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# Integration of Attendance System with Geolocation and Photo Features for Counseling Recommendations Based on TOPSIS Method at MA Salafiyah Ahmad Said

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**ABSTRACT**

Madrasah Aliyah Salafiyah Ahmad Said faces challenges in managing student attendance manually, which takes a significant amount of time. To address this, this study develops an attendance system integrating geolocation, facial photo, and the TOPSIS method to improve attendance accuracy and efficiency. The system enables attendance validation through geolocation and real-time facial photo capture, analyzing student attendance data in 1-2 minutes per month. The analysis results are used to provide counseling recommendations to the counseling teacher for students with low attendance. This system is expected to enhance student discipline, speed up the analysis process, and support more effective decision-making in the learning environment.

## 1. INTRODUCTION

Madrasah Aliyah Salafiyah Ahmad Said, located in Kirig Village, Mejobo District, Kudus Regency, is an educational institution with 195 students divided into two main fields: Natural Sciences (IPA) and Social Sciences (IPS). The school has 22 teachers, including the headmaster, and is characterized by its green-colored building, reflecting the spirit and identity of the school. As a Madrasah Aliyah, the school faces challenges in managing student attendance discipline, which is a crucial factor in the success of the teaching and learning process.

Currently, the school's attendance system is still manual, requiring a lot of time to collect and analyze student attendance data. This process is inefficient because there is no system in place that can quickly and accurately recommend actions regarding student attendance issues. In this regard, counseling plays an important role in assisting students with discipline issues, particularly those related to attendance. However, identifying students who require counseling often takes time due to the lack of a system capable of providing real-time attendance-based recommendations.

Information is data that has been processed and organized to provide meaning and improve decision-making processes[1]. In this context, information is crucial for improving the efficiency of attendance management and supporting faster and more accurate decision-making regarding student discipline issues. Information Systems are vital to the success of an organization and require businesses to operate efficiently and effectively[2]. This is achieved by being competitive at both local and global levels, driven by the quality of human resources and the products or services produced[3]. In today's digital era, accessing and retrieving information has become faster and easier due to the rapid development and expansion of information technology worldwide[4]. Furthermore, this change can impact how individuals verify their identity when entering systems, such as attendance systems[5]. Attendance is a routine activity that individuals perform to show whether they are present or absent at an institution. This attendance is typically managed and monitored by each organization or company[6].

Given this situation, there is a critical need for an advanced system that can provide timely and accurate counseling recommendations for students with low attendance. By utilizing information and communication technology (ICT), the proposed system will incorporate geolocation features and photo verification to ensure accurate and real-time attendance tracking. This system will be capable of quickly identifying attendance issues and automatically providing recommendations to counseling teachers through the application of the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method. This approach will prioritize students with low attendance for immediate counseling intervention. As a result, counseling can be carried out more effectively and efficiently, which will enhance student discipline and support their emotional, social, and academic development. The proposed system will streamline the identification and resolution of attendance issues, allowing the school to take swift and effective actions, while fostering a disciplined learning environment that supports the overall well-being of students.

## 2. RESEARCH METHODOLOGY

The research conducted by Hylenarti Hertyana and Elly Mufida in "Sistem Pendukung Keputusan Penentuan Siswa Penerima Beasiswa Menggunakan Metode TOPSIS" explains how the TOPSIS method can reduce subjectivity in decision-making. This study by Hertyana and Mufida uses five criteria in selecting scholarship recipients, namely parental income, number of family dependents, housing status, academic achievements, and extracurricular achievements. By applying the TOPSIS method, the evaluation process becomes more objective, accurate, and efficient, significantly contributing to improving the quality of decisions made by the school [7].

Another study by Fitria Rizqi Nurdiana et al. in "Sistem Pendukung Keputusan Pemberian Beasiswa Dengan Metode TOPSIS" also uses the TOPSIS method in scholarship recipient selection. This study by Nurdiana et al. includes criteria such as parental income, number of dependents, report card grades, school achievements, completeness of documents, and interview results. The study shows that by using TOPSIS, the decision-making process becomes more objective, effective, and efficient. The developed web-based system allows administrators to flexibly adjust the weight of criteria, improving the efficiency of the scholarship selection process [8].

Next, Muhammad Zen et al. in their research titled "Sistem Pendukung Keputusan Pemilihan Siswa Study Tour Menggunakan Metode TOPSIS" also apply the same method for selecting participants for study tours. This study by Zen et al. identifies four main criteria: student achievements, health history, document completeness, and students' financial capabilities. The developed web-based system enables administrators to adjust the criteria weights more flexibly, thus enhancing the efficiency and quality of decision-making in selecting students who meet the requirements for participating in the event [9].

Additionally, Imam Turmudi and Perani Rosyani, in their study titled "Perancangan Presensi Online Menggunakan Foto dan Geolocation Guna Meningkatkan Kedisiplinan Pegawai Berbasis Website" developed a web based attendance system that uses photos and geolocation to verify the attendance of employees working outside the office. This study aims to simplify the attendance process, improve employee discipline, and reduce the data corruption and loss issues commonly encountered in the previous manual attendance system. The MySQL-based system used for data storage allows for more secure and efficient access [10].

Lastly, the research conducted by Bahrul Ngulum, Islahul Arif, and Rico Hernawan in "Implementasi Teknologi Geolocation Dan Foto Realtime Untuk Optimalisasi Sistem Absensi Guru Di MI Nurul Huda" develops an attendance system based on geolocation and real-time photos to address issues arising from the use of manual attendance systems. This study by Ngulum et al. aims to improve the accuracy and efficiency of the attendance process by utilizing geolocation to ensure the teacher's geographical location and real-time photos as visual verification. Preliminary evaluations show that the implementation of this system can increase attendance accuracy by up to 95%, reduce attendance time by 50%, and minimize the potential for fraud by 80%. This research makes a significant contribution to the development of more efficient and reliable attendance systems and provides a solution that can be adopted by other educational institutions [11].

Previous studies have monitored student attendance but have not yet integrated attendance systems with the TOPSIS method to provide counseling recommendations for students with low attendance. This research aims to develop an attendance information system that leverages geolocation and photo technology to accurately monitor student attendance and uses the TOPSIS method to provide counseling recommendations. With this system, attendance issues can be detected more quickly, and counseling can be delivered more efficiently and effectively, enhancing student discipline and well-being.

### 2.1 Data Collection Methods

The author used observation, interviews, and literature study to gather the necessary data. Observation was conducted to analyze the manual attendance system at Madrasah Aliyah Salafiyah Ahmad Said. Interviews with teachers aimed to identify issues related to student discipline, and literature study involved reviewing journals related to the TOPSIS method in decision-making analysis as well as journals on attendance systems and information systems that are relevant. Literature study is a method aimed at gathering data and information from various sources, such as written documents, photos, images, and electronic documents, which support the writing process [12].

The attendance system designed in this study automates the collection of student attendance data through a website equipped with GPS features and student facial photos. The collected data is then analyzed using the TOPSIS method to rank students based on their attendance preferences. The analysis results are used by the counseling teacher (BK) to provide guidance to students with low attendance in order to improve their discipline.

The criteria and weights used in the TOPSIS analysis were determined based on interviews, as shown in Table 1, which presents real data. Table 2 displays example data for student attendance over a one-month period, with data anonymized to protect privacy. Below are the tables:

**Table 1.** TOPSIS Criteria and Weight

| CODE | CRITERIA | WEIGHT | ATTRIBUTE |
|---|---|---|---|
| K1 | On-Time | 0,5 | Benefit |
| K2 | Tardiness | 0,1 | Cost |
| K3 | Permission | 0,1 | Cost |
| K4 | Absent | 0,3 | Cost |

**Table 2.** Example of Alternative Evaluation Data for Each Criterion of Student Attendance for 1 Month

| ALTERNATIF | K1 | K2 | K3 | K4 |
|---|---|---|---|---|
| A | 20 | 3 | 1 | 2 |
| B | 18 | 5 | 2 | 1 |
| C | 19 | 3 | 1 | 3 |

The explanation of the weight for each criterion is as follows: On-Time (K1) measures the frequency of students' punctual attendance with a weight of 0.5, serving as the primary indicator of discipline. Tardiness (K2) measures how often students are late, with a weight of 0.1, as it is often influenced by factors that are understood. Permission (K3) measures the number of permissions requested by students, with a weight of 0.1, as it is generally more acceptable compared to unexcused absences. Absence (K4) measures

absenteeism without any explanation, with a weight of 0.3, as it represents a more serious disciplinary violation.

### 1.2 System Development Methods

Based on the explanation provided by the previous author, the method chosen for developing this system is the Waterfall method. The Waterfall method follows a sequential approach in the software life cycle, starting with analysis, followed by design, coding, testing, and support stages [13].

### 1.3 System Analysis

The actors representing the users of the Student Attendance System Integration with Geolocation and Photo Features using the TOPSIS Method for Counseling Guidance Recommendations at MA Salafiyah Ahmad Said are as follows:

a. Student
b. Teacher

These actors perform several tasks as outlined in Table 3 below:

**Tabel 3.** Business Processes Used in the System

| NO. | SYSTEM FLOW | ACTOR | USE CASE |
|---|---|---|---|
| 1 | Log in to the system | Student, Teacher | Login |
| 2 | Activate geolocation feature | Student | Activate GPS |
| 3 | Take a photo for attendance | Student | Take a photo |
| 4 | Mark attendance for present or permission | Student | Attendance |
| 5 | Select the attendance period to be analyzed using TOPSIS | Teacher | Select month and year |
| 6 | View TOPSIS recommendations for counseling guidance | Teacher | View low attendance recommendation data |
| 7 | Log out of the system | Student, Teacher | Logout |

## 3. RESULTS AND DISCUSSION

### 1.1 System Design

After the analysis process, the system design stage is carried out using a use case diagram, The use case diagram that illustrates the system flow based on Table 3 can be seen in Figure 1 below:

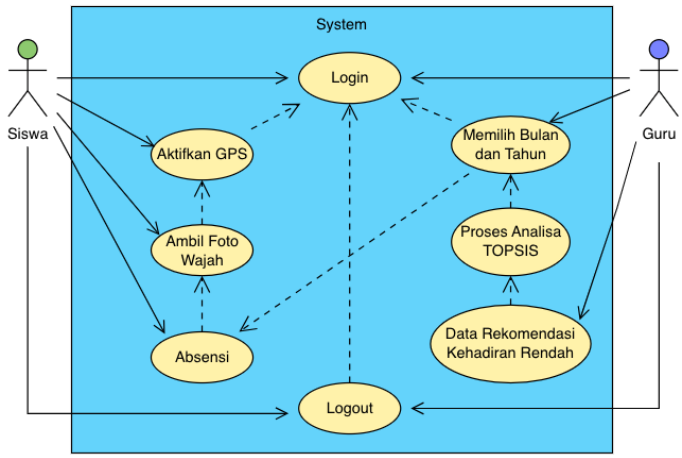


**Figure 1.** Use Case Diagram of the Attendance and TOPSIS Analysis System

### 1.2 Database Design

The table relationships established in the database for the development of the Integrated Attendance System with Geolocation and Photo Features for Counseling Recommendations Based on the TOPSIS Method at MA Salafiyah Ahmad Said are illustrated in Figure 2 below:

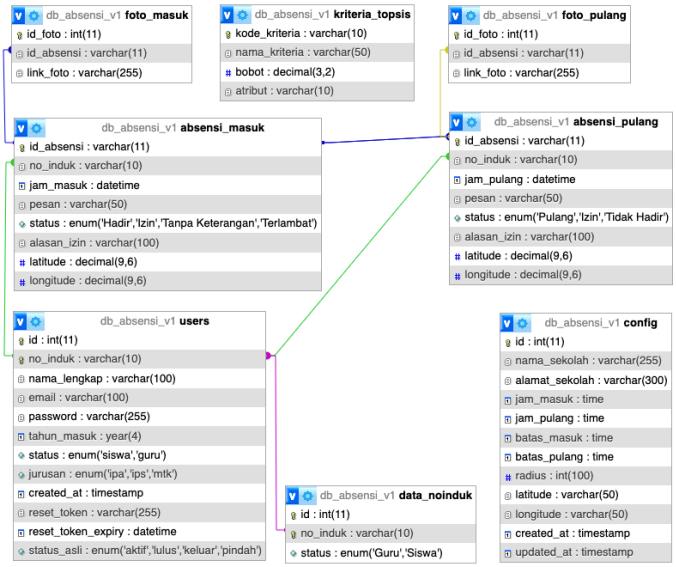


**Figure 2.** Database Table Relationship

### 1.3 System Results

The analysis and design process has led to the development of an Integrated Student Attendance System at MA Salafiyah Ahmad Said. This system incorporates geolocation and photo features to ensure the accuracy and validity of student attendance records.

Furthermore, This system integrates the TOPSIS method to analyze attendance data, which is then used to rank students based on the lowest attendance preference values. The resulting data is utilized by the counseling teacher (BK) to provide guidance. To obtain the user's geolocation, the system uses JavaScript navigator.geolocation, while for face photo capture, the system leverages face-api.js. The system was developed using the PHP programming language and MySQL database. The following sections present several interfaces of the system that has been built:

1) Login Page View

This page allows users to access the system by entering their Student/teacher ID numbers and password. The layout of the page is shown in Figure 3 below:

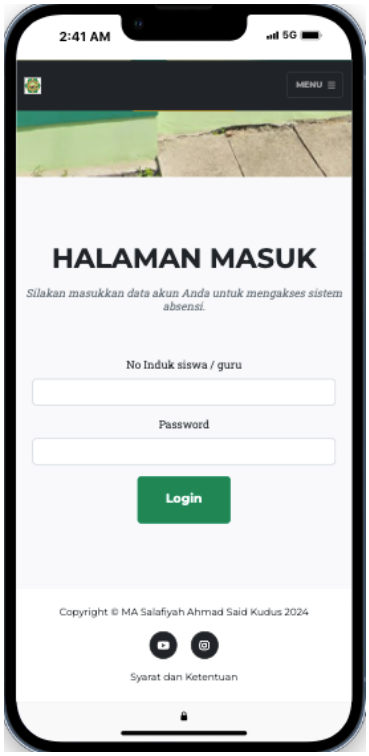


**Figure 3.** Login Page View

2) Dashboard Page View

The dashboard page provides a summary of student attendance data, including the number of present, absent, and excused students. This information is displayed in real-time to offer an overview of attendance status. The layout of the page is shown in Figure 4 below:

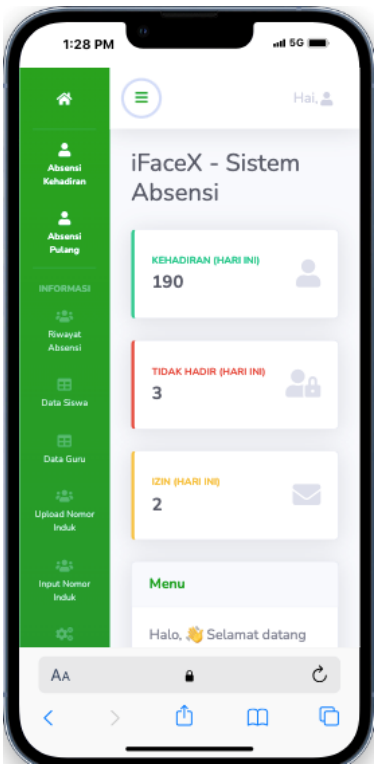


**Figure 4.** Dashboard Page View

3) Attendance With Geolocation and Facial Photo Page View for Check-In

The check-in attendance page is a part of the application interface used by students to record their arrival. On this page, students are required to enable GPS on their smartphones and take a facial photo to complete the attendance process. Once the facial photo is successfully captured and the student clicks the submit button, the attendance data is immediately recorded in the system's database. The layout of the attendance and facial photo page is shown in Figures 5 and 6 below:


**Figure 5.** Check-In Attendance Photo Capture


**Figure 6.** Check-In Attendance Photo and GPS Distance

4) Attendance With Geolocation and Facial Photo Page View for Check-Out

The check-out attendance page allows students to record their departure by enabling GPS and capturing a facial photo. After submitting the photo, the attendance data is instantly saved in the system's database. Figures 7 and 8 show the layout of this page:

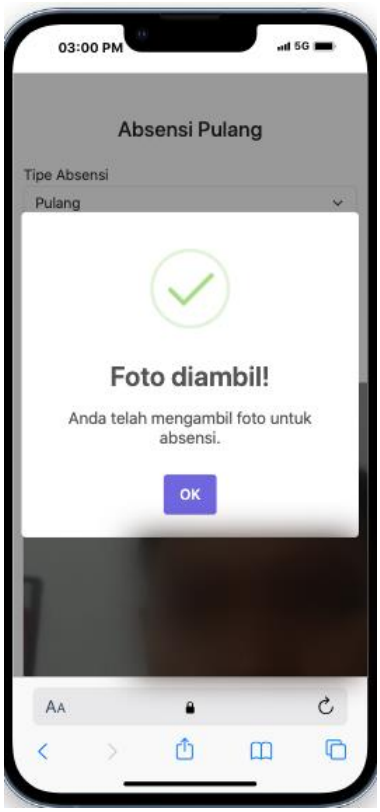


**Figure 7.** Check-Out Attendance Photo Capture

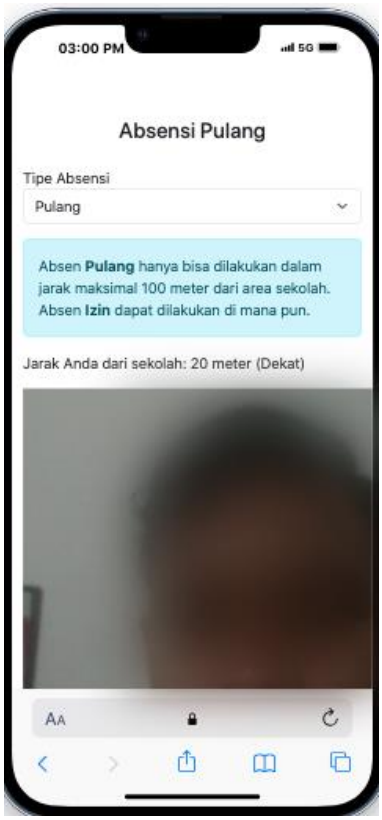


**Figure 8.** Check-Out Attendance Photo and GPS Distance

5) Student Attendance History Page View

The student attendance history page is an application interface accessible to students. This page displays recorded attendance data, including timestamps and GPS location coordinates. The layout of the student attendance history page is shown in Figure 9:

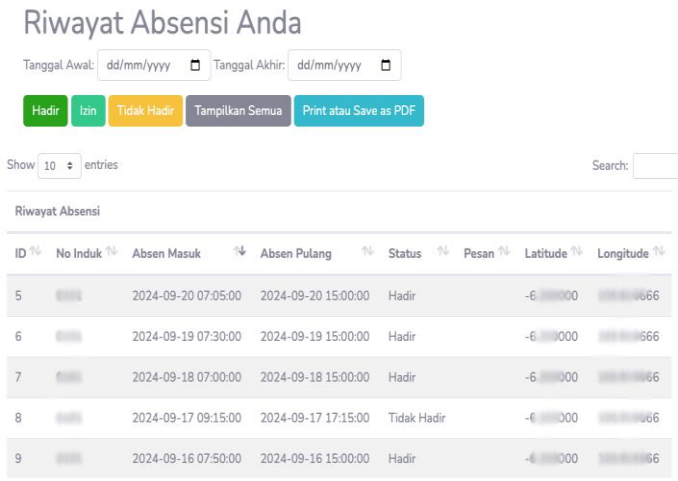


**Figure 9.** Student Attendance History Page View

6) TOPSIS Analysis Page for Low Attendance Recommendations

The low attendance recommendation page is an interface that is accessible only by teachers. On this page, teachers can select student attendance data based on the month and year to be analyzed using the TOPSIS method, utilizing the student attendance matrix data and applying the criteria and weights specified in Table 1. The stages of the TOPSIS method include: creating a normalized decision matrix, creating a weighted normalized decision matrix, determining the positive ideal solution matrix and the negative ideal solution matrix, calculating the distance between the values of each alternative and the positive and negative ideal solution matrices, and determining the preference value for each alternative [7], which is then used to recommend students with low preference values. The clear and structured layout of this page enables teachers to easily determine the next steps, such as providing counseling to students in need. The layout of the low attendance recommendation page is shown in Figure 10.

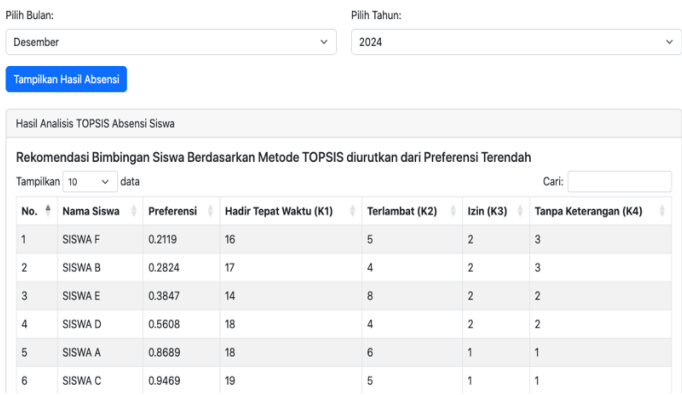


**Figure 10.** TOPSIS Analysis Page for Low Attendance Recommendations

### 1.4 Black Box Testing

In the implementation of the Attendance System Integration with Geolocation and Photo Features for Counseling Recommendations Based on the TOPSIS Method at MA Salafiyah Ahmad Said, black box testing was conducted to evaluate the system's outputs based on various input scenarios, including geolocation and facial photos for student attendance. The results of the black box testing are presented in Table 4.

**Table 4.** Black Box Testing

| NO | Module Test | Tested Functions | Test Scenario | Expected Result | Observation |
|---|---|---|---|---|---|
| 1 | Login Page | Log in to the system | Fill in user login data | Users can log in to the system | Succeed |
| 2 | Geolocation | Activate geolocation feature | Activate GPS on the device | GPS is enabled and ready for use | Succeed |
| 3 | Attendance Page | Take a photo for attendance | Take a photo of the student | photo is captured and stored in the system | Succeed |
| 4 | Attendance Page | Mark attendance for present or permission | Select present or permission status | Attendance is recorded in the system | Succeed |
| 5 | TOPSIS Analysis | Select the attendance period to be analyzed using TOPSIS | Choose month and year for analysis | The system analyzes the data for the selected period | Succeed |
| 6 | TOPSIS Analysis | View TOPSIS recommendations for counseling guidance | View recommendations for low attendance students | The system displays TOPSIS analysis results sorted by lowest attendance preference | Succeed |
| 7 | Logout Page | Log out of the system | Click the logout button | User is logged out and redirected to login. | Succeed |

## 4. CONCLUSIONS

### 4.1 Conclusions

Based on the implementation and testing of this research, several important points can be concluded. The conclusions of this study are as follows:

1. The attendance system that integrates geolocation, facial photos, and the TOPSIS method has significantly improved the accuracy and efficiency of student attendance management at MA Salafiyah Ahmad Said.
2. The previously manual attendance analysis process can now be performed quickly and accurately, reducing the time required for monthly attendance analysis to approximately 1-2 minutes.
3. The system automatically provides counseling recommendations to the guidance counselor for students with low attendance based on TOPSIS analysis results, ensuring they are prioritized for counseling to improve their discipline.
4. By utilizing geolocation for attendance validation and facial photos for verification, the system enables more timely and relevant decision-making.
5. Overall, the system not only helps improve the efficiency of attendance analysis but also positively impacts the learning environment by fostering better organization and supporting students emotionally and academically.

### 1.5 Advice

Based on the conclusions outlined above, several suggestions can be made for further development of the system as follows:

1. Although the system is already web-based and responsive, making it easy to access anytime and anywhere, developing a mobile application could be the next step, especially to enhance user convenience for those who frequently use mobile devices.
2. To improve security, it is recommended to introduce additional features such as data encryption and multi-factor authentication to protect students' personal information and maintain data confidentiality in the system.
3. Future research could consider integrating the attendance system with students' academic performance data (report cards), allowing for an analysis of the relationship between attendance and academic performance, which could enable more appropriate actions to improve student discipline.
4. Further research is needed to evaluate the long-term impact of this system on improving student discipline and academic performance, to gain deeper insights and continue enhancing the system's effectiveness in the future.

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