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Fingerprint Biometric Based Attendance System for College

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Abstract:
A Fingerprint Biometric Based Attendance System for College is designed to automate and secure the attendance recording process using biometric fingerprint recognition technology. Traditional attendance methods such as manual registers and ID card scanning are prone to errors, time consumption, and proxy attendance. To overcome these problems, biometric technology provides a reliable and accurate solution for verifying the identity of students.

In this system, each student's fingerprint is registered and stored in the database during the enrollment phase. When students arrive at the classroom or college entrance, they scan their fingerprints using a fingerprint scanner device. The system captures the fingerprint image, processes it, and matches it with the stored fingerprint templates in the database. If the fingerprint matches, the attendance is automatically marked along with the date and time.

This biometric-based attendance system improves accuracy, prevents proxy attendance, reduces manual work, and provides real-time attendance tracking. It can be effectively implemented in colleges to ensure reliable and efficient attendance management.

Keywords: Fingerprint Recognition, Biometric System, Attendance Management, Security, Automation, Student Identification.

1. Introduction

Attendance management is an essential part of academic institutions for monitoring student participation and discipline. Traditional attendance systems such as manual registers require teachers to spend considerable time marking attendance. These methods are also prone to errors and manipulation such as proxy attendance.

Biometric technology provides a more reliable and secure method for authentication. Among various biometric techniques, fingerprint recognition is widely used because of its uniqueness, accuracy, and low cost. Each person has a unique fingerprint pattern that cannot easily be duplicated.

The proposed Fingerprint Biometric Based Attendance System uses fingerprint scanning devices to capture student fingerprints and automatically mark attendance in a database. The system is connected to a web

application developed using HTML, CSS, JavaScript, and PHP/Flask for managing student data and generating attendance reports.

This system reduces administrative workload, improves accuracy, and ensures that only authorized students can mark their attendance.

2. Literature Review

Biometric technology has become an important solution for improving security and authentication systems in various fields, including education. Traditional attendance systems such as manual registers and ID cards are often inefficient and can lead to errors or proxy attendance. To overcome these issues, many researchers have proposed biometric-based attendance systems that use unique human characteristics such as fingerprints, facial recognition, or iris patterns for identification.

Shekar et al. (2024) - The researchers proposed an IoT-based biometric student attendance system using fingerprint sensors and microcontrollers. The system sends attendance data to a cloud server and provides real-time monitoring and SMS notifications. The study highlighted the advantages of integrating IoT with biometric attendance systems.

Xiaoliang et al. (2024) - This research introduced a multimodal biometric attendance system combining multiple biometric techniques such as face recognition and gait recognition. Experimental results showed improved accuracy and better real-time attendance tracking compared with traditional systems. Mankar et al. (2024) - The authors analyzed various biometric attendance systems used in educational institutions. Their research emphasized the importance of fingerprint authentication in improving attendance accuracy, reducing time consumption, and increasing user satisfaction in academic environments.

Bakshi (2025) - The study presented a fingerprint attendance system that captures fingerprint images and compares them using structural similarity index techniques. The results demonstrated that fingerprint-based systems provide highly accurate attendance verification compared to traditional attendance methods.

3. Methodology

The methodology describes the process used to develop the fingerprint biometric attendance system. The system is designed to automatically record student attendance using fingerprint recognition technology.

3.1. Student Registration - In the first step, students are registered in the system. Basic details such as student name, ID number, department, and contact information are entered into the database. Each student is then required to scan their fingerprint using the fingerprint scanner.

3.2. Fingerprint Enrollment - During enrollment, the fingerprint scanner captures the student's fingerprint image and converts it into a digital template. This template is stored securely in the system database and used later for identification and verification.

3.3. Fingerprint Verification - When students arrive for class, they place their finger on the fingerprint scanner. The system captures the fingerprint and compares it with the stored fingerprint templates in the database to verify the student's identity.

3.4. Attendance Recording - Once the fingerprint is successfully verified, the system automatically records the student's attendance along with the date and time. The attendance record is stored in the database for future reference.

3.5. Database Management - All attendance data are maintained in a centralized database. The system allows administrators or teachers to view, update, and manage attendance records easily.

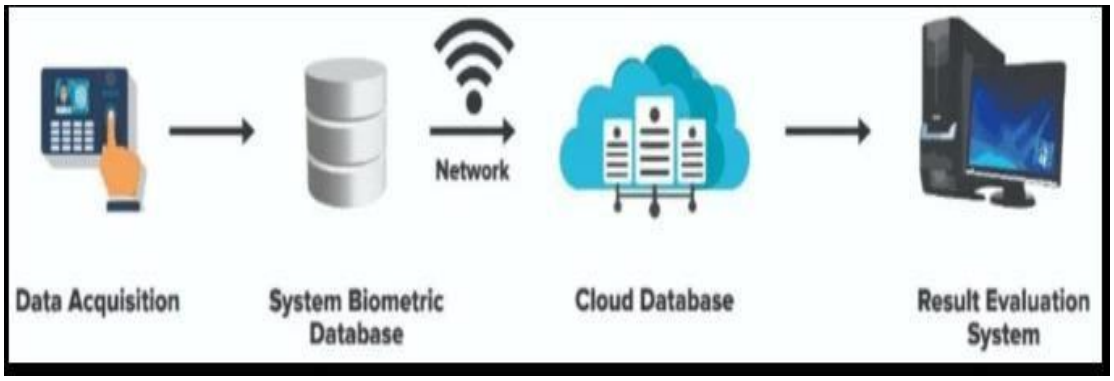
3.6. Report Generation - The system generates attendance reports such as daily attendance, monthly attendance, and student attendance summaries. These reports help teachers and administrators monitor student attendance efficiently.

Overall, this methodology ensures an accurate, secure, and automated attendance management system that reduces manual work and prevents proxy attendance in colleges.

4. Modules description

1. Student Registration Module Stores student details
✓ Registers fingerprint template
2. Fingerprint Authentication Module
✓ Captures fingerprint
✓ Matches with stored templates
3. Attendance Recording Module
✓ Marks attendance automatically
✓ Saves date and time
4. Admin Dashboard Module Manage students
✓ View attendance records
5. Report Generation Module
✓ Daily attendance reports
✓ Monthly reports
✓ Export attendance to CSV/Excel
6. Login & Security Module
✓ Admin login authentication
✓ Data protection

5. System Architecture



6. Performance Result

The developed Fingerprint Biometric Attendance System was successfully implemented and tested for recording student attendance. The system accurately captured and verified students' fingerprints using a biometric scanner. After verification, the attendance was automatically recorded in the database with the corresponding date and time.

During testing, the system demonstrated high accuracy in identifying registered students and effectively prevented proxy attendance. The fingerprint verification process was quick and efficient, allowing multiple students to mark their attendance within a short period.

Overall, the results show that the biometricbased attendance system improves efficiency, accuracy, and security compared to traditional manual attendance methods. The system reduces time consumption and provides reliable attendance management for educational institutions.

7. Conclusion

The Fingerprint Biometric Based Attendance System for College provides a modern and efficient solution for managing student attendance. By using fingerprint authentication, the system ensures that attendance is recorded accurately and prevents proxy attendance.

This system reduces manual work for faculty members, improves attendance tracking, and provides reliable attendance reports.

8. Future Scope

The fingerprint biometric attendance system can be further improved by integrating advanced technologies and additional features. In the future, the system can be connected with cloud-based databases to store attendance records securely and allow administrators to access data from anywhere.

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