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Lampiran 1. Jurnal

A Combination of the Haversine Formula Algorithm and the Sequential Searching Algorithm in Web based Online Attendance

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***Abstract*—Manual attendance systems are generally inefficient and can waste time calling individually. The lecture attendance system is one of the most important elements in education. Attendance is part of the evaluation process between lecturers and students. This affects the final grades received by students. Problems that arise are often found in class, namely false attendance and often cheating by students related to absence so that they can achieve a minimum level of attendance in teaching and learning activities. Then an application is made using two algorithms that can produce solutions to reduce problems such as cheating with the method used, namely the haversine formula algorithm to measure the distance between students and campus buildings and the sequential search algorithm to search data. The results of the calculation of the haversine formula algorithm get an accuracy of 99.5969% from 100 student data to campus buildings and the data search process in sequential search gets an average run time of 19.0634 seconds.**

Keywords—Attendance System, Haversine Formula, Sequential Search

I. INTRODUCTION

The progress of information is very impressive because it is developing so rapidly, making it easier for human life to complete a job [1]. Changes are needed in all respects, including the method of conveying information, from conventional to more modern approaches in order to help readers understand the information presented more easily [2]. Technological developments must be directly proportional to the development of human resources. This goal requires the full attention and cooperation of all components of the education community, including parents and educators who are directly involved in the education process. For example, the lecture attendance system is one of the most important elements in education. Attendance is a collection of data that is useful for knowing the number of participants in an activity/event. Attendance is a measure of whether an activity is running as it should. The presence of the lecturer shows the quality of the material presented. While the presence of students determines whether they attend or not. Every activity related to members will certainly make attendance. Improving the quality of the tutoring system, including the student attendance system with the attendance system. to help control the progress of the work to achieve the best results according to the target requirements. So students will increasingly look for topics that affect students' understanding of the subjects studied. Absenteeism is part of the evaluation process between lecturers and students, this affects the final grades that students receive. Checking student absences can be detrimental to teaching lecturers and other students who carry out these attendance activities [3]. Manual attendance systems are generally inefficient and can waste time calling individuals. Regarding student discipline in terms of attendance, the problem that is often found in class is false attendance. Students appear to be present but not present, and often there is cheating by students regarding absence so that they can achieve a minimum level of attendance in teaching and learning activities. Attendance data becomes unstructured and difficult to check if there are problems. Based on the research conducted [4], [5], [6], [7], [8], [9], [10]. They have the same problem, namely the attendance process which is still done manually. Further research is carried out [11], [12], [13]. They have the same problem, namely limitations in notifying absences. The difference between this research and previous research is the use of algorithms. In previous studies have not used the algorithm. Meanwhile, this study uses two algorithms that can produce solutions to reduce problems such as cheating in absenteeism. By determining a distance of 50 meters from the coordinates of the campus building as validation of attendance data. Therefore this research is "A combination of the Haversine Formula Algorithm and the Sequential Searching Algorithm in Web based Online Attendance". With this application for the effectiveness and efficiency of manual attendance and anticipating a student cheating in attendance.

II. LITERATURE REVIEW

A. Attendance

Collection of attendance data, part of institutional activity reports, institutional components containing attendance information, arranged and arranged in such a way that it is easy to find and by interested parties when needed [14].

B. Attendance System

The attendance system is a system used to identify, record, or summarize the presence of individuals in an institution [15]. The attendance system records the names of institution members as well as when members enter and leave. The attendance system is able to provide proper reporting. While most government agencies use attendance records to track attendance, attendance records can also provide information about individual productivity.

C. Haversine Formula Algorithm

The Haversine Formula algorithm is an important equation formula in navigation, this formula gives the distance between two points on a spherical circle for one degree of latitude and longitude. The Haversine formula method uses longitude and latitude as input variables.

The Haversine formula is an algorithm used to calculate distances by taking two points on the earth used in a route and giving the great circle distance using longitude as the entered latitude. So latitude and longitude can provide distance data between two points [15].

The haversine formula method has now been refined, in particular using the spherical law of the simple cosine formula [16]. The starting point and waypoint are given in decimal degrees, which are then converted into an angle value in radians, and the calculation is done by calculating the Haversine formula, namely:

$$d = R \times 2 \times arcsin\left(\sqrt{a + c}\right) \quad (1)$$

To get the value of a in (1), (2) will be used, meanwhile to get the value of c, (3) is used.

$$a = sin\left(\frac{\Delta lat}{2}\right)^2 \quad (2)$$

$$c = cos(lat1) - cos(lat2) \times sin^2\left(\frac{\Delta long}{2}\right) \quad (3)$$

Legend:

- $R = earth's\ radius\ 6371\ km$
- $\Delta lat = (lat2 - lat1)$
- $\Delta long = (long2 - long1)$
- $c = axis\ interaction\ calculation$
- $d = distance\ (km)$

D. Sequential Search Algorithm

The sequential search algorithm compares all the data in the array one by one by examining each existing data element sequentially up to the last data element in the array. For example, computer programs often look up graduation numbers to retrieve information from e-mail addresses or institutional names. The data to be searched is traced from front to back across all elements of the array, and the data to be searched should not be allocated until there is no similar data before the end of the iteration [17].

E. Website

Website is a program that contains multimedia content forming a series of interconnected buildings, each building contains a network of pages or hyperlinks [18].

F. HTML

HTML is a script that displays information via the internet, HTML is one of the formats used to create documents and applications that run on the web [18].

G. PHP

PHP is a web programming language which is built on a server-side scripting language, PHP is available for free and this PHP language is very easy to use [19].

H. MySQL

MySQL is used as an application in managing databases where the aim is to build a website that uses a database. MySQL is also an open source database software in MySQL data which is usually stored in the form of tables where the tables are connected to each other. Therefore many web application programmers often use MySQL because this software is available for free, and is reliable [18].

I. XAMPP

XAMPP is a software which supports many operating systems. XAMPP is widely used in the development of web-based applications [19].

J. PHPMyAdmin

PHPMyAdmin is free software with the PHP programming language which is used to handle MySQL administration. PHPMyAdmin is also used to support various MySQL operating systems as follows: it plays a role in managing databases, indexes, users [19].

K. Previous Literature Study

This attendance information system makes it easier for teachers or education staff to register attendance and prevent student registration, the main problem is that registration and reporting to Klabat University is done manually, research uses the prototype method [4].

Designing an Office Employee Attendance System to assist offices with attendance problems, controlling all employees with attendance issues, this research uses data research methods, design and construction [5].

Web-based Attendance Information System for return and return attendance which is done manually and is not effective, in this study using PHPMySQL [6].

The Online Presence System for recording attendance is still done manually, resulting in incompatibility of data in preparing the final learning report, in this study using MySQL for data storage [7].

Designing an Online Attendance Application to create employee discipline, reduce the potential for fraud, which is done manually creates a lot of risk and fraud, in this study using the Kotlin programming language using the Agile method [8].

Internet-based Student Attendance Information System for manual data management such as attendance, in this study using PHP, MySQL, CodeIgniter, Unified Modeling Language (UML) Tools and the Waterfall Method [9].

Student Attendance System to make it easier to monitor student attendance, manage data, and implement systems in educational environments to help users identify attendance, in this study using Android smartphone technology [11].

An attendance system that provides easier and more comfortable recording and checking of attendance using a QR Code Scanner and is also able to provide attendance information, in this study using SMS Location Tracker [12].

The Mobile Class Attendance System is used to monitor student attendance during online learning with problems that arise such as limitations in notifying absences, in this study it was made on Android and the PHPMyAdmin server [13].

An attendance system that facilitates the process of managing employee attendance data and makes attendance data more accurate, to solve problems in managing employee attendance data at the Diskominfo Pemalang Regency is done manually. This research uses the waterfall method and is done online [10].

III. RESEARCH METHODS

A. Research Focus

This application is made using the Haversine Formula Algorithm to calculate and limit distances and the Sequential Search Algorithm to search data. This application is designed to be applied in the Universitas Nasional Informatics Study Program, the target user is National University Informatics Study Program students, this application does not handle the attendance list of lecturers.

B. Data Sources

This study uses secondary data which is data obtained from the Informatics Study Program, Faculty of Communication and Informatics Technology, Universitas Nasional in a finished form, such as: Student ID Number, Lecturer ID Number, Student Name, and Lecturer Name.

C. Research Stages

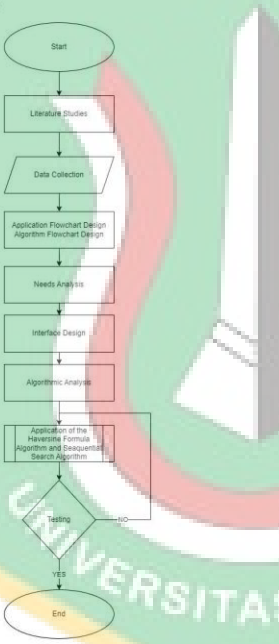

Fig. 1. Research Stages

Fig. 1 : Is a research stage consisting of literature study, data collection, application flowchart design, algorithm flowchart design, needs analysis, application of the Haversine Formula algorithm and application of the sequential search and testing algorithm.

D. Haversine Formula Algorithm Flowchart

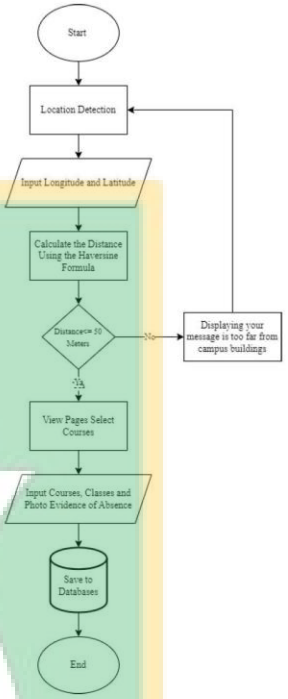

Fig. 2. Haversine Formula Algorithm Flowchart

Fig. 2 : Starting from detecting the location with GPS, inputting longitude and latitude, calculating the distance with the Haversine Formula Algorithm, if the distance is more than 50 meters it will display a message that you are too far from the campus building and if the distance is less than 50 meters then it will continue to input the subjects, classes and proof of attendance photos and then automatically saved to the database.

E. Sequential Search Algorithm Flowchart

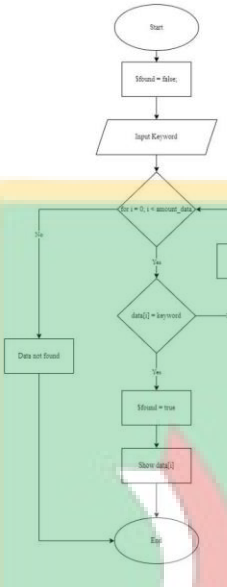

Fig. 3. Sequential Search Algorithm Flowchart

Fig. 3 : Starting from inputting keywords, entering keywords contained in the database of student names, npm, lecturer names, nid into the array, looping based on the number of arrays, checking if the keywords being tracked are found then the search will finish and display data, if the keywords being tracked are not found up to the amount of data, then the looping process will stop and bring up the message data not found or does not exist.

IV. Results And Discussion

A. Research Results

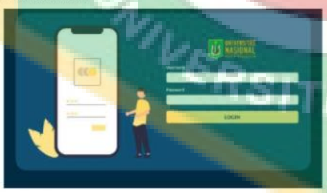

Fig. 4. Home Login

Fig. 4 : is the login homepage, where the User must enter a Username and Password to enter the homepage of each role.

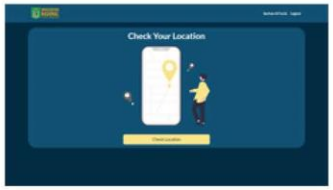

Fig. 5. Check Attendance Location Page

Fig. 5 : is an attendance location check page, students check attendance locations.

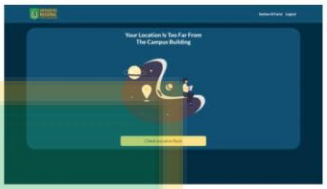

Fig. 6. Failed Location Check Page

Fig. 6 : is a failed location check page, if the student's location is far from the campus building, the student can repeat the location check again.

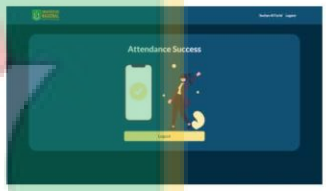

Fig. 7. Attendance Page Success

Fig. 7: is a successful attendance page that displays the status of a successful attendance.

B. Discussion

a) Application Testing:

TABLE I
Application Testing

Nr	*Scenario Testing*	*Test result*	*Conclusion*
1	Admin, Lecturer, Student enter username and password correctly	Login is successful and go to the page according to each role	Be accepted
2	Students click the button see schedule	View Personal Schedule	Be accepted
3	Student Click the change password button and then change the password	The process will be successful and the system will successfully change the student password	Be accepted
4	The student clicks the attendance button for the lecture	Displays Lecture Attendance	Be accepted
5	Student clicks check location	The process will be successful if the distance between the	Be accepted

Nr	*Scenario Testing*	*Test result*	*Conclusion*
		student location and the campus building is less than 50 meters	
6	Student clicks Check Location Again	The process will be successful if the distance between the student location and the campus building is less than 50 meters	Be accepted
7	Student clicks on course	Displays Courses	Be accepted
8	Student clicks select class	Show Classroom	Be accepted
9	Students click the proof of attendance button	The process will be successful and the system will display a successful attendance page	Be accepted
10	The lecturer clicks the search button for students	The process will be successful and the system will display the data you are looking for	Be accepted
11	Lecturer Click the change password menu and then change the password	The process will be successful and the system will successfully change the lecturer's password	Be accepted
12	Lecturer clicking the download button Absence Recap	The process will be successful and the successful system will automatically download the attendance recap file	Be accepted
13	The lecturer clicks the student attendance validation button	The process will succeed and the system will succeed change presence status	Be accepted
14	Admin Change User Password	The process will succeed and the system will succeed add users	Be accepted
15	Admin added User	The process will succeed and the system will succeed add users	Be accepted
16	Change User Data	The process will succeed and the system will succeed change user data	Be accepted
17	Admin delete User data	The process will succeed and the system will succeed delete users	Be accepted

b) Testing with the Haversine Formula Algorithm:

TABLE II

THE RESULTS OF THE COMPARISON TEST OF THE HAVERSINE FORMULA MANUAL CALCULATION WITH THE CALCULATION SCRIPT CODE

Test	*Difference*	*Accuracy*
1-10	0,0488	99,7039%
11-20	0,0672	99,8081%
21-30	0,1285	99,5366%
31-40	0,0885	99,6753%
41-50	0,0850	99,6545%
51-60	0,0808	99,7007%
61-70	0,1189	99,4782%
71-80	0,1065	99,4903%
81-90	0,1136	99,4788%
91-100	0,1138	99,4784%

The average accuracy results are 99.5969% from 100 data with Haversine manual calculations and calculations with Script code.

c) Testing with the Sequential Search Algorithm:

TABLE III

DETAIL OF SEQUENTIAL SEARCH ALGORITHM TEST RESULTS

Testing	***Search Run Time***
Testing 1 – 10	18,6074 seconds
Testing 11 -20	20,9483 seconds
Testing 21 – 30	20,5815 seconds
Testing 31 – 40	21,9927 seconds
Testing 41 -50	19,0337 seconds
Testing 51 -60	15,9846 seconds

Testing	*Search Run Time*
Testing 61 -70	20,2264 seconds
Testing 71 -80	19,7458 seconds
Testing 81 – 90	16,1724 seconds
Testing 91 - 100	17,2697 seconds

The results of the run time so as to get the average run time in the username search using the sequential search algorithm of 19.0634 seconds.

V. Conclusion And Recommendations

A. Conclusion

In applying the Haversine Formula, you can find out the distance limits for students to campus buildings. After testing the implementation of the haversine formula, obtaining an average accuracy value of 99,5969 %, it can be concluded that the results of manual distance calculations with applications that are not too far away and testing the implementation of sequential search obtain an average run time value of 19,0634 seconds.

B. Suggestions

Based on the analysis and discussion that has been carried out, suggestions can be given that can be useful and beneficial for the progress of the application.
As for suggestions from the author as follows:
1. Added attendance permission feature on absence status.
2. Added proof of permission upload feature.
3. In further application development it can be developed by adding other algorithms.

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Lampiran 2. Letter of Acceptance

ICCoSITE

*The 2023 International Conference on **Computer Science, Information Technology, and Engineering***

Ref. : ICCoSITE/LoA/I/2023/130
Date : February 3, 2023

LETTER OF ACCEPTANCE

2023 International Conference on Computer Science, Information Technology, & Engineering

Virtual Conference (Online) 16 February 2023

Paper	:	1570877935 **A combination of the Haversine Formula Algorithm and the Sequential Searching Algorithm in Web Based Online Attendance**
Authors	:	Sechan Al Farisi (Universitas Nasional, Indonesia); Fauziah Nasir Fauziah, FFF (Universitas Nasional & ICT Company, Indonesia)

Dear Author(s),

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Congratulations on the acceptance of your paper and thank you for your interest. We look forward to seeing you at the conference soon.

General Chair,

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Ahmad Chusyairi, S.Kom., M.Kom.

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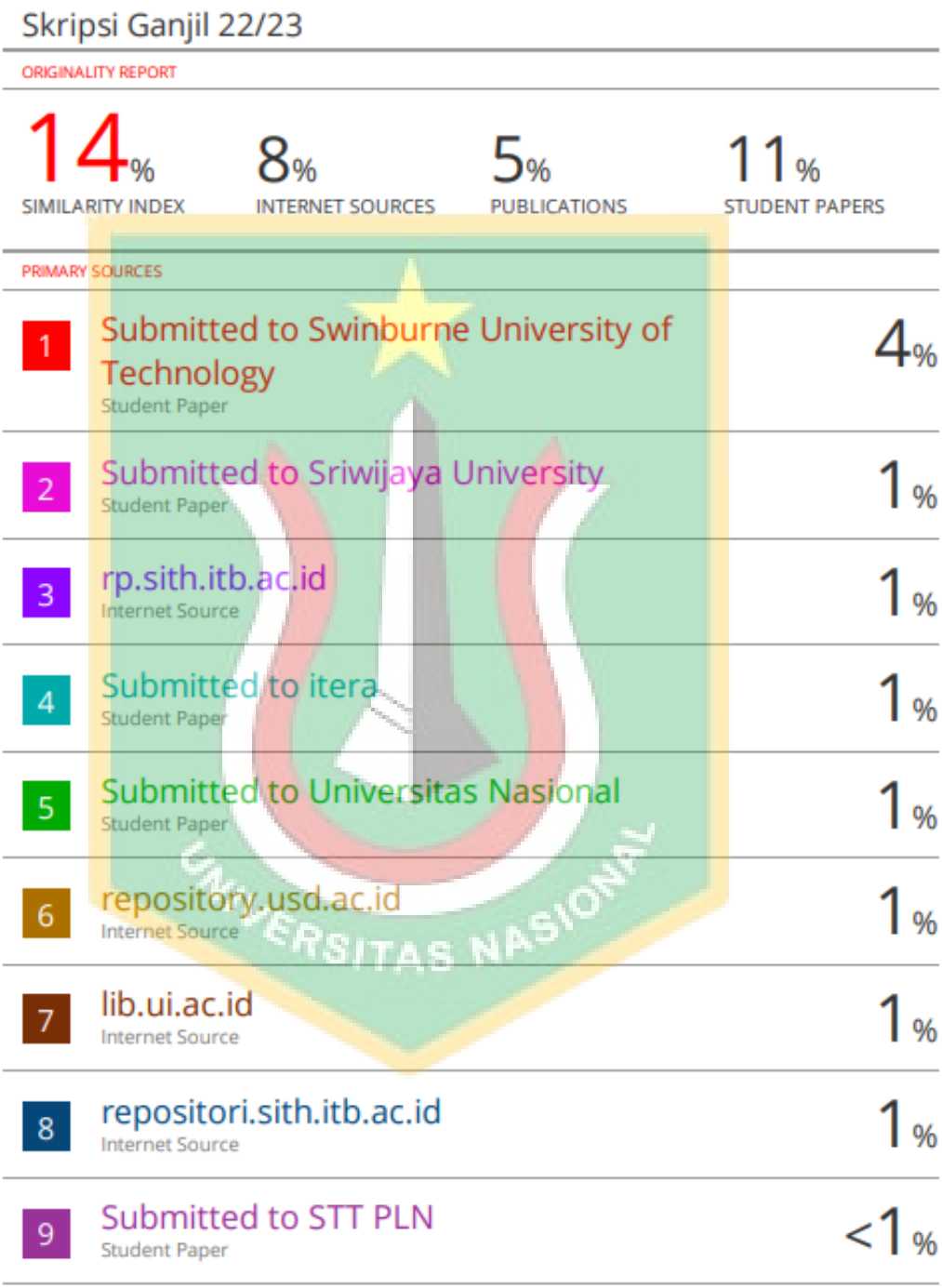
Lampiran 3. Hasil Turnitin



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