

Abstract

In an era where security, accuracy, and efficiency are critical in institutional operations, traditional attendance and access control methods such as manual registers, ID cards, and password-based systems have become increasingly inadequate. These conventional approaches are often vulnerable to errors, impersonation, data manipulation, and unauthorized access, leading to inefficiencies in managing student records and campus security. To address these challenges, this project proposes the design and implementation of a Hybrid Biometric Sign In/Sign Out System that integrates both facial recognition and fingerprint verification technologies into a single, robust authentication framework.

The system is developed to automate the student attendance process by verifying identity through two biometric modalities, ensuring a higher level of accuracy and security compared to single-factor systems. The workflow begins when a student approaches a device installed at entry or exit points, enters their name or student ID, and undergoes face recognition followed by fingerprint verification. Upon successful authentication, the system records the sign-in or sign-out time, optionally logs device information (e.g., laptops or tablets), and stores all data securely in a centralized database. This database supports advanced administrative features such as real-time record monitoring, search and filter capabilities, attendance report generation, and entry correction.

The hybrid approach significantly reduces false acceptance and rejection rates by combining the strengths of two biometric systems, making it more reliable even under challenging conditions. It also enhances institutional security by preventing unauthorized access, ensuring that only registered individuals are granted entry. Additionally, the system minimizes human intervention, reduces paperwork, and improves the efficiency of attendance tracking and reporting processes.

Overall, this project demonstrates how biometric technologies can be leveraged to create a secure, user-friendly, and scalable identity management solution. By merging automation with multi-factor biometric verification, the Hybrid Biometric Sign In/Sign Out System offers a practical and future-ready approach to attendance management, suitable for educational institutions and other organizations seeking to improve security, accountability, and operational efficiency.