

Dual Authentication System using Bluetooth for Attendance System

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Abstract: *Dual Authentication System Using Bluetooth for Attendance System is a security system that allows users to access the system or application using two different ways: Bluetooth and a password. This system's main objective was to investigate and design a dual authentication system using Bluetooth. Next, this system aims to develop the implementation of a dual authentication system using Bluetooth and evaluate the effectiveness of the dual authentication system using Bluetooth for attendance systems. This system can obtain user information by scanning the Bluetooth address from the user's smartphone. The user's Bluetooth address can be obtained by using the Bluetooth Scanner Device that will be developed. The security feature of this system uses Bluetooth Low Energy (BLE). It verifies the device you're connected to if it's the intended device and then generates an encryption key for both devices to use throughout the session. The user can use this system by using two login options: Bluetooth and a password. For the Bluetooth login method, the user must be on the Bluetooth Scanner Device and press the 'Login' button on their smartphone. For the password login method, the user only needs to enter the user ID and password.*

Keywords: Dual Authentication; Bluetooth Communication; Attendance System; Bluetooth Light Energy.



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1. INTRODUCTION

Bluetooth Scanner Device will be developed in this project. The device will be designed using Arduino software, Wi-Fi, and Bluetooth Modules (ESP32)(Maji, 2020). Moreover, the system's interface will be developed using PHP and connected to the database. The cost to create the system is low so that the system can be widely used. The data required by the user to use this system is the username, user ID and user password. The security feature used for this system, Bluetooth Low Energy, is essential for this system so that user information is guaranteed to be safe (Seyemer, 2019).

Attendance management system is an important aspect for any company or organization. Through attendance data, we can get a general understanding of the basic performance of employees or students. At the same time, attendance is also closely related to the employee's salary base. With the advent of smart phones nowadays, the attendance system has become easier than in the past when companies or institutions still used the time card system (Punch Card). This Dual Verification

Attendance System will allow users to check their attendance by using Bluetooth from their smartphone. The system will use a dedicated Bluetooth Scanner Device to scan the user's Bluetooth address when the user comes to the terminal. By using this system, user attendance information and data will be accurate and easier. This study contains all the detailed information about the attendance system and consists of a description of the issues, goals, scope, and importance of this system.

Due to the development of advanced technology nowadays, the attendance system has also been improved by using the QR code system (Li, 2020). However, there are still shortcomings regarding the current attendance management system that uses the QR code system. The problem is that QR codes can be scanned wherever they are. Employees or students just need to get a picture of the QR code, and they can scan the code even if they are not in the right location. As a result, neither the employer nor the management can identify the exact location of the employee. Therefore, user attendance information obtained through the current attendance system is not transparent and attendance information is easily manipulated by users. Therefore, this Dual Verification Based Attendance System was created to obtain transparent and accurate attendance information and data and prevent employees or students from abusing the existing attendance system.

2. METHOD & MATERIAL

The hierarchical chart that has been built based on the Dual Authentication Based Attendance System becomes a reference in the process of designing the structure of this interface in order to explain the functions and how to use this system according to the role of the entities and components involved. Figure 1 shows the hierarchical chart for this study.

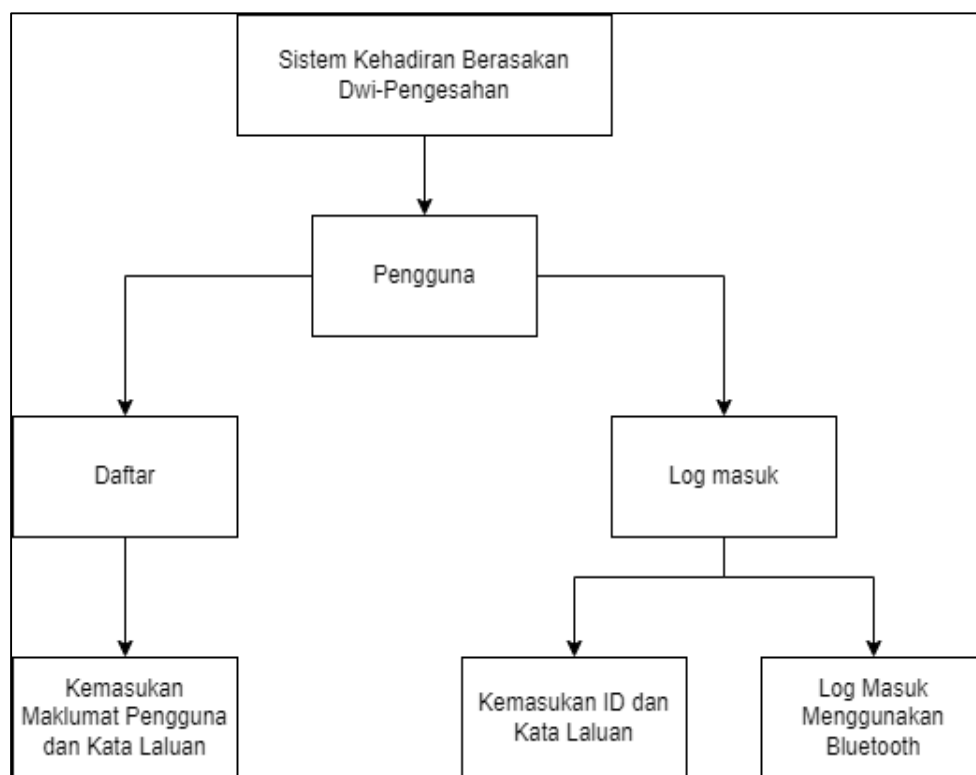


Figure 1. The hierarchical chart

The hierarchy chart will also give an overview of the flow and process involved in the Dual Authentication Based Attendance System which has only one type of user and contains two main pages namely New User Registration Page and User Login Page.

2.1 New User Registration Page

The new user registration page is an important page where new users will register themselves into the system. New users need to come to the Bluetooth Scanner Device and the user will be asked to fill in the user ID, username and password fields to register. Once this process is done, user information will be registered into the system. The user's information will be used for the log-in process into the Dual Authentication Based Attendance System.

2.2 User Login Page

The user login page is a page that users will use to log their presence into the system. The user needs to come to the Bluetooth Scanner Device and the user just needs to press the login button displayed on the smartphone screen. For the second method, the user only needs to enter the user ID and password to log in the presence in the system. This process needs to be done to ensure that user attendance information can be recorded in the Dual Authentication Based Attendance System.

2.3 System Interface Design

The system interface design phase is an important phase because the interface plays an important role in creating a system that is comfortable for users. This is because, the interface is a part of the system that the user will face to achieve the objective of the Double Authentication Based Attendance System and if the user does not face any problem using the system, then the objective of the study will be achieved. The interface also indirectly gives understanding to the user to use the system and shows the user about the functions found in the system. The interface is a combination of elements from the system, elements from the user and also the method of communication or interaction between the two.

2.4 User Registration Page Interface Design

Figure 2 shows the interface display of the new user registration page for the Dual Authentication Based Attendance System. In the page there is space to fill in the user ID, username, password and the register button. When the user presses the register button, the user's information will be stored in the system database. After the registration process, users can log in attendance using this system.

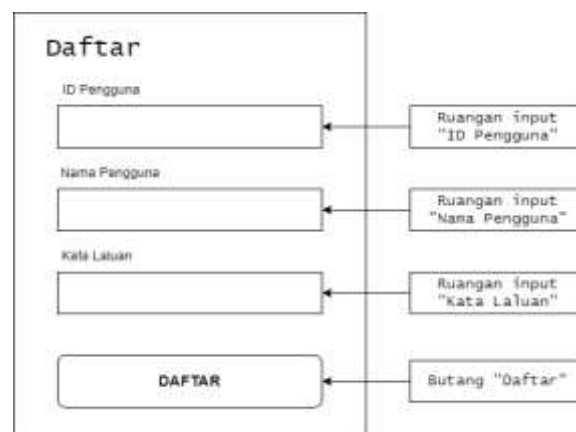


Figure 2. User Registration Page

2.5 Login Page Interface Design

Figure 3 shows the user presence login page interface display. For this site, users are given two options to log in. First, the user can log in the presence of the user using Bluetooth that has been scanned by the Bluetooth Scanner Device. Additionally, users can log in attendance using a password. Users only need to enter their user ID and password.

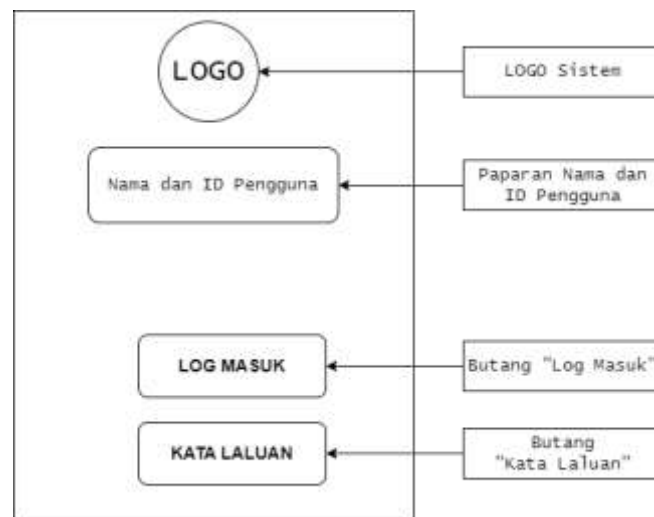


Figure 3. User Login Page

2.6 System Algorithms

The Algorithm of the Attendance System Based on Dual Authentication is generated pseudo-randomly based on numbers and symbols and converted to hash form. Algorithm involvement in this system to ensure the user registration process and user presence login can be carried out. Using this algorithm the Bluetooth Scanner Device can scan the Bluetooth address from the user's smartphone and then proceed with the registration process and attendance login process. Figure 4 is the Pseudo Code used to ensure that the Dual Authentication Based System can function properly.

```

Hadir ke Peranti Pengimbas Bluetooth
Buka Sistem

Input: ID Pengguna, Nama Pengguna, Kata Laluan
Proses 1;
If
    Pengguna tidak wujud
    Papar halaman pendaftaran;
Else
    If
        Pengguna Log Masuk Menggunakan Kata Laluan atau Bluetooth;
    If
        Rekod kehadiran disahkan;
    If
        Masukkan Maklumat pengguna dalam pangkalan data
        Berjaya log masuk;
    Else
        Ulang Proses 1;
    Else
        Ulang Proses 1;
    Else
        Ulang Proses1;

```

Figure 4. System Algorithm

3. FINDINGS

The implementation process is the process of applying what has been discussed in the design in order to build a system that works as planned. The system is built according to functional and appearance requirements based on design and user-friendly interface. Each action that the user needs to perform will be explained according to the steps in the sequence.

3.1 User Login

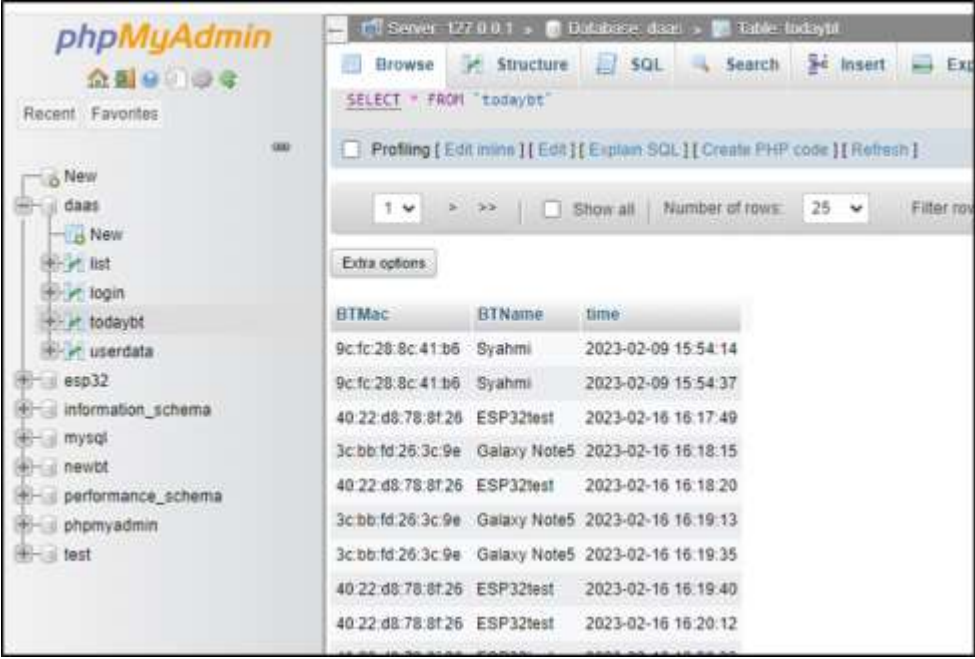
The user login process is the first process that will happen in this system. Users must enter user ID, username, password, Bluetooth address to register themselves in this system. All information that has been filled in by the user will be used to give access to the user during the login process. An error message display will appear if the user enters the required details incorrectly. Figure 5 shows the interface display of the check-in.

The image shows a user registration interface. At the top, there is a blue logo consisting of two overlapping shapes, with the word "SIGNUP" in bold black text below it. Below the logo are four light blue rounded rectangular input fields, each with a label: "ID", "Username", "Password", and "Bluetooth Address". The "Password" field has a small eye icon on its right side. Below these fields is a dark blue rounded rectangular button with the text "Sign up" in white. At the bottom, there is a link that says "Already have an account Login". The entire interface is enclosed in a light blue border.

Figure 5. User Registration Interface

3.2 Bluetooth Scan

Users need to scan Bluetooth on the smartphone to enter the Bluetooth address into the database. To verify login the user needs to enter the Bluetooth address in the database. Figure 6 shows the user's Bluetooth address in the database.



Server: 127.0.0.1 Database: daas Table: todaybt

SELECT * FROM "todaybt"

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

1 > >> Show all Number of rows: 25 Filter rows

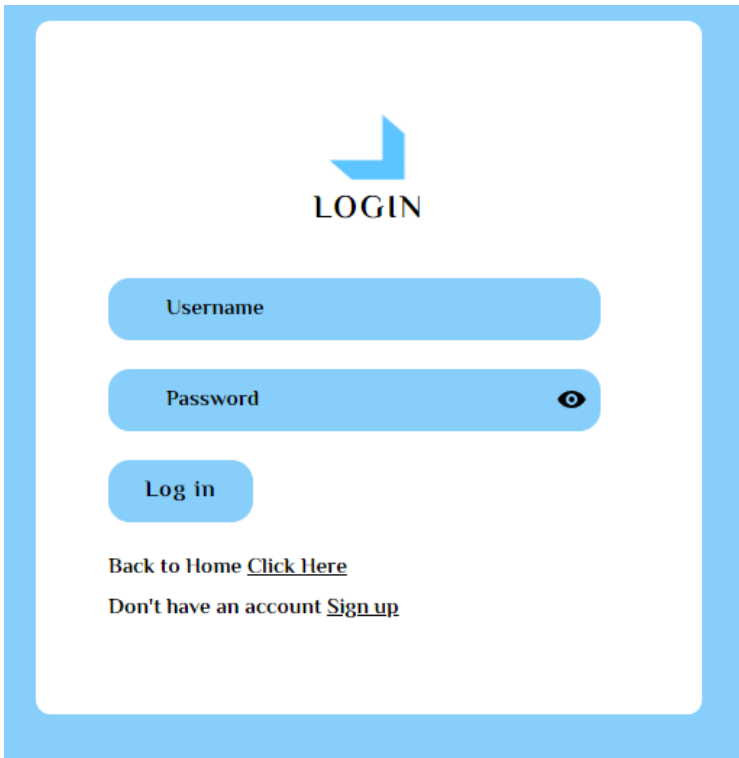
Extra options

BTMac	BTName	time
9c:fc:28:8c:41:b5	Syahmi	2023-02-09 15:54:14
9c:fc:28:8c:41:b6	Syahmi	2023-02-09 15:54:37
40:22:d8:78:8f:26	ESP32test	2023-02-16 16:17:49
3c:bb:fd:26:3c:9e	Galaxy Note5	2023-02-16 16:18:15
40:22:d8:78:8f:26	ESP32test	2023-02-16 16:18:20
3c:bb:fd:26:3c:9e	Galaxy Note5	2023-02-16 16:19:13
3c:bb:fd:26:3c:9e	Galaxy Note5	2023-02-16 16:19:35
40:22:d8:78:8f:26	ESP32test	2023-02-16 16:19:40
40:22:d8:78:8f:26	ESP32test	2023-02-16 16:20:12

Figure 6. User Bluetooth Address Database

3.3 User Login

This user login process is a module that will be done by the user to access the main page. The user needs to enter a username and password as the first authentication. Only users who have a Bluetooth address in the database can access the main page. Figure 7 shows the display of the login interface. Figure 8 shows the display of login successfully registered.




LOGIN

Username

Password 

Log in

Back to Home [Click Here](#)

Don't have an account [Sign up](#)

Figure 7. User Login Page Interface



Figure 8. Login Successful Interface

4. DISCUSSION

Beta testing or user acceptance testing is a testing process for users to ensure that all system objectives are achieved and the system interface is easy for users to understand. Testing has been done by users to ensure that all the features in the system can be used perfectly. Thus, in order to get feedback from system users after the beta version system is launched, slide and analysis questionnaires are distributed to beta users to receive feedback from them whether positive or negative so that the system can be evaluated and improved if there are any deficiencies.

Before the process to develop this system is done, this study has distributed a questionnaire to 30 users who have access to the main page. This is to get some information and user wishes before this system is developed. Appendix B shows the questionnaire that was distributed. After getting feedback from users, the developer has made an analysis of the questionnaire. Figure 9 shows a graph of feedback from users.

Question 1 shows the highest amount of negative feedback compared to other questions is because beta users who do not understand the concept of double authentication feel that this method is a bit cumbersome and difficult for the user, making it less user friendly, but that is the sacrifice that the user has to make to ensure that the data obtained is accurate for the user although less user mesa.

Also, based on the results of the feedback, most users chose a positive answer. So it is proven that this system works well and achieves the set objectives.

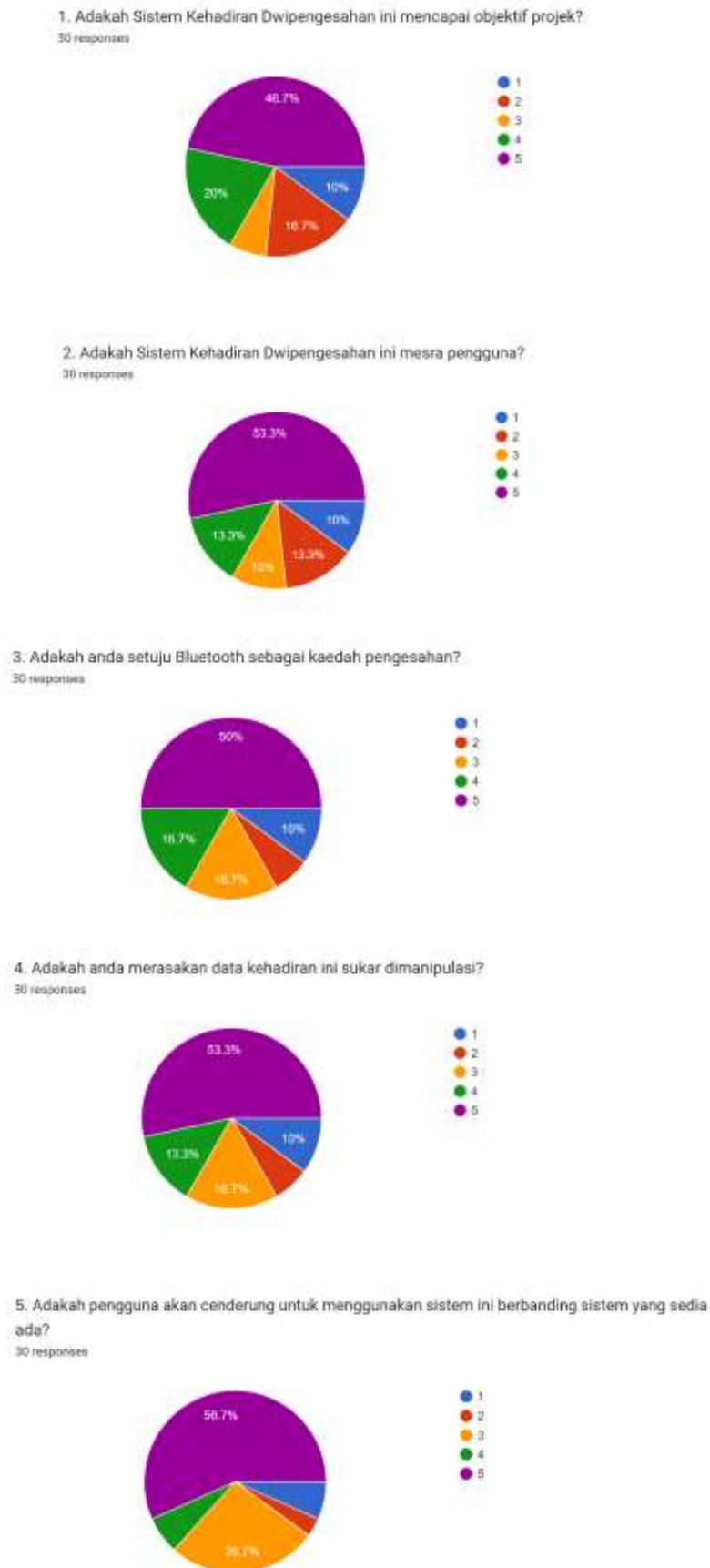


Figure 9. User Feedback

5. CONCLUSION

Some flaws that can be fixed by developers are the system's own problems, but flaws from the user can only be avoided if the user is responsible. Therefore, among the suggestions that can be made in the future for the purpose of improving the system until the Dual Authentication Attendance System uses Bluetooth and passwords have no weaknesses. Among the recommended upgrades are:

- a) Upgrade the scanning level of the Bluetooth Scanner Device.
- b) Upgrade the system online to an operating system (Android).
- c) Upgrade user attendance record report.

In conclusion, overall this system achieves the objectives and goals and fulfills the scope that has been set. An organized framework and the implementation of work according to the schedule allow this system to be developed successfully. A Dual Authentication Attendance System using Bluetooth and passwords is very desirable to implement to facilitate users to log attendance while at the same time being able to obtain accurate attendance data.

Acknowledgments: In this section, we acknowledge Computer Science Department and Psychological Computing Research Group, Faculty of Defence Science and Technology, National Defence University of Malaysia for fund and material support.

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