

**Automated Attendance Portal**

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**INTRODUCTION**

Attendance systems of old practices are not quite efficient. Now a days for keeping track on student’s attendance. Student enrollment in schools and colleges is increasing every year and each student’s attendance plays a very important role. So, it is necessary to discuss an effective system which records the attendance of a student automatically. Maintaining attendance is very important in all the colleges for checking the performance of students. Every college has its own method in this regard. Some are taking attendance of students manually using attendance registers or marking attendance sheets or file-based approach and some have adopted the methods of automatic attendance using some biometric techniques. But in these methods, students must wait for a long time in a queue at the time they enter inside the classroom.

Many biometric systems are available in the market, but the key authentications are the same in all the techniques. Every biometric system consists of an enrollment process in which the unique feature of a person is stored in the database and after that, there are some processes of identification and verification of the person. These two processes compare the biometric features of a person with previously stored template captured at the time of enrolment of a student. Biometric templates can be of many types like Fingerprints, Eye Iris, voice etc. Our system uses the face recognition approach for the automatic attendance of the students in the classroom environment without student intervention. The purpose of developing the new attendance management system is to computerize the traditional methods of taking the attendance. Therefore, to draw the attention of students and make them interactive in observing technologies, we try to move on to the latest upcoming trends in developing attendance systems. This is the reason for the college attendance management system to come up with an approach that ensures a strong contribution of students in classrooms.

To track the attendance of the students, we have introduced the attendance management system. With the introduction of this attendance system, skipping classes for students without the staff’s knowledge has become difficult. The attendance management system is to count the number of students and urge students to attend the classes on time, to improve the quality of teaching.

**SCOPE**

**1.1 In Scope**

The Attendance Management System using facial recognition technology is a transformative initiative designed to streamline and modernize the process of tracking student attendance in educational institutions. The scope of this project encompasses several key areas, ensuring a comprehensive, efficient, and user-friendly solution that addresses the diverse needs of students, teachers, and administrators.

**Core Functionality**

1. Automated Attendance Tracking:
   * The primary scope of the project is to automate the attendance-taking process using facial recognition technology. This eliminates the need for manual attendance, reducing errors and saving valuable time during class sessions.
2. RFID Integration:
   * The system integrates RFID technology to ensure secure and unique identification of students. Each student is issued an RFID card that links to their profile, providing an additional layer of security and ensuring accurate data association.
3. Real-Time Processing:
   * The project aims to provide real-time attendance tracking. As students enter the classroom, the system immediately processes their facial data and marks their attendance, providing instant feedback and updates.

**System Architecture**

1. Database Management:
   * Utilizing MySQL, the system maintains a robust and scalable database to store all student information, attendance records, and class schedules. This ensures data integrity and facilitates easy retrieval and reporting.
2. Backend Server:
   * The system is supported by an Apache server that manages data requests, handles user authentication, and ensures secure communication between the frontend and backend components. This server-side management ensures reliability and scalability.
3. PHP Modules:
   * The project includes several PHP modules that handle different functionalities, such as user registration, class management, attendance logging, and report generation. These modules are designed to work together seamlessly, ensuring smooth operation and efficient data processing.

**User Interface**

1. Teacher and Admin Dashboards:
   * The system provides intuitive dashboards for teachers and administrators. These dashboards offer easy access to attendance records, student profiles, class schedules, and various reports, enhancing the user experience and improving productivity.
2. Student Interface:
   * Students can access their attendance records and other relevant information through a dedicated interface. This transparency helps students keep track of their attendance and ensures accountability.

**Future Enhancements**

1. Advanced Facial Recognition Algorithms:
   * The project scope includes potential future enhancements involving more advanced deep learning algorithms, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), to improve recognition accuracy and speed.
2. Mobile Application Development:
   * Expanding the project to include mobile applications for iOS and Android platforms would provide greater flexibility. Teachers and administrators could manage attendance from their mobile devices, and students could use their smartphones for identification.
3. Integration with Learning Management Systems (LMS):
   * Integrating the Attendance Management System with existing LMS platforms could offer a holistic view of student engagement and performance. This integration would allow for comprehensive data analysis, correlating attendance with academic performance.
4. Advanced Analytics and Predictive Modelling:
   * Implementing advanced analytics could provide deeper insights into attendance patterns and student behaviour. Predictive models could help identify trends and potential issues, enabling proactive interventions.
5. Multi-Modal Biometric Authentication:
   * Future developments could incorporate additional biometric technologies, such as fingerprint scanning and voice recognition, to provide multi-modal authentication, further enhancing the system’s security and reliability.

**Operational and Compliance Considerations**

1. User Training and Support:
   * The project scope includes provisions for user training to ensure that teachers, administrators, and students can effectively use the system. Ongoing support is also planned to address any issues and aid as needed.
2. Data Privacy and Security:
   * Ensuring compliance with relevant data privacy laws and institutional policies is a critical aspect of the project. The system is designed with robust security measures to protect sensitive information and maintain confidentiality.
3. Scalability and Flexibility:
   * The system is designed to be scalable, capable of handling increasing numbers of students and classes without performance degradation. Its modular architecture allows for easy updates and customization to meet evolving needs.

In conclusion, the scope of the Attendance Management System project is comprehensive, addressing current needs while anticipating future requirements. By leveraging cutting-edge technology and prioritizing user experience, the project aims to revolutionize attendance management in educational institutions, making it more efficient, accurate, and secure.

**1.2 Out of Scope**

The out-of-scope section defines the boundaries of the project by specifying what will not be included. This helps to manage expectations and ensures that all stakeholders have a clear understanding of the project's limitations.

1. **Multi-Campus Management:**
   * The system is designed to handle attendance management within a single educational institution. Managing attendance across multiple campuses or geographically dispersed locations is not within the scope of this project.
2. **Integration with External Learning Management Systems (LMS):**
   * This project does not include integration with existing LMS platforms such as Moodle, Blackboard, or Canvas. While such integrations could enhance functionality, they are beyond the current project's scope.
3. **Mobile Application Development:**
   * The project focuses on a web-based interface for administrators and a desktop-based facial recognition system. Developing native or cross-platform mobile applications for students or faculty is not included.
4. **Advanced Biometric Authentication:**
   * While facial recognition is used, the system does not include other forms of biometric authentication such as fingerprint scanning, iris recognition, or voice recognition.

**1.3 Quality Objective**

The quality objectives for the Attendance Management System project are defined to ensure that the system meets the highest standards of reliability, usability, performance, security, and maintainability. These objectives guide the testing process to ensure the system functions effectively in a real-world educational environment. Below are the detailed quality objectives tailored for this project:

1. **Reliability:**
   * Objective: Ensure that the system performs consistently under defined conditions.
   * Metrics: Achieve 99.9% uptime, zero critical system crashes during operation, and a maximum of one minor issue per semester that requires intervention.
2. **Usability:**
   * Objective: Provide an intuitive and user-friendly interface for administrators, teachers, and students.
   * Metrics: Conduct user satisfaction surveys targeting an 85% satisfaction rate. Aim for 95% task completion rate without errors and less than 5 minutes of training time per user for basic operations.
3. **Performance:**
   * Objective: Ensure the system performs efficiently under various load conditions.
   * Metrics: Response time for any user action should be less than 2 seconds under normal load conditions and less than 5 seconds under peak load. System should handle up to 500 concurrent users without performance degradation.
4. **Security:**
   * Objective: Protect sensitive data and ensure compliance with relevant data protection regulations.
   * Metrics: Implement robust encryption for data storage and transmission. Conduct regular security audits with a goal of zero vulnerabilities detected in periodic security scans. Ensure compliance with GDPR and other relevant regulations.
5. **Maintainability:**
   * Objective: Ensure the system can be easily maintained and updated.
   * Metrics: Document 100% of the codebase and system functionalities. Implement modular design allowing for easy updates and bug fixes, with a target of resolving 90% of reported bugs within two business days. Ensure the system is designed to support seamless updates without downtime.
6. **Scalability:**
   * Objective: Design the system to accommodate future growth in the number of users and data volume.
   * Metrics: System should scale to support up to 1000 concurrent users and manage data growth of 20% per year without significant performance impacts.

**1.4 Roles and Responsibilities**

Detail description of the Roles and responsibilities of different team members like

* **QA Analyst:** Anand Parashar

The Quality Assurance (QA) Analyst conducted testing on software, websites, and other technical products to identify and resolve bugs, defects, and other potential issues.

* **Test Manager:** Ms. Akansha Tyagi

Managed all test processes, including test plans, resources, costs, timescales, test deliverables and traceability.

* **Configuration Manager:** Mrs. Neha Shukla
* **Developers:** Anand Parashar, Antriksh Tyagi, Devraj Gupta, Ansh Shrivastava. Developed the model and trained it.
* **Installation Team:** Anand Parashar, Antriksh Tyagi, Devraj Gupta, Ansh Shrivastava., Akansha Tyagi, Neha Shukla

Responsible for smooth execution of the program

**Test Methodology**

**2.1 Overview**

For attendance management system project with facial recognition, the Waterfall Model is a suitable Software Development Life Cycle (SDLC) model to consider. Here's why:

1. **Sequential Approach**: The Waterfall Model follows a linear and sequential approach, where each phase must be completed before moving on to the next. This aligns well with the systematic nature of developing an attendance management system, where requirements need to be defined, implemented, and tested in a structured manner.
2. **Well-Defined Phases**: The Waterfall Model consists of distinct phases, including Requirements Analysis, Design, Implementation, Testing, Deployment, and Maintenance. Each phase has its own set of deliverables and objectives, making it easier to track progress and ensure that all necessary tasks are completed.
3. **Clear Documentation**: Since the Waterfall Model emphasizes thorough documentation at each stage, it ensures that requirements, design specifications, and test plans are well-documented before proceeding to the next phase. This documentation is essential for maintaining clarity and consistency throughout the development process, especially in a project like attendance management where precise specifications are crucial.
4. **Low Risk of Scope Creep**: The Waterfall Model's rigid structure makes it less susceptible to scope creep, as changes to requirements are discouraged once the project moves beyond the Requirements Analysis phase. This can be advantageous for maintaining project stability and meeting deadlines, particularly in projects with well-defined and stable requirements like an attendance management system.
5. **Suitable for Small to Medium-Sized Projects**: The Waterfall Model is particularly well-suited for small to medium-sized projects with clear and stable requirements, making it an appropriate choice for developing an attendance management system within a specified timeframe and budget.

**2.2 Test Levels**

Testing is a crucial phase in the development of the attendance management system to ensure it functions correctly, efficiently, and reliably. The testing process involves various techniques and methodologies to validate different aspects of the system, including functionality, performance, security, and user experience.

**1. Unit Testing**

1. **Objective:** To test individual components or modules of the system to ensure they work as intended.
2. **Methodology:**
   1. Write test cases for each function and method in the code.
   2. Use a testing framework like **unit test** in Python to automate the execution of these test cases.
   3. Mock external dependencies (e.g., database connections) to isolate the component being tested.
3. **Example:**
   1. Test the getClassData function to ensure it correctly retrieves class data from the server.
   2. Test the getStudentOfClass function verify it fetches the correct list of students for class.
4. **Test Cases Used in This Project:**

**Test Case 1: Valid RFID Data Retrieval**

1. **Objective:** Verify that the getClassData function retrieves correct class data for a valid RFID.
2. **Input:** Valid RFID, current time.
3. **Expected Output**: Correct class data (class name, subject, teacher name, and email).

**Test Case 2: Invalid RFID Data Retrieval**

1. **Objective**: Verify that the getClassData function handles invalid RFID correctly.
2. **Input:** Invalid RFID, current time.
3. **Expected Output**: Error message indicating RFID not registered.

**Test Case 3: Student List Retrieval**

1. **Objective:** Ensure getStudentOfClass function retrieves the correct list of students for a given class.
2. **Input:** Valid class name.
3. **Expected Output:** List of student objects with correct details (roll number, name, image path).

**2. Integration Testing**

1. **Objective:** To test the interaction between different modules and ensure they work together as expected.
2. **Methodology:**
   1. Combine individual modules and test them as a group.
   2. Use integration test cases to verify the flow of data and control between modules.
3. **Example:**
   1. Test the integration of the RFID reader module with the class data retrieval and face recognition modules.
   2. Verify that the attendance submission process works correctly when combining the face recognition output with the attendance recording module.
4. **Test Cases Used in This Project:**

**Test Case 1: End-to-End Attendance Capture**

1. **Objective:** Verify the complete workflow from RFID scan to attendance recording.
2. **Input:** Valid RFID, current time, captured face images.
3. **Expected Output:** Successful attendance submission and correct record in the database.

**Test Case 2: RFID and Face Recognition Integration**

1. **Objective:** Test interaction between RFID reader and face recognition module.
2. **Input:** Valid RFID, face images.
3. **Expected Output:** Correct identification of faces and accurate attendance recording.

**3. System Testing**

1. **Objective:** To test the entire system to ensure it meets the specified requirements.
2. **Methodology:**
   1. Conduct end-to-end testing of the system, including all integrated modules and external interfaces.
   2. Perform functional testing to validate that the system performs the expected tasks and produces the correct outputs.
3. **Example:**
   1. Test the complete attendance capture and submission workflow, from scanning the RFID tag to recognizing the face and recording attendance in the database.
   2. Verify that the system handles various scenarios, such as unregistered RFID tags, invalid class times, and multiple students in the frame.
4. **Test Cases Used in This Project:**

**Test Case 1: Complete System Functionality**

1. **Objective:** Test the entire system functionality as a whole.
2. **Input:** Valid RFID, face images, class data.
3. **Expected Output:** End-to-end system works correctly, from RFID scanning to attendance submission.

**Test Case 2: Handling Multiple Students**

1. **Objective:** Verify system performance and accuracy with multiple students.
2. **Input:** Multiple RFID scans, multiple face images.
3. **Expected Output:** Correct attendance records for all students.

**4. Performance Testing**

1. **Objective:** To assess the system's performance under various conditions, including load and stress testing.
2. **Methodology:**
   1. Use performance testing tools to simulate multiple users and concurrent operations.
   2. Measure response times, throughput, and resource utilization.
3. **Example:**
   1. Test the system's performance when multiple RFID scans and face recognition processes occur simultaneously.
   2. Measure the time taken to process and submit attendance for a large class size.
4. **Test Cases Used in This Project:**

**Test Case 1: Load Testing**

1. **Objective:** Assess system performance under a high load of concurrent RFID scans and face recognitions.
2. **Input:** Simulated concurrent RFID scans and face recognitions.
3. **Expected Output:** System maintains performance without significant degradation.

**Test Case 2: Stress Testing**

1. **Objective:** Test system behaviour under extreme conditions.
2. **Input:** Extreme number of RFID scans and face recognitions beyond normal usage.
3. **Expected Output:** System handles stress gracefully, with appropriate error handling.

**2.3 Test Completeness**

Few criteria to check Test Completeness are:

* 100% test coverage
* All open bugs are fixed or will be fixed in the next release.

**2.4 Automation Testing-Selenium**

**Test Case 1: Admin Login**

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**Test Case 2: Teacher Login**

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**Test Case 3-Admin Dashboard**

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**Test Case 4-Teacher Dashboard**

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