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Implementation Of Face Recognition In Employee Attendance System Case Study In Bandung Computer Education

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Abstract

As technology advances, administrative activities, such as attendance management, have transitioned from manual techniques to digital platforms, facilitating more efficient access. At Bandung Computer Education, the employee attendance system remains manual, with attendance documented in Excel and evidence of attendance transmitted via WhatsApp.

This procedure requires time for validation and does not ensure data security. The utilization of facial recognition technology serves as an efficient solution, facilitating automatic attendance tracking, minimizing the risk of mistakes, and managing data without manual entry in Excel or through photo verification using WhatsApp. This research seeks to create a face recognition-based attendance system that enhances accessibility for employees.

This research encompasses the phases of system design and development, commencing with needs analysis and culminating in implementation. A needs analysis is conducted through surveys and interviews. The employed system development methodology is the prototype technique. The study's results indicate that the built facial recognition system has enhanced the accuracy of attendance recording and bolstered data security. This system is regarded as more accessible to employees.

Keywords : *Face Recognition, Attendance System, Data Security*

INTRODUCTION

With technological advancement, all administrative activities, including attendance tracking, have transitioned from conventional ways to digital platforms. Tasks previously conducted offline can now be executed online, facilitating access and enhancing workflow efficiency. By implementing this measure, firms can expedite their operations, minimize paper usage, and improve communication. Enterprises can more effectively satisfy the requirements of contemporary work environments by adopting digital technologies.

At Bandung Computer Education, the staff monitoring system continues to depend on manual methods. This labor-intensive procedure results in possible inaccuracies in data entry and management, as attendance verification is transmitted through WhatsApp as photographs. Employees are required to submit their attendance documentation, and administrative personnel must diligently verify each entry, which might be arduous.

Furthermore, further obstacles emerge when transmitting photographs as evidence of attendance via WhatsApp. The procedure is complicated by the necessity to authenticate each uploaded photograph. This strategy is not only time-consuming but also creates data security risks. Dependence on messaging applications for confidential information may expose a company to risks, such as unauthorized access and data breaches.

To solve this problem, a more efficient and secure attendance management system is necessary. Digital solutions, such as facial

recognition technology, could revolutionize the way attendance is tracked at Bandung Computer Education. By automating the attendance recording process, the organization can reduce errors, streamline operations, and enhance data security, which ultimately leads to a more efficient and reliable system.

Understanding Facial Recognition

Face recognition is a technology that uses facial features to identify or confirm a person's identity. Ini biasanya digunakan dalam attendance systems that use facial scanning techniques. These systems can identify faces through photos, videos, or even in real time. (Bah & Ming, 2020)

Face recognition is a key component of biometric security technology, which also includes other forms such as voice recognition and fingerprint recognition that can be integrated into attendance machines. This technology is widely used in corporate and government offices to replace traditional fingerprint systems for employee time and attendance tracking. (Mukherjee et al., 2022)

Currently, face recognition is a rapidly growing field due to its applications in various fields, such as system security, access control to rooms, and identity recognition from databases. It can recognize millions of faces, even with significant changes, such as aging, wearing glasses, or changing hairstyles.

Organizations can use facial recognition technology to enhance security and streamline processes, making attendance tracking more efficient and accurate. This innovation will shape the future of identity verification across various fields. (Nguyen-Tat et al., 2024)

Face recognition is intriguing due to its several advantages, including its capacity to swiftly and precisely identify and detect an individual's face, even in the presence of injuries or facial hair alterations such as mustaches or beards. Numerous algorithms are frequently employed in facial recognition systems, such as eigenfaces and fisherfaces. The accuracy level achieved with the eigenfaces method reaches 88%.

This research utilizes the face detection algorithm established by Paulus Viola and Michael Jones, published in 2001. This technique is commonly referred to as the Viola-Jones approach. The methodology for object detection in an image integrates four fundamental concepts:

Basic rectangular characteristics:

1. A cohesive image for swift feature identification.
2. The AdaBoost algorithm for machine learning.
3. An effective cascade classifier that integrates many features.

Understanding the Attendance System

An attendance system is a mechanism employed to document and oversee individual presence at a specific location. This mechanism may be either manual or digital.

An electronic attendance system utilizes technology to automatically and instantly record an individual's attendance. This encompasses the application of biometric technologies, including fingerprint and facial recognition, which can improve efficiency and precision in attendance monitoring (Huang et al., 2021; Saied & Syafii, 2023).

Understanding Local Binary Pattern Histogram (LBPH)

The Local Binary Pattern Histogram (LBPH) is an advanced method developed from the Local Binary Pattern (LBP) method to enhance face recognition accuracy. LBP functions as a texture descriptor that can also characterize faces, as facial images might be perceived as an amalgamation of micro-texture patterns. This is a non-parametric operator that characterizes the local spatial configuration of the image. (Chowanda et al., 2022)

OpenCV

OpenCV is an open-source library written in C++ that is designed for image processing and computer vision applications. OpenCV theoretically functions by emulating the human visual system, which perceives objects through "vision" and relays images of those items to the brain for processing, enabling comprehension of visual stimuli. OpenCV is a domain of artificial intelligence utilized for the construction and analysis of image information, object recognition, and other applications. At the time of this research's composition, OpenCV provides three facial recognition algorithms: Eigenface, Fisherface, and Local Binary Pattern Histogram (LBPH). (Kortli et al., 2020)

Pre-processing

Preprocessing, also known as image processing, is a type of signal processing that takes images as input and transforms them into another image as output through specific processes. Image processing is conducted to rectify faults in image signal data that arise during transmission and signal capture, as well as to enhance the visual quality of images for improved interpretation by human visual systems. (Sugeng & Mulyana, 2022; Valueva et al., 2020) This is accomplished through the alteration and analysis of photographs. In the preprocessing phase, the image values are refined to yield more precise information.

The preprocessing stages employed are as follows:

a. Cropping

   Cropping is the process of isolating the facial picture by removing extraneous portions beyond the face.

b. Grayscale

   The grayscale step involves converting the RGB image format to grayscale format. This aims to optimize the pixel intensity of the image, thereby reducing memory computation demands and enhancing processing performance.

How the Haar Cascade Classifier Works

As stated by Cao et al., (2020), the Haar algorithm employs statistical techniques for facial recognition. This technique utilizes Haar-like properties as examples. The classifier uses images of a specific dimension, generally 24x24 pixels. The Haar method identifies faces by employing a sliding window technique of 24x24 pixels throughout the image, seeking regions that resemble a face. Furthermore, Haar possesses the capacity to execute scaling, enabling it to identify faces that are either larger or smaller than those in the classifier images. The characteristics of Haar-like features are determined by their shape, encompassing the coordinates and dimensions of each feature.

Implementing facial recognition technology in the employee attendance system can effectively resolve this issue. Facial recognition

technology facilitates automated attendance tracking through facial identification, hence minimizing the likelihood of inaccuracies. This method facilitates enhanced data administration, eliminating the necessity for individual entry in Excel or photo verification via WhatsApp.

Consequently, the author has devised a method that streamlines the attendance procedure for employees to address these issues. The objective is to optimize the attendance procedure and augment the efficacy and efficiency of employee attendance administration.

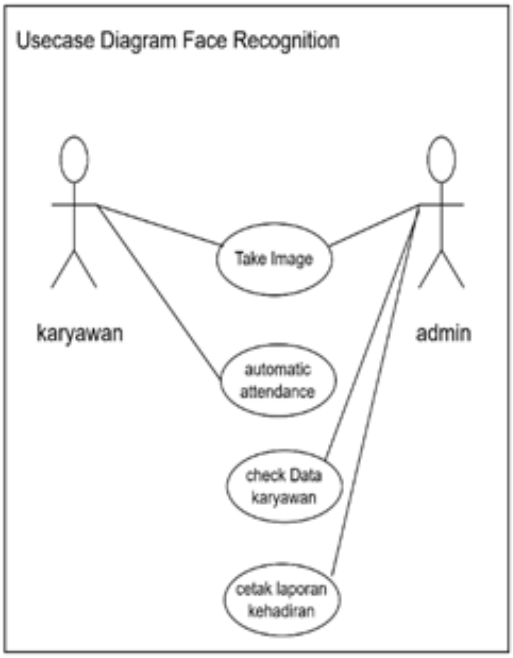
METHOD

The research methodology begins with a literature analysis to understand the recent advancements in facial recognition technology, as well as the applications and issues associated with digital attendance management systems. A needs analysis is conducted through surveys and interviews with employees and management at Bandung Computer Education to determine their requirements, challenges, and expectations for the attendance system. Furthermore, an examination of the existing manual attendance recording method will be conducted to pinpoint deficiencies and opportunities for enhancement. A preliminary evaluation of the system will be conducted using pertinent datasets to determine its precision and efficacy in face detection under diverse situations.

System Development Methodology

The system development methodology begins with the design of the system architecture, which encompasses software components, user interfaces, and system workflows. This design is visualized using flowcharts and mockups to depict user interactions. A prototype of the attendance system utilizing facial recognition is subsequently created, incorporating modules for picture acquisition, facial processing, and attendance data storage. This prototype undergoes testing to assess its functionality and correctness, with user feedback gathered for subsequent enhancements. The system is subsequently installed at Bandung Computer Education, along with training for its employees. System review occurs post-implementation to verify that performance aligns with expectations, while maintenance and technical assistance are provided to

RESULT AND DISCUSSION **Design Analysis**



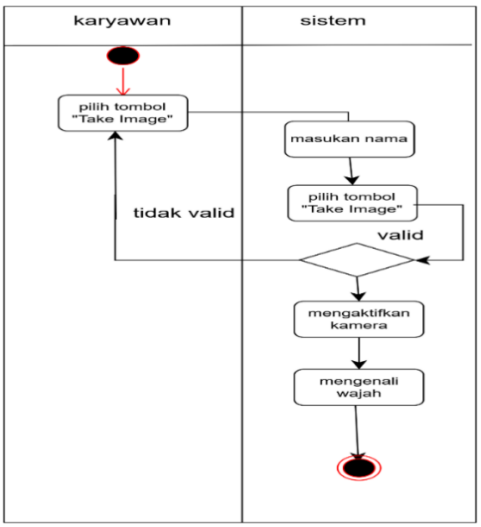


Figure 1. Design Analysis

System Design

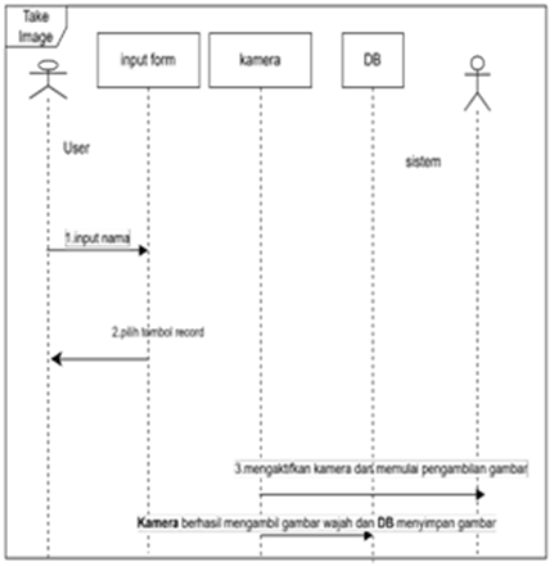


Figure 2. Sequence Diagram Design

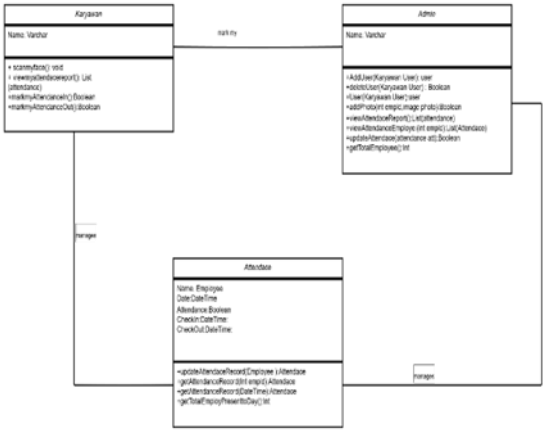


Figure 3. Class Diagram Design

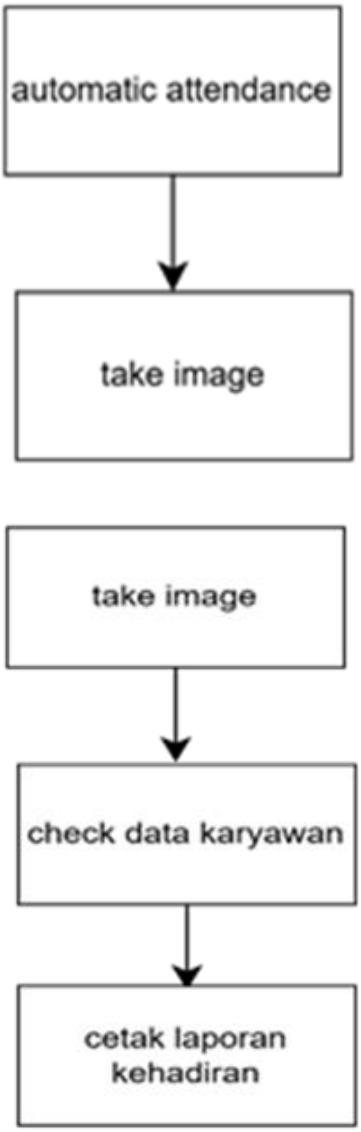


Figure 4. Menu Structure Design

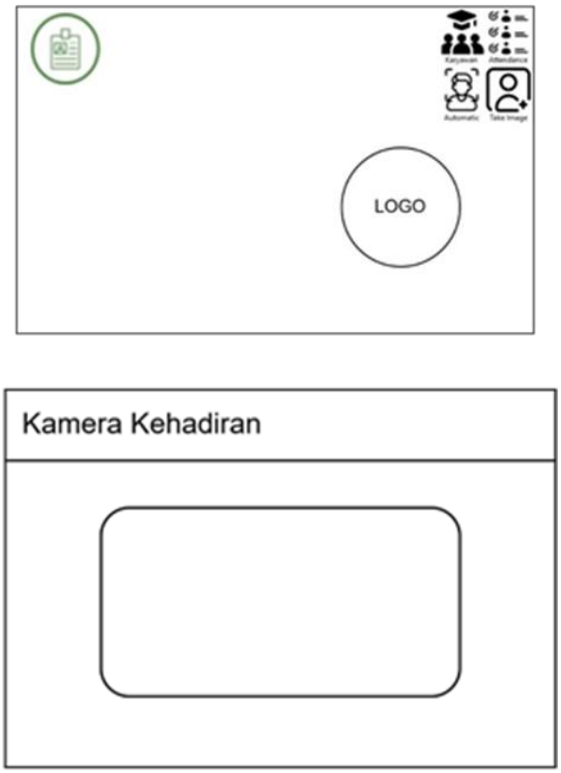
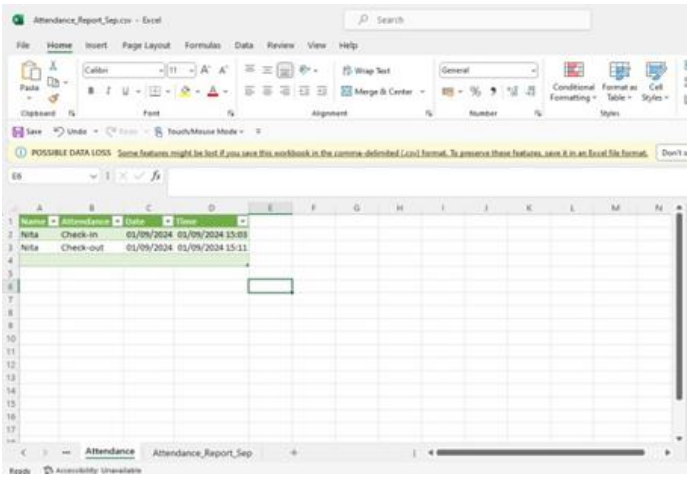
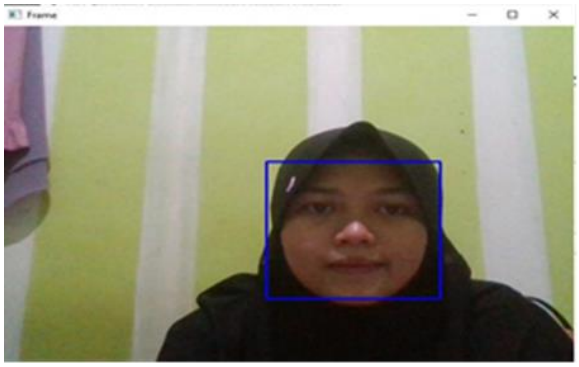


Figure 5. Interface Design

System Implementation




Attendify
Face Recognition Absensi Karyawan
Klik Tab Menu Di Kanan Atas

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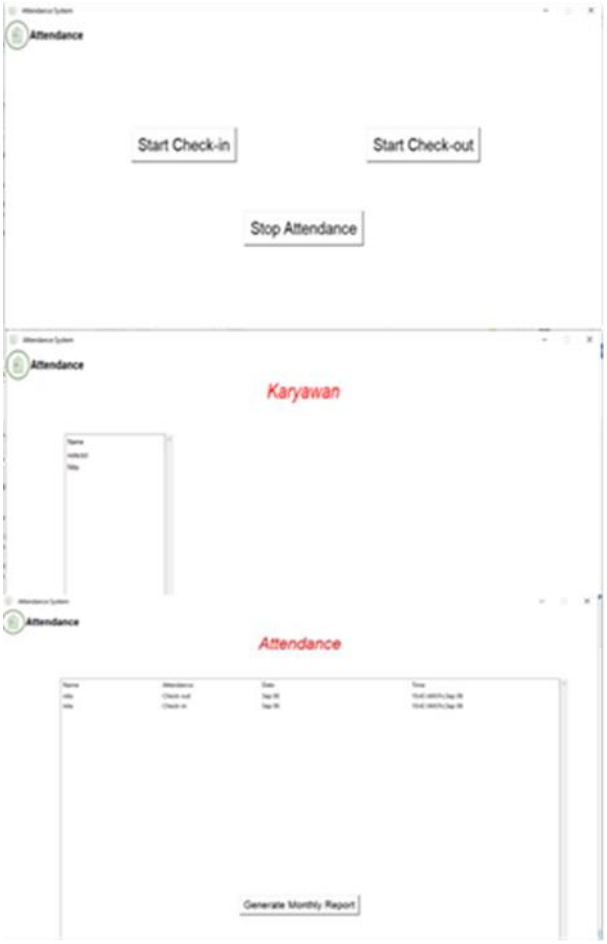

CONCLUSION

Based on the analysis of the completed research, several critical findings can be derived regarding the mobile web-based Tahsin learning application. The development of an attendance system application utilizing facial recognition technology significantly improves the efficiency of employee check-ins, optimizing the attendance process and minimizing the potential for errors associated with manual entry. This invention not only conserves time but also enhances the overall efficacy of attendance management. Moreover, the technology demonstrates its ability to precisely identify faces that have been previously registered in the database, ensuring dependable attendance verification. The twin purpose of enabling user-friendly attendance tracking and ensuring data accuracy highlights the efficacy of using advanced technology in educational applications.

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