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DEVELOPMENT OF A PRESENCE SYSTEM WITH FACE RECOGNITION INTEGRATED WITH ONLINE APPLICATIONS USING DEEP LEARNING METHODS TO EXPAND THE TEACHING AND LEARNING PROCESS AT SMKN 9 MALANG

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Abstract

Attendance systems are needed in various fields such as companies, government agencies, educational agencies, and others. Especially for educational institutions, the attendance system functions to control or determine the presence of students, teaching staff, and educational staff. SMKN 9 Malang City is an educational institution that has the obligation and role to equip its graduates with life skills in an integrative manner, which combines generic and specific potential to solve and overcome life's problems. This school has 5 expertise concentrations from which students can choose. In measuring the presence of the academic community, SMKN 9 Malang City uses an attendance system that includes Finger (for students and PTT and GTT) and the application from the East Java Province BKD e-Presence ASN. However, in its use several weaknesses were found that prevented the application from running efficiently, these weaknesses were 1) the number of locations, 2) a large number of students, 3) Time was less effective because the ratio between tools and students was still not ideal, 4) Sometimes some students have to try several times for less sensitive fingerprints, 5) Not connected with parents so that the school, the students' guardians/committee collaborate in monitoring their son. To follow up on problems with the attendance system used, schools need a more effective and efficient attendance system, namely by using Face Recognition Integrated with Online Applications Using Deep Learning Methods. The system created can make attendance easier for students, teaching staff, and educational staff. It is hoped that this system can improve student discipline and make it easier to monitor the performance of teaching staff and educational staff.

Keywords: Face Recognition, Deep Learning, Attendance

1. INTRODUCTION

Education is a conscious effort to develop human personality and abilities in a planned and responsible manner both inside and outside school. Therefore, teachers must be accountable for developing their students' potential both academically and non-academicly. In the learning process at school, it is hoped that changes will occur in students' attitudes and behavior, especially those related to discipline.

Schools have also become a center or even an institution that not only forms intelligent people but is also involved in building disciplined character and responsibility towards students because discipline is necessary even in the world of work. Therefore, the various efforts made to increase student graduation in schools become a benchmark for competency and quality of education and can become a competitive advantage. In this case, discipline is one of the main factors in student attendance in class or what is usually called attendance.

The function of attendance itself is to provide information about student attendance from the school to parents as one of the student's learning processes (Gultom, 2011). Apart from that, there is another function of attendance as a monitoring system carried out by the school, but this is not just the responsibility of the school, but will also be an active participation by parents. Student attendance in class is often a mandatory requirement in the world of education, and is a

benchmark for assessing students. Sometimes students still encounter fraudulent practices in attendance in order to achieve minimum attendance. From an administrative perspective, paper-based attendance has the potential to be wasteful and also lengthens the administrative stages because it requires manual recapitulation.

Until now, there are various ways to carry out attendance activities, both in education, government or other fields. Some use the latest technology such as fingerprint recognition (Faqih, 2015), but quite a few institutions still use manual systems such as signing on books and then recapitulating to obtain a final report on attendance. The manual attendance process has many disadvantages such as waste of paper, time-consuming recapitulation, difficult to integrate with other systems, and vulnerable to forgery. The results of previous research conducted by Azhar (2018) and Rahma et al (2021) show that the use of Fingerprint Presence (Fingerprint) shows a significant influence on student discipline. Apart from finger print, there is another technology that can be used for presence, namely a facial detection system.

Face Recognition (FR) is an excellent biometric technique for identity authentication. FR technology can be applied for automatic attendance recording in academic environments. There are several advantages to using a camera system, such as saving time and effort, providing strong evidence for quality assurance and human resource management tasks, and avoiding the transmission of infectious diseases (Son et al, 2020)

In previous research conducted by Prasanti and Utaminingrum (2020), a student attendance system was developed based on facial recognition using a webcam and mini PC with the Haar Cascade method for face detection, Local Binary Pattern, and K-Nearest Neighbor for facial recognition. The facial recognition accuracy value obtained was 78.125% with k=2. Furthermore, in another study conducted by Pratamasunu et al (2020), the Haar Cascade method was used for face detection in videos and Deep Learning for identification. The test results from this research obtained an accuracy rate of 99.6% provided that the color composition and light level of the video were the same as the training data.

SMK Negeri 9 Malang City as one of the educational institutions feels obliged to play a role and equip its graduates with life skills in an integrative manner, which combines generic and specific potential to solve and overcome life's problems. This school has 5 expertise concentrations, namely: Motorcycle Engineering, Industrial Electronics Engineering, Software Engineering, Computer and Network Engineering, and Animation. Based on data obtained through preliminary observations at SMKN 9 Malang City, there were 968 students, 66 teaching staff, and 20 educational staff. There are two applications used for the attendance of students, teaching staff, and educational staff, namely Finger (for students and PTT and GTT) and the application from BKD East Java Province e-Presence ASN. However, in its use several weaknesses were found that prevented the application from running efficiently, these weaknesses were 1) the number of locations, 2) a large number of students, 3) Time was less effective because the ratio between tools and students was still not ideal, 4) Sometimes some students have to try several times for less sensitive fingerprints, 5) Not connected with parents so that collaboration between the school, the student's guardians/committee in monitoring their son.

2. IMPLEMENTATION METHOD

The results of previous research that are relevant to this research are as follows:

a) Azhar (2018) in his research entitled The Effect of Using Fingerprint Presence and Punishment on Student Discipline shows that there is a significant influence of using fingerprint presence and giving punishment together on student discipline at Madrasah Aliyah Tarbiyatut Tholabah Lamongan

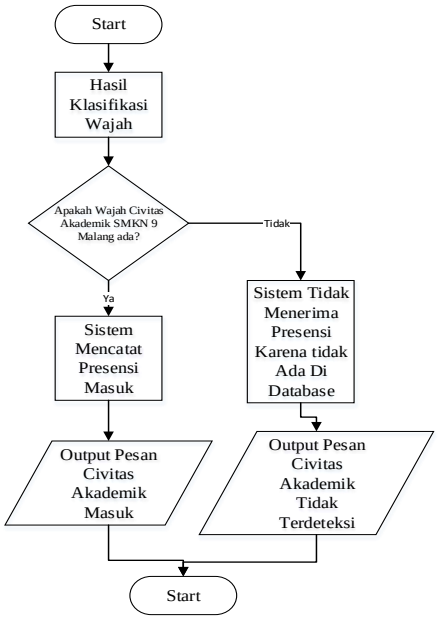
b) Rahma et al (2021) in their research entitled Developing Student Discipline Through

Fingerprint Presence shows that the disciplinary development of students carried out by schools using fingerprints is quite good because it is carried out continuously, measurably, and encourages students to be disciplined.

c) Khotimah (2022) in his research entitled The Effect of Implementing a Barcode System-Based Presence in Improving Student Discipline at MTsN Gowa Balang-Balang shows that there is an influence of implementing a barcode system-based presence in improving student discipline at MTsN Gowa Balang-Balang. The remainder of student discipline is influenced by other factors.

d) Susiyanti and Sholeh (2018) in their research entitled The Effect of Fingerprint-Based Presence on Student Discipline at SMA Negeri 18 Surabaya showed that fingerprint-based attendance has a positive and significant influence on student discipline.

e) Tanjung (2019) in his research entitled The Effect of the Finger Print Presence System on Employee Performance Through Work Discipline at the Medan City Regional Tax and Retribution Management Agency (Bpprd), shows that there is an influence of the finger print presence system on employee performance, the finger print presence system has on discipline employee work. There is also the influence of the finger print attendance system on employee performance which is mediated by work discipline at the Medan City Tax and Retribution Management Agency (BPPRD).



Picture Incoming absence flowchart

When the Academic Community enters, students, teaching staff and educational staff will scan their faces for presence. If they are registered in the system, they will be successful in making attendance at SMKN 9 Malang. Still, if their face is not detected by the system, the system will display a message that the Academic Community data does not exist / is not stored in the database.

3. RESEARCH RESULTS AND DISCUSSION

The following is a presence tool that has been modified and set to be able to take employee faces to be processed in attendance:

Gambar 3. 1 Alat Presensi

A presence system using facial recognition is carried out to check whether the system can run according to the features designed during the system analysis process. The following are the tests that have been carried out:

Table 3. 1 System Testing

No.	Skenario Pengujian	Hasil yang diharapkan	Hasil Pengujian	Kesimpulan
1.	Open Application	Shows that the application can be opened	Can be opened	Succeed
2.	Running Camera	The camera can record faces	Can record faces	Succeed
3.	Faces can appear on the monitor	The application can display faces	Can show face	Succeed
4.	Can do facial recognition	The application can recognize faces	Can do facial recognition	Succeed
5.	Application can apper message absences (Name, Time, Presence)	The application can display a message that the employee has successfully been absent	Can display messages	Succeed
6.	Absence data on the website is recorded	The system can record the names of absent employees and the time of attendance/return	Data is stored on the website	Succeed

According to the results of the testing in table 2.1, the application is successful in running according to the features that have been determined when conducting system analysis.

3.1 Implementation System

This implementation will explain how to create a system for the presence facial recognition application. Facial data is stored in the “known” folder. Facial data is saved in JPG format. A folder is created to store employee facial data which will be used to compare faces when the facial recognition process is running.

Picture folder "known" And Picture System Face Recognition

After carrying out training data, we will continue the process of creating presence with facial recognition. Facial recognition attendance will be connected to the SMKN 9 Malang attendance website. The address of the website is http://presensimkn9malang.com/. Then, so that the "trainSave.py" file which has carried out training data from the "known" folder can run on the facial recognition code, use the pickle function. Pickle is a library from Python which has functions for storing and reading data from a file.

Then, how the facial recognition system works, first the camera will record the employee's face, the face recorded by the camera will be compared to the facial data in the "known" folder. If successful, a message will appear that the employee is absent and the time will be displayed. If it fails, it will appear that the employee failed to be absent. Home attendance is successful if the employee has worked more than 8 hours, if it is less than 8 hours then home absence will appear failed. The attendance data will be stored on the SMKN 9 Malang attendance website. SMKN 9 Malang. The data recorded is absence_id, employee_id, day, entry time, return time, length of overtime hours, and attendance status. The following are the results of attendance recorded on the website:

Picture Precensi Form Website

From the picture above, it can be implemented for 5 people who made a presence, 5 people succeeded in making a presence using a facial recognition program. In Figure 4.3, there was a failed absence, the cause of the failed absence was because in the "known" folder the name of the image file stored for an employee named Ari Purna Subaryono was different from the one in the PT attendance website data. Srivijaya. The file stored in the "known" folder is Ary Purna Subaryono, while the one on the website is Ari Purna Subaryono. So the system does not record the employee's absence. The following is a table of conditions when the file name in the folder is "known" and the name in the presence website database:

From table 3.2 it can be concluded that the name of the image file in the "known" folder must be the same as the name stored in the presence website database. Because if one of them is

different, then the employee who is taking attendance cannot record his or her absence on the PT attendance website system. SMKN 9 Malang. From 5 people's facial data that is processed, a percentage can be taken of 20 x 100/100 = 100%. From that percentage, the application was successful in carrying out attendance using facial recognition. Then a test was carried out using the confusion matrix to calculate the precision and recall of image recognition. The following are the results of the confusion matrix calculation:

Table of numbers when performing facial recognition

	People 1	People 2	People 3	People 4
People 1	10	0	0	0
People 2	0	10	0	0
People 3	1	0	6	3
People 4	2	0	0	8

Table Calculation table for true positive, true negative, false positve, false negatif

	TP	TN	FP	FN
People 1	10.0	27.0	0.0	3.0
People 2	10.0	30.0	0.0	0.0
People 3	6.0	30.0	4.0	0.0
People 4	8.0	27.0	2.0	3.0
Amount	34.0	114.0	6.0	6.0

Table is a table for finding true positive, true negative, false positive, false negative values. True positive values are taken from faces that are successfully detected. A false positive is a value whose face is predicted incorrectly. False negatives are taken from faces that do not match the prediction. A true negative is a value that is not predicted and is not the true face.

Calculation Table

	Accuracy	Precision	Recall
People 1	0.93	1.00	0.77
People 2	1.00	1.00	1.00
People 3	0.90	0.60	1.00
People 4	0.88	0.80	0.73
Average	0.93	0.85	0.87

In table are calculations for calculating accuracy, precision and recall in image recognition. Accuracy, precision and recall calculations are obtained from the following calculations:

Accuracy = $\frac{TP+TN}{TP+TN+FP+FN}$

Precision = $\frac{TP}{TP+FP}$

Recall = $\frac{TP}{TP+FN}$

Table is a table of the number of image recognitions that correspond to the person doing the facial recognition. An example is when an employee's face is scanned into a facial recognition application, the employee's face that is successfully scanned according to the data is

10 times. This test was carried out when the distance from the camera was 50 cm and pictures were taken 10 times. Table 3.5 is a calculation to find true positives, true negatives, false positives, false negatives from table After calculating from table, accuracy, precision and recall calculations will be carried out.

4. CONSULSION

From the research results, an attendance system has been developed for SMK Negeri 9 Malang which can assist in the process of arrival and departure times by looking at the results of daily attendance recaps. The system testing process is carried out by distributing tests directly to teachers at SMK Negeri 9 Malang. This testing consists of six questions that can represent the ease and functionality of the attendance information system that has been developed. The attendance system that is designed can avoid errors in providing the rights and obligations received by teachers. The limitation of this research is that several teachers lack knowledge in the field of technology so when running the system a technical guide is needed.

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