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Smart Classroom Attendance: A Contactless Facial Recognition Solution

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Abstract: *Attendance management plays a crucial role in organizational and academic environments, where traditional manual methods are often inefficient, prone to errors, and susceptible to fraudulent practices such as proxy attendance. In this work, we present a Face and Iris Recognition-Based Attendance Management System (FAMS) that automates attendance recording with enhanced accuracy and security by utilizing biometric authentication techniques. The proposed system integrates real-time face detection using Haar Cascade Classifiers and face recognition using the Local Binary Pattern Histogram (LBPH) algorithm, ensuring reliable identification even under varying environmental conditions. Additionally, the system enhances authentication robustness by incorporating iris recognition, leveraging Hough Circle Transform to detect and extract iris features from detected eye regions. Implemented in Python with support from libraries like OpenCV, Tkinter, PIL, and Pandas, the system provides a simple and user-friendly graphical interface, allowing users to enroll themselves by capturing face images, training recognition models, and participating in real-time attendance capture. Attendance records are automatically stored in CSV files and simultaneously updated in a local MySQL database, ensuring both offline and persistent record-keeping. Experimental validation was conducted with a group of participants across multiple sessions. The system achieved a face recognition accuracy of approximately 95%, with iris-based verification contributing an additional 2–3% increase in overall authentication confidence. The real-time performance, with an average recognition time of around 0.3 seconds per frame, demonstrated the system's suitability for practical use cases without the need for specialized high-performance hardware. Comparative evaluations with traditional methods indicated a significant reduction in human errors and administrative overhead. Although effective, the system has limitations under extreme lighting variations and requires subjects to maintain appropriate positioning for optimal iris detection. Future work aims to incorporate deep learning-based facial and iris recognition models such as CNN architectures, implement adaptive preprocessing techniques for illumination correction, and extend platform compatibility towards mobile and cloud-based deployments. Overall, the proposed system offers a promising, scalable, and robust solution to the persistent challenges in conventional attendance management, ensuring enhanced accuracy, user convenience, and operational security.*

Keywords: Face Recognition, Iris Recognition, Attendance System, LBPH Algorithm, Python, OpenCV, Haar Cascade Classifier, Tkinter GUI, Real-Time Image Processing, Feature Extraction.

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