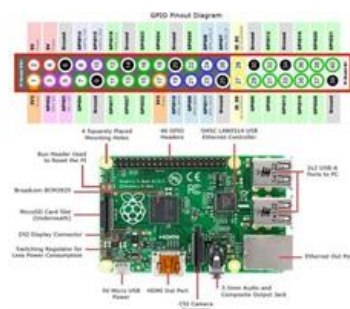


Figure 4. GPIO Raspberry Pi Design

This allows the selection of ports for the ultrasonic sensor and GPS module used in the inspection circuit to be adjusted according to the location of the existing GPIO pins. The design of GPIO Raspberry shown in Figure 4.

3. Result and Discussions

The analysis will include testing the monitoring system and the overall system, encompassing the DHT11 sensor, load cell sensor, and the visual system.

- Fingerprint Testing: This fingerprint test is to determine the accuracy of the attendance process. In this test, 10 trials were conducted for each person, resulting in the accuracy results presented in Table 1 below.

TABLE 1. The First Fingerprint Test Result

Name	Finger	ID	Test Sum	Succeed	Not Succeed	Percentage
M.Raysa	Jempol Kanan	1	10	10	0	100%
Aulia.M	Jempol Kiri	2	10	10	0	100%
Zuheri	Klingking Kanan	40	10	10	0	100%
Rahmazan	Telunjuk Kanan	4	10	10	0	100%
Nurliana	Telunjuk Kanan	5	10	10	0	100%
Nurliani	Telunjuk Kiri	6	10	10	0	100%
Retya.A.O	Jari Tengah Kiri	7	10	10	0	100%

The fingerprint data has been successfully tested based on the data and has also been stored in the database, the accuracy results obtained from the fingerprint test are calculated as follows:

$$accuracy = \frac{10-0}{10} * 100=100\%$$

The Table 2 below shows the second fingerprint that has been successfully tested based on the data and has also been stored in the web database. This table shows the second fingerprint test with the following accuracy calculation :

$$accuracy = \frac{10-4}{10} * 100=60\%$$

TABLE 2. The Second Fingerprint Test Result

Name	Finger	ID	Sum Test	Succeed	Not succeed	Percentage
Nisha.K	Jari Manis Kiri	8	10	6	4	60%
Mansurni	Telunjuk Kiri	9	10	10	0	100%
M.Raysa	Kelingking Kiri	10	10	10	0	100%
Fany Sury	J.Manis Kanan	17	10	10	0	100%
Ida.M	J. Telunjuk Kiri	34	10	10	0	100%
Lia.I	J. Tengah Kanan	32	10	10	0	100%

Table 3 shows the third fingerprint test that has been successfully tested based on the data and has also been saved in the web database, and in this table is the third fingerprint test with the following value search,

$$accuracy = \frac{10-0}{10} * 100=100\%$$

TABLE 3. The Third Fingerprint Test Result

Nama	Sidik Jari	ID	Jumlah Pengujian	Berhasil	Tidak Berhasil	Nilai Persentase
Cut A	Telunjuk Kiri	33	10	10	0	100%
M Raysa	Klingking Kanan	13	10	10	0	100%
Jikti K	J.Tengah Kiri	14	10	10	0	100%
Rizki F	J. Manis Kiri	15	10	10	0	100%
Aulia A	J. Tengah Kanan	16	10	10	0	100%
Rahmi	J. Manis Kanan	30	10	10	0	100%
Amalia	Telunjuk Kanan	31	10	10	0	100%

- Notification Email : After fingerprinting, the system will send a notification to the student's parents via Gmail, allowing them to monitor their child's attendance. The results of sending the notification are shown in Figure 5.



Figure 5. Email Notifications

Based on the table above, 97.7% of the registered fingerprints were successfully read. This value is obtained from the average fingerprint success rate. The total number of successful fingerprints in the first table is 70 out of 70 tests, because each person was tested 10 times. The value of 70 is divided by 70, then multiplied by 100, resulting in 100% in the first table. The total number of successful cases in the second table is 56. Then, 56 is divided by 60, and the result is multiplied by 100, resulting in 93.3%. The total number of successful cases in the third table is 70 out of 70 tests, because each person was tested 10 times. The value of 70 is divided by 70, then multiplied by 100, resulting in 100% in the first table. Because the total number of successful fingerprints is divided by the total number of tests when the placement is performed. The following table shows the third fingerprint that has been successfully tested based on the data and has also been stored in the database. After completing the fingerprint, a notification will be sent immediately to the parent's Gmail to monitor the child's attendance. In this notification, the parent can download the application and create an account if they do not already have one to log in to the system.

- Web Testing: Web testing using the Selenium tool, and according to the test results, the output was successful. The following is a description of the buttons in the Selenium testing tool, which can be seen in Table 4 below:

TABLE 4. Selenium Results

Button	Output
Username	OK
Password	OK
Mahasiswa	OK
Orang Tua	OK
Jurusan	OK
Prodi	OK
Kelas	OK
Report	OK

4. Conclusion (14 pt)

Based on the discussion and testing conducted on the fingerprint attendance system, the following conclusions can be drawn:

- Based on the testing, it can be concluded that out of 10 tests performed on 20 individuals registered in the table, 97.7% of the fingerprints were read successfully.
- The application created by parents can only monitor children's attendance based on data recorded by fingerprints and the database in real time.

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