JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

An Autonomous College, Affiliated to University of Mysuru
Re-accredited by NACC with 'A' Grade,
Ooty Road, Mysuru – 570025

A
Project Report On

"SMART ATTENDANCE SYSTEM USING FINGERPRINT"

Submitted in the partial fulfillment of the requirements for the award of
IV Semester

Master of Computer Applications

Submitted By
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2023 - 2024

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CERTIFICATE

This is to certify that **RUCHITHA KL (P01BE22S126060)**, has successfully completed his/her project work entitled "**SMART ATTENDANCE SYSTEM USING FINGERPRINT"**and submitted the report in partial fulfillment of the requirement of **IVSemester, Master of Computer Applications, JSS College of Arts, Commerce and Science, Mysuru,** during the academic year **2023 - 2024.** It is certified that all corrections and suggestions indicated for the internal assessment have been incorporated in the report. This report has been approved as it satisfies the academic requirements in respect of project work prescribed for IV Semester MCA.

Signature of the Guide
Department of
Master of Computer Application

Signature of the HOD
Department of
Master of Computer Application

VALUED

Name and Signature of the Examiners:

1. _____

2. _____

Signature of the HOD
Department of
Master of Computer Application

DECLARATION

I, RUCHITHA K L **(P01BE22S126060),** hereby declare that the project work entitled **"SMART ATTENDANCE SYSTEM USING FINGERPRINT**" submitted to the **JSS College of Arts,Commerce and Science, Ooty Road, Mysuru (Affiliated to University of Mysore)** during the academic year **2023-2024**, is a record of an original work done by me under the guidance of **Mr RAVIKUMAR VG, HEAD OF THE DEPARTMENT,** Department of Master of Computer Applications.

Date: /08/2024 **RUCHITHA KL**

Place: Mysuru **(P01BE22S126060)**

ACKNOWLEDGEMENT

I would like to express high regard to our college **JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, MYSURU** for grooming me all these years. The support givenby respected Principal **Dr. M Prabhu**is highly memorable.

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Finally, I would like to thank all the faculty members of Department of Master of Computer Applications, for their support.

Ruchitha K L
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ABSTRACT

This project introduces an advanced fingerprint-based attendance system combined with a user-friendly web application, designed specifically for educational institutions. By utilizing a sophisticated pattern matching algorithm, the system ensures accurate and efficient fingerprint recognition, making attendance marking seamless and automated. Faculty members can easily take attendance, manage student information, and monitor each student's attendance through the web application. Meanwhile, administrators have access to a separate portal where they can manage both faculty and student data, view overall attendance statistics, and generate detailed reports.

The system features a fingerprint scanner that captures and processes fingerprint images for both enrollment and verification purposes. Built on a modern tech stack, the web application ensures secure authentication, a responsive user interface, and reliable data storage in a relational database. The faculty dashboard streamlines attendance management, while the admin dashboard provides comprehensive tools for overseeing faculty and student information. Key features include real-time attendance tracking, detailed analytics, and visual reports that help identify trends and irregularities in attendance. By automating the attendance process and centralizing data management, this system aims to reduce manual errors, ease administrative tasks, and enhance overall attendance monitoring in educational environments.

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Managing attendance effectively is vital for educational institutions, as it impacts both administrative efficiency and student performance. Traditional methods, like manual or card-based systems, are often error-prone, susceptible to fraud, and time-consuming. To solve these issues, we've developed an advanced fingerprint-based attendance system, paired with a user-friendly web application. This system is designed to improve accuracy, security, and ease of use. At the heart of our system is a fingerprint recognition module that uses a pattern matching algorithm to verify each student's identity based on their unique biometric data. This ensures that attendance is recorded accurately and cannot be tampered with. The web application complements this by providing an intuitive interface for faculty and administrators to manage attendance records and student details seamlessly.

Faculty members can easily take attendance, add and manage student information, and view individual attendance records through the web portal. Administrators have broader capabilities, including managing faculty details, overseeing student data, and generating detailed attendance reports. This centralized system not only makes the attendance process more efficient but also offers valuable insights through detailed analytics and visual reports. By combining biometric technology with a robust web platform, our project aims to transform attendance management in educational settings, enhancing reliability, efficiency, and data security.

1.2 PROBLEM STATEMENT

Traditional attendance systems in educational institutions, which often rely on manual entry or card-based methods, are plagued by inefficiencies, errors, and the potential for fraud. These outdated methods not only consume valuable administrative time but also compromise the accuracy and reliability of attendance records, which are crucial for tracking student participation and performance. There is a pressing need for a more secure, accurate, and efficient solution to streamline attendance management, reduce administrative burdens, and enhance data integrity.

This project addresses these challenges by introducing an advanced fingerprint-based attendance system integrated with a web application, designed to revolutionize the way attendance is recorded and managed in educational settings.

1.3 SCOPE

The scope of this project encompasses the development and implementation of an advanced fingerprint-based attendance system integrated with a comprehensive web application portal tailored for educational institutions. It includes designing a robust fingerprint recognition module using a pattern matching algorithm for accurate and secure attendance marking. The project will develop a user-friendly web interface for faculty to manage attendance and student records, and a separate admin portal for managing faculty details, student information, and overall attendance statistics. Additionally, the system will provide real-time insights, detailed analytics, and visual reports to identify attendance trends and irregularities. Security measures will be implemented to ensure data protection and privacy.

1.4 OBJECTIVES

- Develop a fingerprint-based attendance system using a robust pattern matching algorithm to ensure precise and tamper-proof attendance records.
- Implement a user-friendly web application for faculty to easily take attendance, manage student details, and monitor individual student attendance.
- Provide a centralized portal for administrators to manage faculty and student information, view overall attendance statistics, and generate comprehensive reports.
- Automate the attendance process to reduce manual errors and administrative workload, allowing staff to focus on more critical tasks.
- Integrate detailed analytics and visual reports to help identify attendance trends and irregularities, aiding in better decision-making and intervention strategies.

Design the system to be scalable and adaptable to different educational settings and future technological advancements.

LITERATURE SURVEY

CHAPTER 2

LITERATURE SURVEY

Every Software development requires the survey process. The Survey process is needed to get the requirement for the software. The Survey also consists of studying the present system and also studying about the tools needed for the development of the software. A proper understanding of the tools is very much essential. Following is an extract of the information of the material collected during literature survey. Literature survey is a methodology of identifying the problems in the existing system through research and proposing the development of the system to solve the problems of existing system.

Title: Automated Wireless Biometric Fingerprint Based Student Attendance System

Authors : Biswaranjan Swain, Jayshree Halder

Year : 2021

Findings :

This paper proposes an automated wireless biometric fingerprint-based attendance system designed to modernize and secure attendance recording in educational institutions. With 75% attendance being mandatory across India since 2002, traditional methods are prone to errors, document misplacement, and proxy attendance. The new system automates and enhances the accuracy and convenience of attendance management, eliminating manual errors and proxy issues. It is also cost-effective compared to existing market solutions, providing a practical upgrade to conventional practices.

Title: Attendance Monitoring System Using Fingerprint Authentication

Authors : Roshani Memane

Year : 2022

Findings :

The proposed system is intended to address the issues with the current attendance system. Biometric systems have been widely employed for identification purposes. These methods of recognition recognise persons based on certain physiological or behavioral characteristics. This method's main goal is to create a transparent attendance system and keep real-time data and

display it online for parents and other academic purposes. Fingerprint Identification Attendance System is a dependable and simple to use system that produces accurate results.

Title: Internet of Things based Biometric Smart Attendance System

Authors : K. Jayakumar, V. Surendar

Year : 2022

Findings :

The proposed fingerprint-based attendance system enhances user security by using unique biometric data, making it a simple and practical solution for students to access the Internet of Things. Attendance is recorded via a biometric fingerprint scanner, with details securely stored in the cloud. This system seamlessly integrates with existing management systems and provides added safety and ecological benefits. Additionally, the collected fingerprint database can be used for identity management and access control applications.

Title: IoT-Based Portable Fingerprint Attendance System Using the Minutiae Based Algorithm

Authors : Mohammad Idhom, Intan Yuniar Purbasari

Year : 2021

Findings :

The portable IoT fingerprint attendance system (PoFAS-Class) modernizes traditional manual attendance by using electronic devices and the Internet of Things (IoT). Utilizing the Minutiae Based algorithm to detect unique fingerprint patterns, the system includes components like the Nodemcu ESP8266 microcontroller, fingerprint sensor, TFT OLED screen, and battery charger module. It offers a portable solution for recording attendance and features web-based registration and user information access, facilitating online attendance through networks like Wi-Fi.

Title: A Fingerprint Based Smart Attendance and Security System Using IoT and Ultrasonic Sensor

Authors : Sayed Al Amin, Md. Ashikul Islam

Year : 2021

Findings :

This project aims to develop a system that tracks student and teacher attendance while enhancing educational institution security using a fingerprint module, sonar sensor, and IoT. The system comprises hardware and a web server. The hardware collects attendance data and monitors classroom security. The fingerprint module verifies identity and controls door locking, while the ultrasonic sensor ensures the person enters the room. Attendance data is then sent via a Wi-Fi module to the web server for record-keeping.

2.2 EXISTING SYSTEM

Traditional attendance recording systems, such as manual roll calls, sign-in sheets, and swipe cards, are prevalent in many educational and professional settings. These methods, while simple and straightforward, are inherently flawed and inefficient. Manual roll calls are time-consuming and disrupt workflow, while sign-in sheets can be easily manipulated, leading to inaccuracies and potential fraud. Swipe cards, though more automated, still suffer from issues such as card loss, theft, and the possibility of proxy attendance. Additionally, these systems require substantial administrative effort to compile, verify, and manage attendance data, often resulting in errors and delays.

DISADVANTAGES

- Manual roll calls and sign-in sheets require significant time to complete, especially in large groups, leading to disruptions in workflow and productivity.
- The manual nature of traditional systems makes them prone to errors such as incorrect entries, missed names, and illegible handwriting
- Sign-in sheets and swipe cards can be easily manipulated, allowing for proxy attendance where one individual signs in or swipes a card on behalf of another

2.3 PROPOSED SYSTEM

Traditional attendance recording systems, such as manual roll calls, sign-in sheets, and swipe cards, are prevalent in many educational and professional settings. These methods, while simple and straightforward, are inherently flawed and inefficient. Manual roll calls are time-consuming and disrupt workflow, while sign-in sheets can be easily manipulated, leading to inaccuracies and potential fraud. Swipe cards, though more automated, still suffer from issues such as card loss, theft, and the possibility of proxy attendance. Additionally, these systems require substantial administrative effort to compile, verify, and manage attendance data, often resulting in errors and delays.

SOFTWARE REQUIREMENT SPECIFICATIONS

CHAPTER 3

SOFTWARE REQUIREMENT SPECIFICATIONS

The Software Requirement Specification (SRS) is a critical document that serves as the bedrock of the software development process. SRS includes not just a list of a system's requirements, but also a description of its key characteristics. These suggestions go beyond the IEEE standards. The recommendations would serve as a baseline for the execution of a contract between the client and the developer, offering clear vision of the product to be built.

One of the most important tasks in the development process is to define a system need. The challenge of determining what a particular software product accomplishes comes after a resource analysis phase. The users of the system, not the system solutions, are the focus at this stage. The requirement specification document's outcome outlines the software's purpose, as well as the desired system's attributes and constraints.

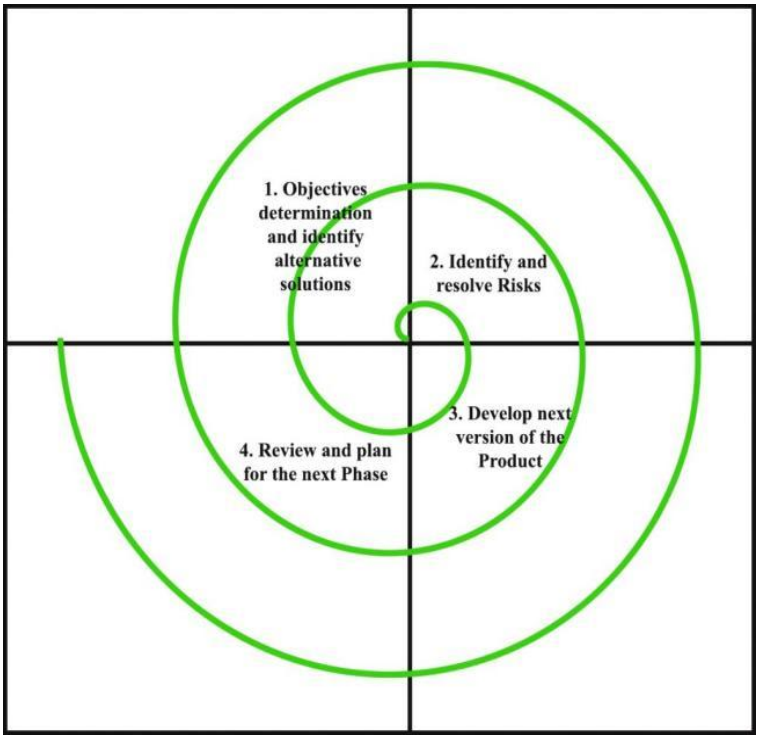


Fig : 3.1 Software Requirement Specification

3.2 TECHNOLOGIES USED

3.2.1 HTML

HTML, or HyperText Markup Language, is the standard markup language for texts that are intended to be viewed on a web browser. Technologies such as Cascading Style Sheets (CSS) and programming languages like JavaScript can help.

Web browsers accept HTML documents from a web server or locally stored files and convert them to multimedia web pages. HTML initially provided cues for the document's look and described the structure of a web page logically. The front end was created using the HTML language, which we picked since it is simple to comprehend and allows us to create robust webpages.

3.2.2CSS

CSS is a scripting language for specifying the appearance of a document authored in a markup language like HTML. Along with HTML and JavaScript, CSS is a key component of the Internet. CSS is a style sheet that allows you to separate presentation from content, including layout, colours, and fonts. This separation of presentation and content, offer greater flexibility and control in the configuration of presentation characteristics, and allow multiple websites to share formatting by stipulating the relevant CSS in a separate.css file, which contributed significantly and repetition in the key tenets and allows the.css file to be cached to improve page load speed between the pages. CSS was utilised in our project to provide the webpages a professional appearance and style.

3.2.3 JavaScript

JavaScript, often known as JS, is a computer language that follows the ECMAScript standard. JavaScript is a multi-paradigm, high-level programming language that is frequently compiled just-in-time. Curly-bracket syntax, dynamic typing, prototype-based object orientation, and first-class functions are all features of this language.JavaScript is one of the basic technologies of the World Wide Web, alongside HTML and CSS. Over 97 percent of websites utilise it client-side for web page behaviour, with third-party libraries

frequently incorporated. To run the code on the user's device, all major web browsers include a specialised JavaScript engine.

3.2.4 MYSQL

MySQL is an open-source relational database management system (RDBMS) known for its robustness, reliability, and ease of use. Developed by Oracle Corporation, it is one of the most popular databases used in web applications and enterprise environments. MySQL uses Structured Query Language (SQL) for managing and manipulating data, which provides a powerful and standardized way to interact with the database. Key features of MySQL include support for various data types, transactions, and complex queries, making it suitable for handling a wide range of applications, from small websites to large-scale enterprise systems. It offers strong data security features, including user access controls and encryption, ensuring the protection of sensitive information.

MySQL's architecture is based on a client-server model where the server manages the database and the client interacts with the database server through SQL queries. It supports various storage engines, such as InnoDB and MyISAM, allowing users to choose the best engine based on their specific needs for performance, reliability, and transaction support. The system's scalability, ease of installation, and extensive community support make MySQL a favored choice for database management in both development and production environments.

3.3 FUNCTIONAL REQUIREMENTS

Fingerprint Scanner Integration:

Interface with hardware to capture fingerprints.

Preprocess fingerprint images for pattern matching (e.g., noise reduction, enhancement).

Implement a robust pattern matching algorithm to verify fingerprint authenticity.

3.3.1Admin Dashboard:

Authentication: Secure login/logout functionality.

Faculty Management:

Add new faculty members.

Update and delete faculty details.

Student Management:

Add new students.

Update and delete student details.

Attendance Overview:

View overall attendance records.

Generate attendance reports.

3.3.2 Faculty Dashboard:

Authentication: Secure login/logout functionality.

Attendance Management:

Mark attendance using the fingerprint scanner.

View and edit attendance records.

Student Management:

Add new student details.

Update existing student details.

Delete student records.

Attendance Tracking:

View the total number of classes attended by each student.

Generate individual student attendance reports.

3.4 NON-FUNCTIONAL REQUIREMENTS

3.4.1 Performance:

The system must process and verify fingerprints quickly, with minimal delay in attendance recording and data synchronization. It should handle multiple simultaneous users efficiently without degrading performance.

3.4.2 Scalability:

The system should be scalable to accommodate varying numbers of users and increased data volume, ensuring it remains effective as the institution grows or as usage demands increase.

3.4.3 Reliability:

The system must be reliable, with minimal downtime and high availability. It should handle system failures gracefully and ensure that attendance data is not lost or corrupted.

3.4.4 Security:

Robust security measures must be implemented to protect sensitive data, including encryption of stored and transmitted data, secure authentication mechanisms, and access controls to prevent unauthorized access.

3.4.5 Usability:

The web application should be intuitive and user-friendly, with clear navigation and easy-to-understand features for faculty and administrators. It should minimize the learning curve and enhance user experience.

3.4.6 Maintainability:

The system should be designed for easy maintenance and updates. This includes modular architecture for straightforward troubleshooting and future upgrades, as well as comprehensive documentation for support and development.

3.4.7 Compatibility:

The system must be compatible with existing hardware and software infrastructure within the institution, and should support various operating systems and web browsers.

HARDWARE AND SOFTWARE REQUIREMENTS

3.5 HARDWARE REQUIRMENTS

- Processor : Intel i5 2.53GHz
- Hard Disk : 40GB
- RAM : 8 GB or above

3.6 SOFTWARE REQUIRMENTS

- Operating system : Windows 8 and above
- Front End : HTML, CSS, JS, BS
- Coding Language : C#, PHP
- IDE : Visual Studio 2015
- Database : MySQL

SYSTEM DESIGN

CHAPTER 4

SYSYTEM DESIGN

4.1 SYSTEM ARCHITECTURE.

Detailed design starts after the system design phase is completed and the system design has been certified through the review. The goal of this phase is to develop the internal logic of each of the modules identified during system design.

The design activity is often divided into two separate phase system design and detailed design. System design is also called top-level design. At the first level focus is on deciding which modules are needed for the system, the specifications of these modules and how the modules should be interconnected. This is called system design or top level design. In the second level the internal design of the modules or how the specifications of the module can be satisfied is decided. This design level is often called detailed design or logic design.

4.1.2 DESIGN CONSIDERATION

User Requirements: Understand and define the needs of faculty, administrators, and students to ensure the system addresses their specific requirements and preferences. This includes ease of use, accessibility, and functionality.

Hardware Integration: Choose reliable and compatible hardware components, such as fingerprint scanners and sensors, that meet accuracy and performance requirements. Ensure these components integrate seamlessly with the software.

Software Architecture: Design a scalable and modular software architecture that supports easy maintenance and future upgrades. Use proven frameworks and technologies for the web application to ensure robustness and flexibility.

Data Security: Implement stringent security measures to protect sensitive data, including encryption for data transmission and storage, secure authentication mechanisms, and access control policies.

Real-Time Processing: Ensure the system supports real-time processing of attendance data and synchronization with the web server to provide up-to-date information and minimize delays.

4.1.3 SCOPE

The scope for system design encompasses developing a comprehensive fingerprint-based attendance and management solution tailored to educational institutions. This includes designing a robust hardware setup integrating fingerprint scanners, sonar sensors, and IoT components for real-time data transmission. The software component involves creating a user-friendly web application for faculty and administrators to manage attendance, student details, and generate reports. The design must ensure seamless integration with existing systems, high security for sensitive data, and scalability to accommodate institutional growth.

4.2 DATA FLOW DIAGRAM

DFD graphically representing the functions, or processes, which capture, manipulate, store, and distribute data between a system and its environment and between components of a system. The visual representation makes it a good communication tool between User and System designer. Structure of DFD allows starting from a broad overview and expands it to a hierarchy of detailed diagrams. DFD has often been used due to the following reasons:

- Logical information flow of the system
- Determination of physical system construction requirements
- Simplicity of notation
- Establishment of manual and automated systems requirements

4.2.1 BASIC NOTATION

FIG :4.1 BASIC NOTATION

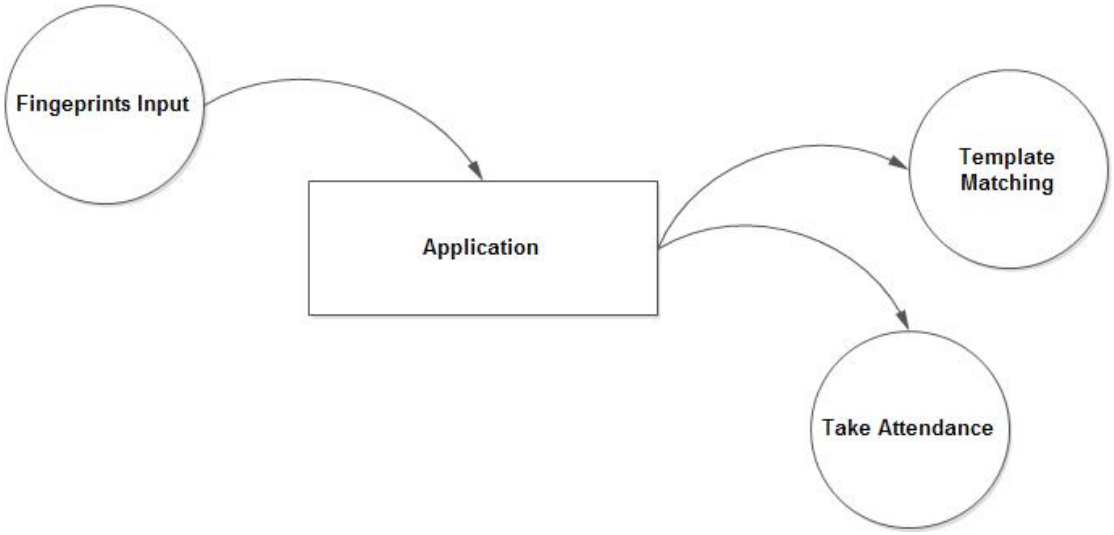
Process: any process that changes the data, producing an output. It might perform computations, or sort data based on logic, or direct the data flow based on business rules. A short label is used to describe the process, such as "Submit payment."

Data store: files or repositories that hold information for later use, such as a database table or a membership form. Each data store receives a simple label, such as "Orders."

External entity: an outside system that sends or receives data, communicating with the system being diagrammed. They are the sources and destinations of information entering or leaving the system. They might be an outside organization or person, a computer system or a business system. They are also known as terminators, sources and sinks or actors. They are typically drawn on the edges of the diagram

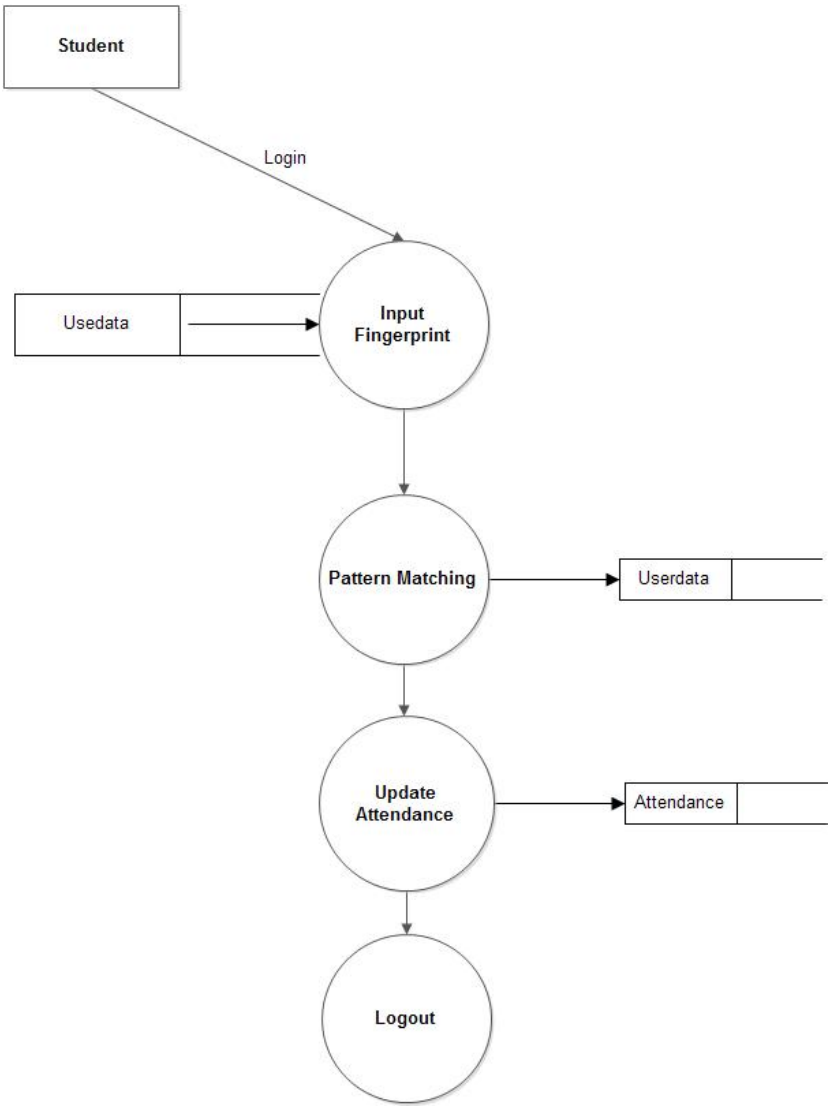
Data flow: the route that data takes between the external entities, processes and data stores. It portrays the interface between the other components and is shown with arrows, typically labeled with a short data name, like "Billing details.

4.2.2 Data Flow Diagram



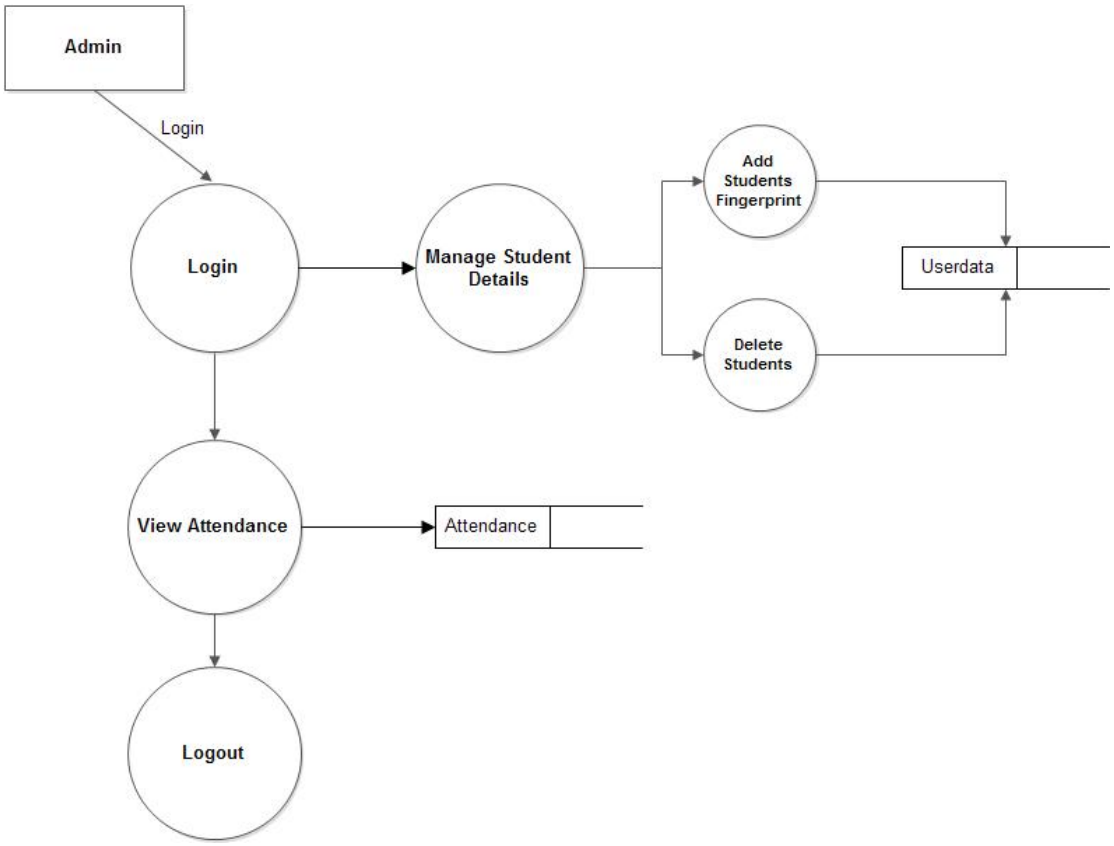
Level 0 dfd

FIG 4.2: Data Flow Diagram



User level 1 dfd

FIG 4.2.1: Student data flow diagram



Admin level 1 dfd

FIG 4.2.2: Admin Data flow diagram

4.3 USE CASE DIAGRAM

Use case diagram is a graph of actors, a set of use cases enclosed by a system boundary, communication associations between the actor and the use case. The use case diagram describes how a system interacts with outside actors; each use case represents a piece of functionality that a system provides to its users. A use case is known as an ellipse containing the name of the use case and an actor is shown as a stick figure with the name of the actor below the figure.

The use cases are used during the analysis phase of a project to identify and partition system functionality. They separate the system into actors and use case. Actors represent roles that are played by user of the system. Those users can be humans, other computers, pieces of hardware, or even other software systems.

4.3.1 User Use case diagram

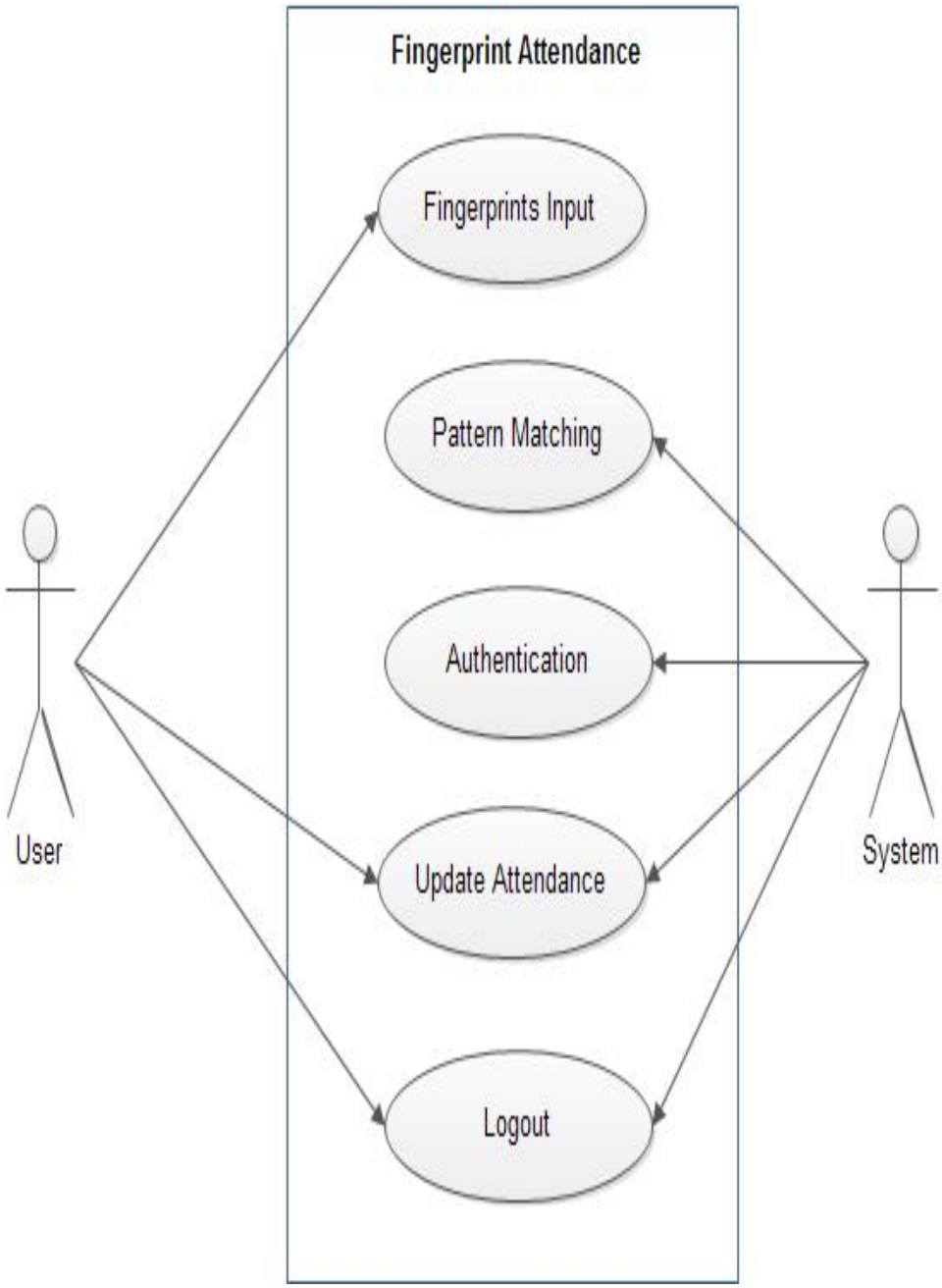


FIG 4.3: User use case diagram

4.3.2 Admin Use case diagram

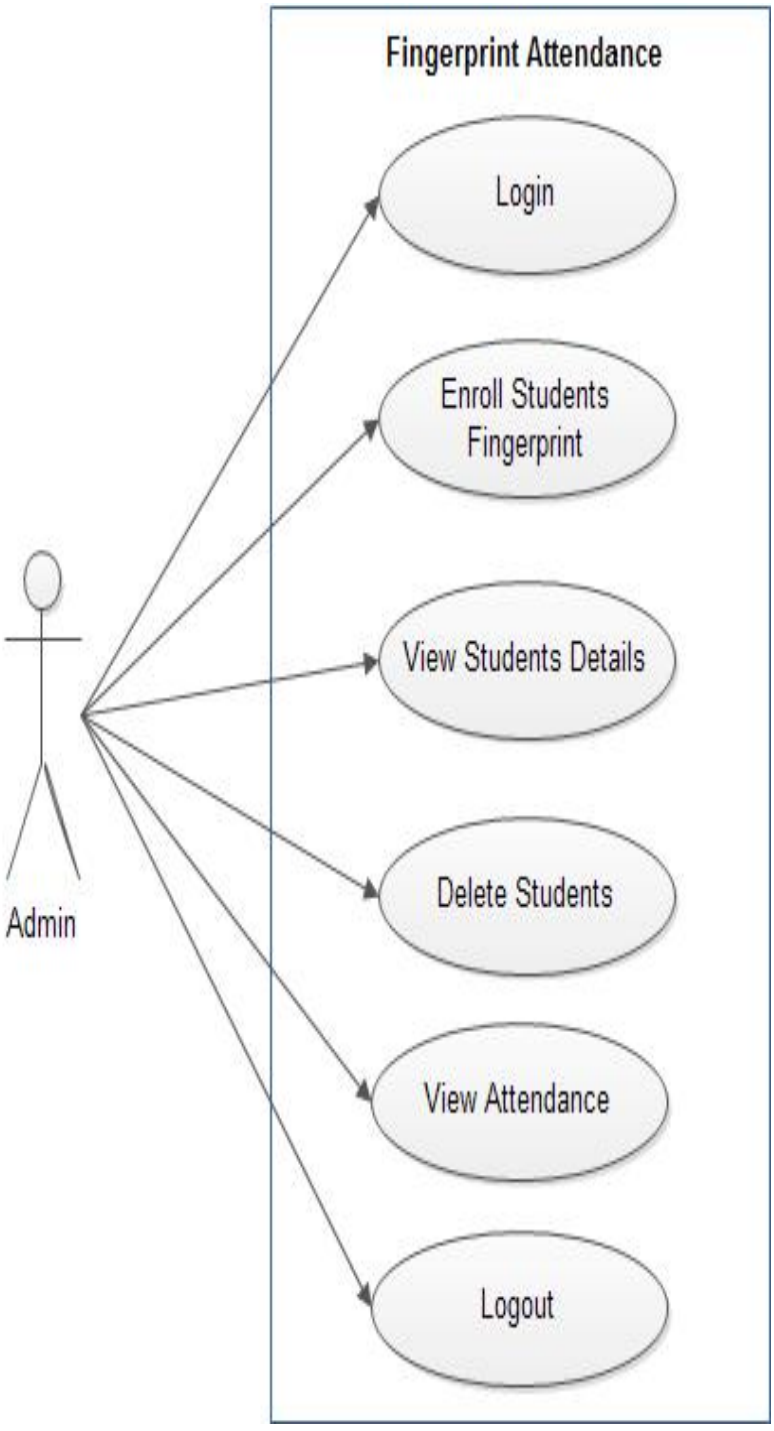


FIG 4.4 :ADMIN CASE DIAGRAM

4.4 SEQUENCE DIAGRAM

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are sometimes called **event diagrams**, **event scenarios.**

Purpose

The sequence diagram is used primarily to show the interactions between objects in the sequential order that those interactions occur. One of the primary uses of sequence diagrams is in the transition from requirements expressed as use cases to the next and more formal level of refinement.

4.4.1 User Sequence Diagram

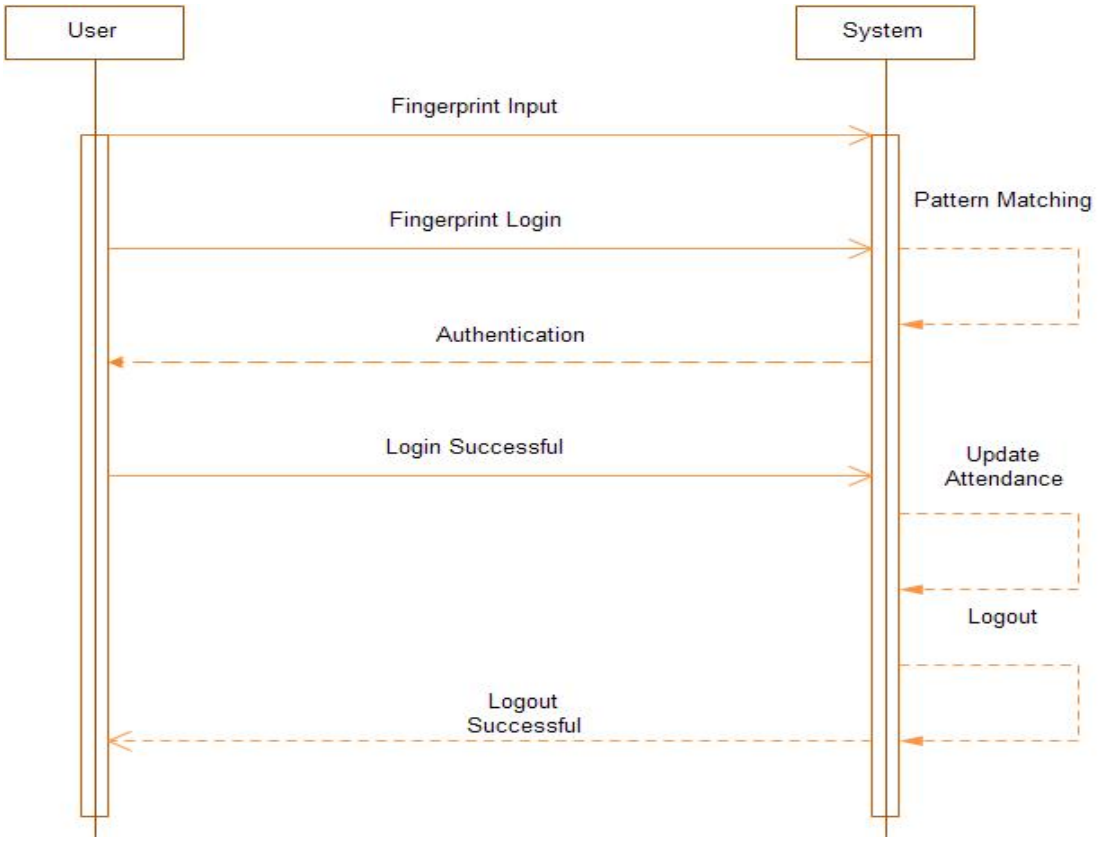


FIG 4.5:**User Sequence Diagram**

4.4.2 Admin Sequence Diagram

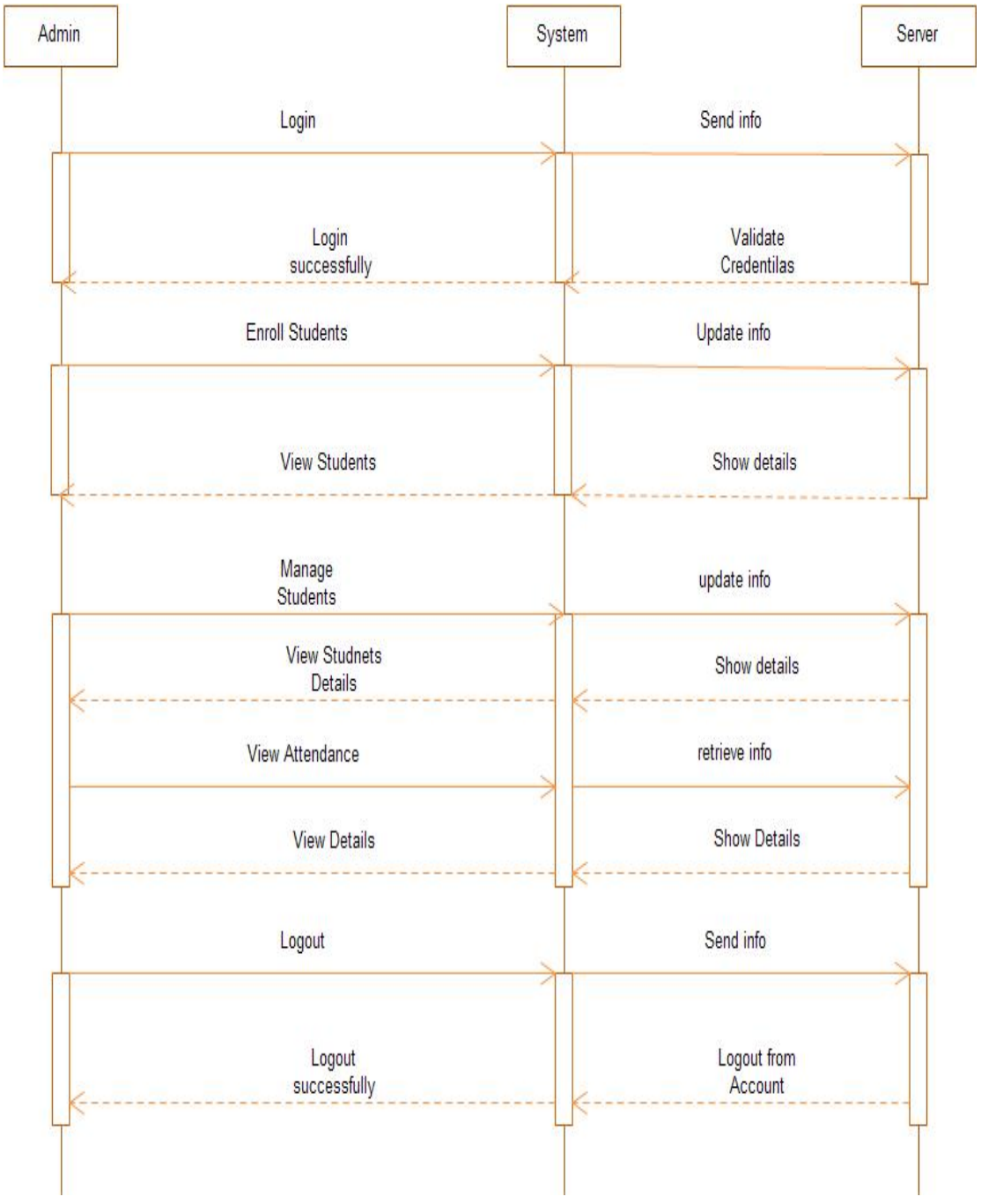


FIG 4.6: **Admin Sequence Diagram**

4.5 ACTIVITY DIAGRAMS

Activity diagrams represent the business and operational workflows of a system. An Activity diagram is a dynamic diagram that shows the activity and the event that causes the object to be in the particular state. It is a simple and intuitive illustration of what happens in a workflow, what activities can be done in parallel, and whether there are alternative paths through the workflow.

Basic Notations

Initial Activity

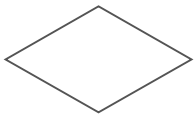
This shows the starting point or first activity of the flow. It is denoted by a solid circle.

Final Activity

The end of the Activity diagram is shown by a bull's eye symbol, also called as a final activity.

Activity

Represented by a rectangle with rounded (almost oval) edges



Decisions

A logic where a decision is to be made is depicted by a diamond.

Workflow

Workflow is depicted with an arrow. It shows the direction of the workflow in the activity diagram.

4.5.1 User Activity Diagram

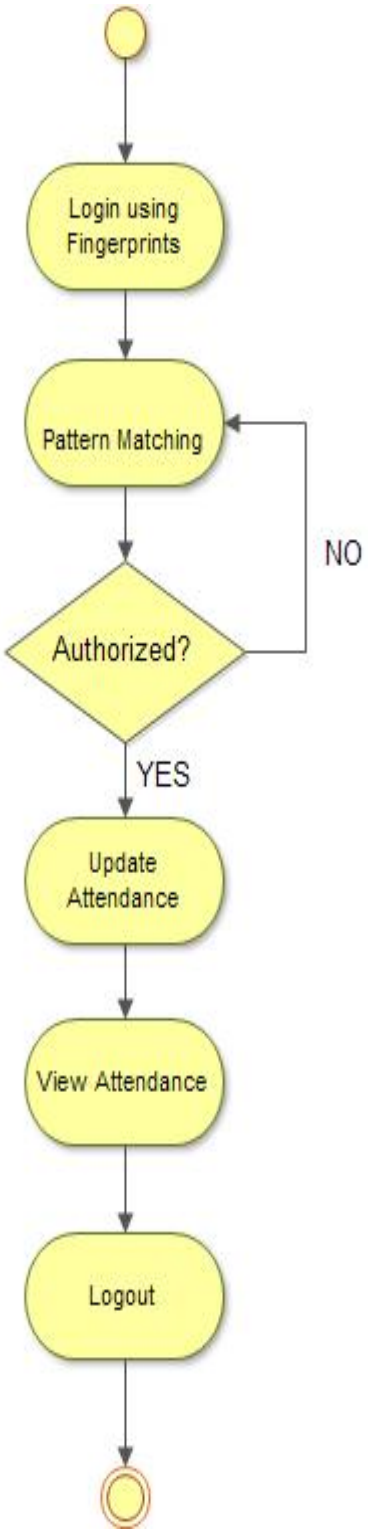


FIG 4.7: User Activity Diagram

4.5.2 Admin Activity Diagram

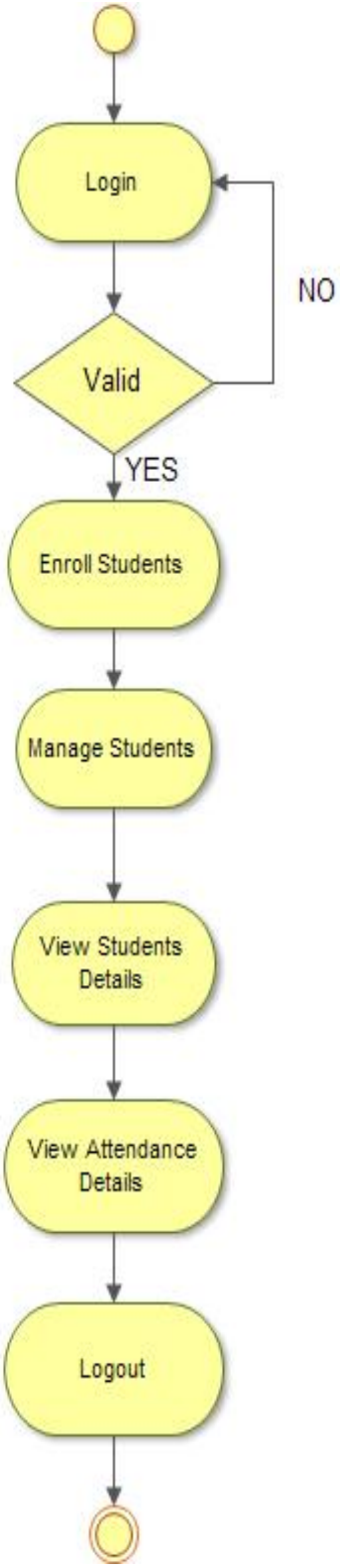


FIG 4.8: **Admin Activity Diagram**

4.6 ER DIAGRAM

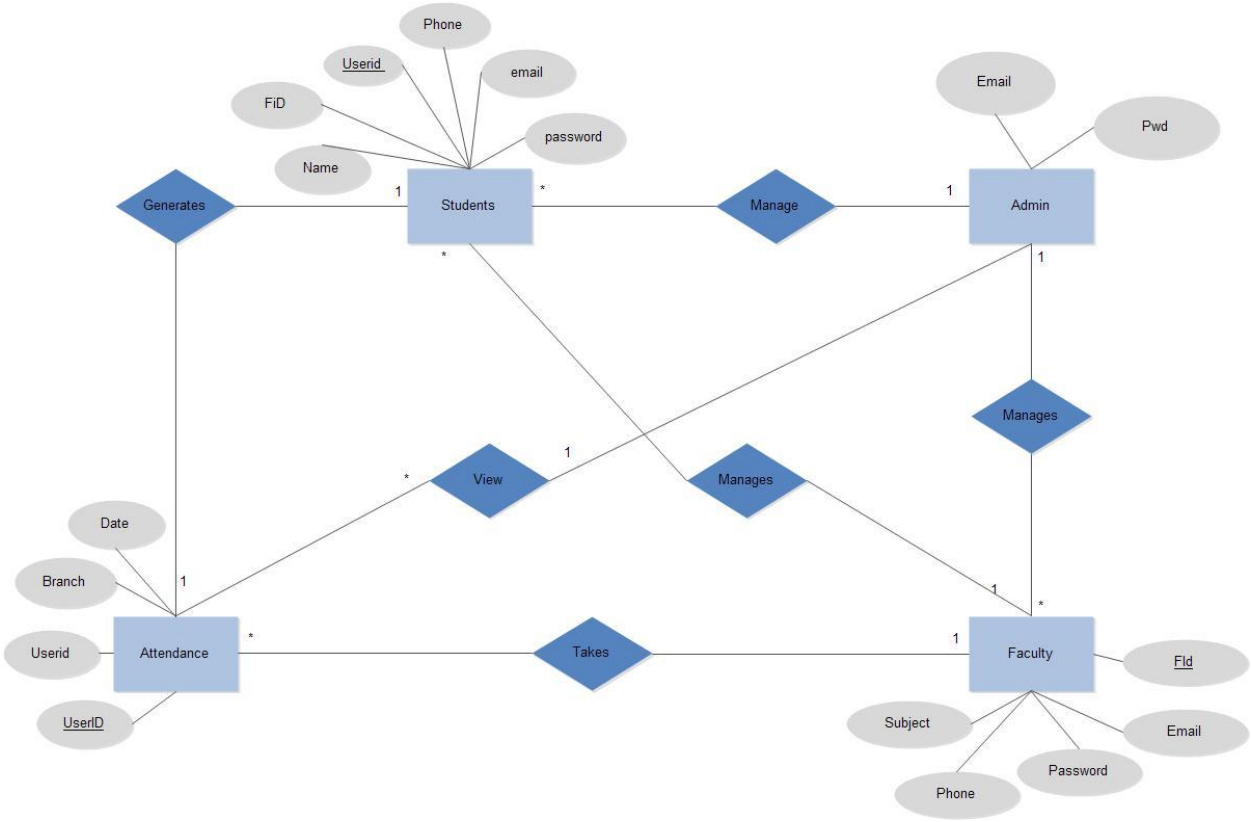


FIG 4.8.1: ER DIAGRAM

4.7 CLASS DIAGRAM

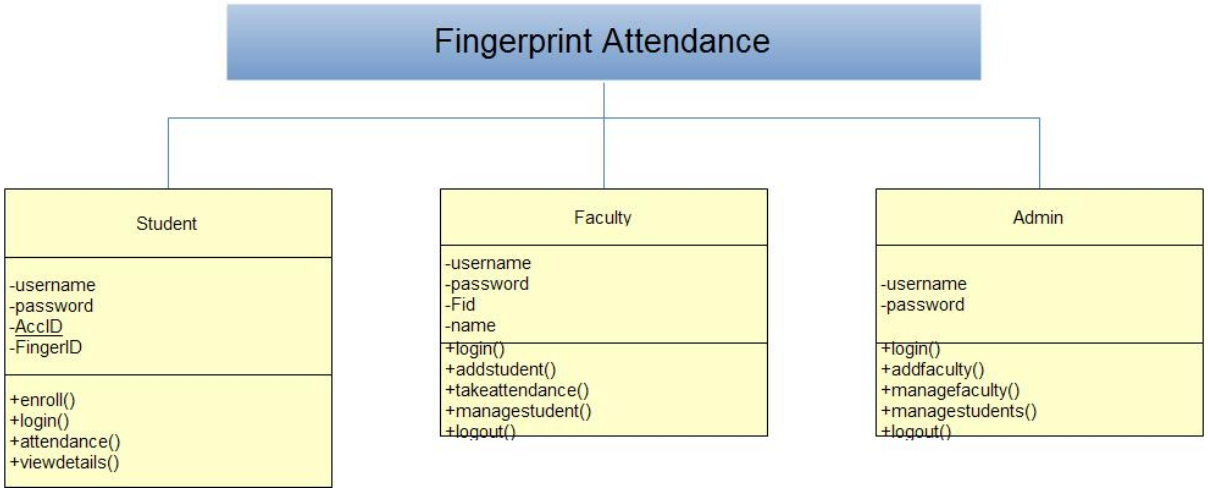


FIG 4.9: CLASS DIAGRAM

SYSTEM IMPLEMENTATION

CHAPTER 5
SYSTEM IMPLEMENTATION

INTRODUCTION

Implementation is the way toward changing over another or a re-examined framework plan into an operational one. The goal is to put the new or amended framework that has been tried into activity while holding expenses, dangers, and individual aggravation to the base. A basic part of the execution cycle is to guarantee that there will be no disturbing the working of the association. The best strategy for acquiring control while embedding any new framework is utilize very much arranged test for testing every new program. Before creation records are utilized to test live information, text documents should be made on the old framework, duplicated over to the new framework, and utilized for the underlying trial of each program.

5.1 ALGORITHM

5.1.1 Pattern Matching

Fingerprint Acquisition:

Image Capture: The process begins with capturing a high-resolution image of a fingerprint using a fingerprint scanner. This image includes various ridge and valley patterns unique to each individual.

Preprocessing: The captured image is then preprocessed to enhance quality. This may involve noise reduction, contrast adjustment, and binarization to improve the clarity of ridge patterns.

5.1.2 Feature Extraction:

Minutiae Detection: The core of fingerprint pattern matching involves detecting minutiae points, which are specific features of the fingerprint such as ridge endings and bifurcations (where a ridge splits into two).

Feature Mapping: These minutiae points are mapped and represented in a data format that includes their locations and orientations. This data forms the basis for comparison.

5.1.3 Pattern Matching Algorithm:

Template Creation: During the enrollment phase, the minutiae data from a fingerprint is used to create a biometric template. This template is stored in the database for future comparisons.

Matching Process: When a fingerprint is scanned for attendance, the system extracts minutiae points from this new scan and compares them against the stored templates. This comparison is based on the spatial relationship and pattern of minutiae points.

Algorithm Application: A pattern matching algorithm, such as the Minutiae-Based Matching Algorithm, is applied to calculate a similarity score between the newly scanned fingerprint and stored templates. This algorithm evaluates the degree of match based on factors like the distance between minutiae points, their orientation, and their relative positions.

5.1.4 Decision Making:

Threshold Setting: The system uses a predefined threshold to determine if the similarity score is high enough to confirm a match. If the score exceeds this threshold, the system verifies the identity and records attendance; otherwise, the attempt is rejected.

Error Handling: If a match is not found or if there is a low confidence level, the system may prompt for additional authentication or flag the attempt for review.

SYSTEM TESTING AND VALIDATION

CHAPTER 6

SYSTEM TESTING AND VALIDATION

This section gives the different experiments performed to check for the successful execution of the endeavour. Testing is a technique of cross confirmation of the planned framework model under dynamic state and different data sources. This cycle is completed differently. The primary goal of programming advancement life cycle is to create an item without any blunders or not many mistakes. In the cycles of accomplishing bother free programming, we plan testing and experiments. Programming testing is accomplished for the achievement of the application. The testing is done mostly to check whether the item meet the prerequisite of the client appropriately. It is utilized to check the bugs and blunders in the framework or to discover the imperfections of the framework. Testing is refined for each part. Thusly every one of the tried modules are coordinated and the total construction is tried with the test data, outstandingly wanted to uncover that the planned design is viable in all perspectives

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6.1 Design of test cases related to the project:

This section of the testing covers many forms of testing, such as module testing, integration testing, system testing, component interface testing, system testing, and operational acceptability testing.

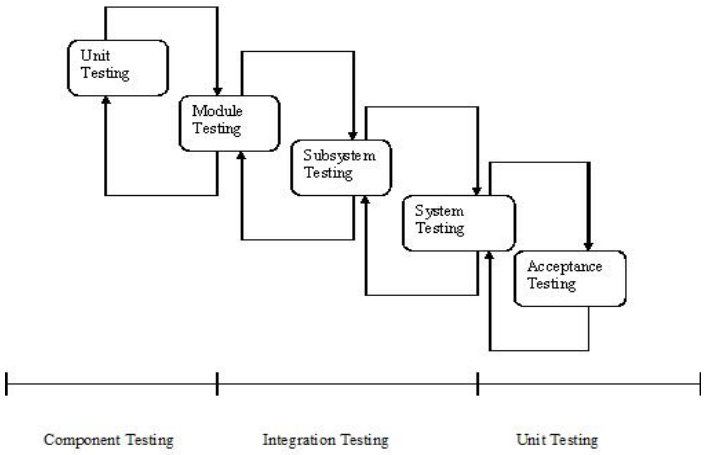

Fig. 6.1 the Testing process

TYPES OF TESTING

The different sorts of testing done on the framework are:

- Unit Testing
- Integration Testing
- System Testing

6.1.1 Unit Testing

Unit test principally manages testing the littlest unit of programming diagram. Every single module is tried freely. Testing of every single module is done at the hour of programming. It checks whether each module which is tested is working accurately as for the normal outcome.

6.1.2 Integration Testing:

Integration testing is a deliberate methodology for creating test to reveal botches which happens inside the design. In the endeavour every one of the modules that are tried are joined and thereafter the total computer programmer is tried by and large. In the mix testing every one of the mistakes uncovered is revised for the following testing steps

6.1.3 System Testing:

At the point when each and every module is tried totally, modules are coordinated for execution as a system. By then the top-down testing is utilized, what begins from upper level to bring down level module, should be done to check whether the entire structure is performing effectively.

- To provide the quality oriented product.
- To check whether is developed as per the requirements specified by the user.
- To check the software quality.
- To find the errors or faults in the developed software.
- To increase quality of software.
- To reduce development cost of software.
- It is done for the successful execution of the software.

6.2 Test Cases:

Test Case Number	Test Case name	Test Case Description	Result
TC – 01	Clicking submit without entering details	Alert "Please fill all details"	Pass
TC – 02	Clicking submit without entering Username	Alert "Please fill Username"	Pass
TC – 03	Clicking submit without entering password	Alert "Please fill Password"	Pass
TC – 04	Clicking submit without entering email id	Alert "Please fill email id"	Pass
TC – 05	Clicking submit without entering phone number	Alert "Please fill contact number"	Pass
TC – 06	Clicking submit entering confirm password data which is not matching with password data	Alert "Password and Confirm Password do not match"	Pass
TC – 07	Clicking submit without entering login details	Alert "Please enter the username and password"	Pass
TC – 08	Clicking submit without entering password	Alert "Please enter the password"	Pass
TC – 09	Clicking submit without entering Username	Alert "Please enter the Username"	Pass
TC – 10	Clicking submit entering wrong Username	Alert "Invalid User"	Pass
TC – 11	Clicking submit entering wrong password	Alert "Invalid User"	Pass
TC – 12	Clicking submit entering wrong Username and password	Alert "Invalid User"	Pass

TC – 13	Clicking submit after entering Correct Username and password	Loaded User Home page	Pass
TC – 14	Enroll a new fingerprint	Fingerprint is successfully enrolled and stored in the database.	Pass
TC – 15	Verify fingerprint for attendance	Fingerprint is successfully verified and attendance is marked.	Pass
TC – 16	Add new student details	Student details are successfully added and saved in the database.	Pass
TC – 17	View total number of classes attended by a student	Total number of classes attended by the student is displayed correctly.	Pass
TC – 18	Admin adds new faculty	Faculty details are successfully added and saved in the database.	Pass
TC – 19	Unauthorized user attempts to log in	Access is denied, and an error message is displayed.	Pass
TC – 20	Faculty manages student details	Student details are successfully updated and saved in the database.	Pass
TC – 21	System scalability for large number of users	System handles the load without performance degradation.	Pass
TC – 22	Data security	Fingerprint data and attendance records are securely stored in the database.	Pass
TC – 23	Data transmission to web server	Attendance data is successfully transmitted to and reflected in the web server.	Pass
TC – 24	Logout	System clears the session of the user	Pass

RESULT AND PERFORMANCE ANALYSIS

CHAPTER 7

RESULTS AND PERFORMANCE ANALYSIS

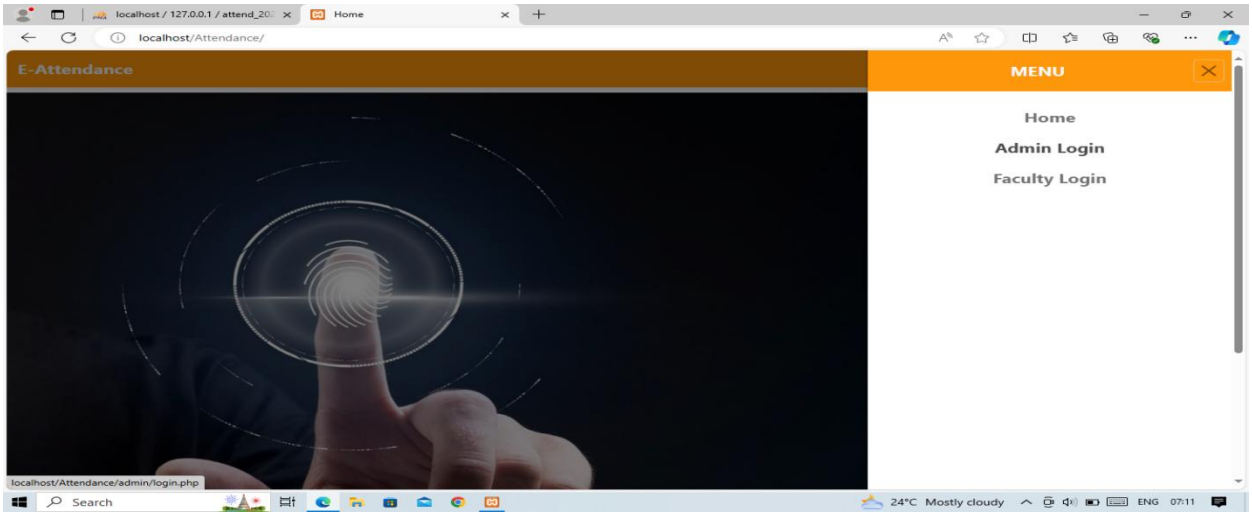

FIG 7.1: MENU PAGE

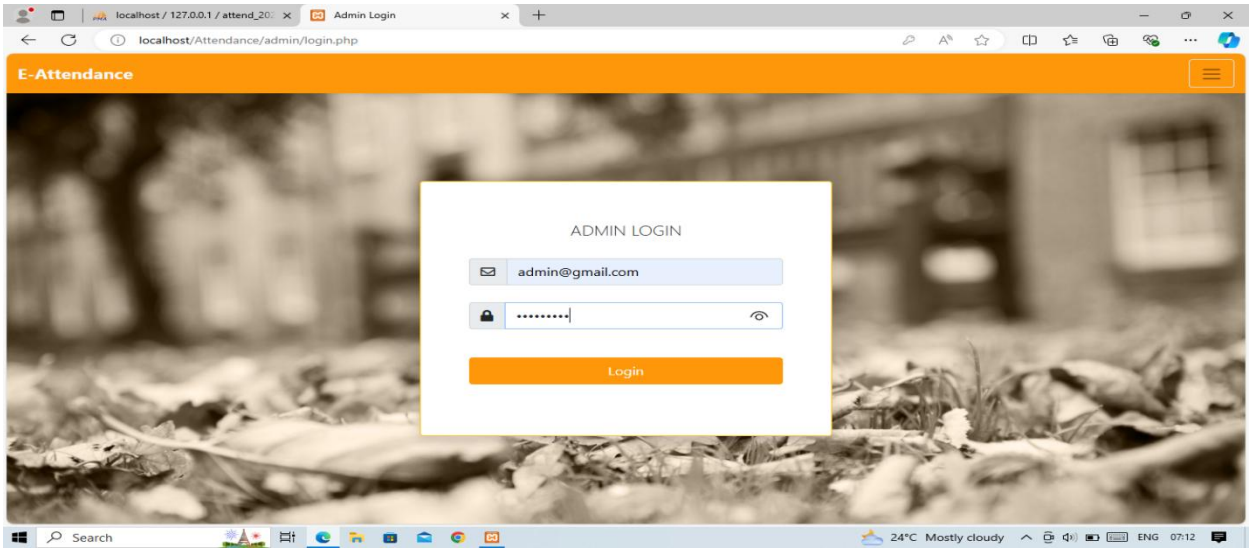

FIG 7.2: ADMIN LOGIN PAGE

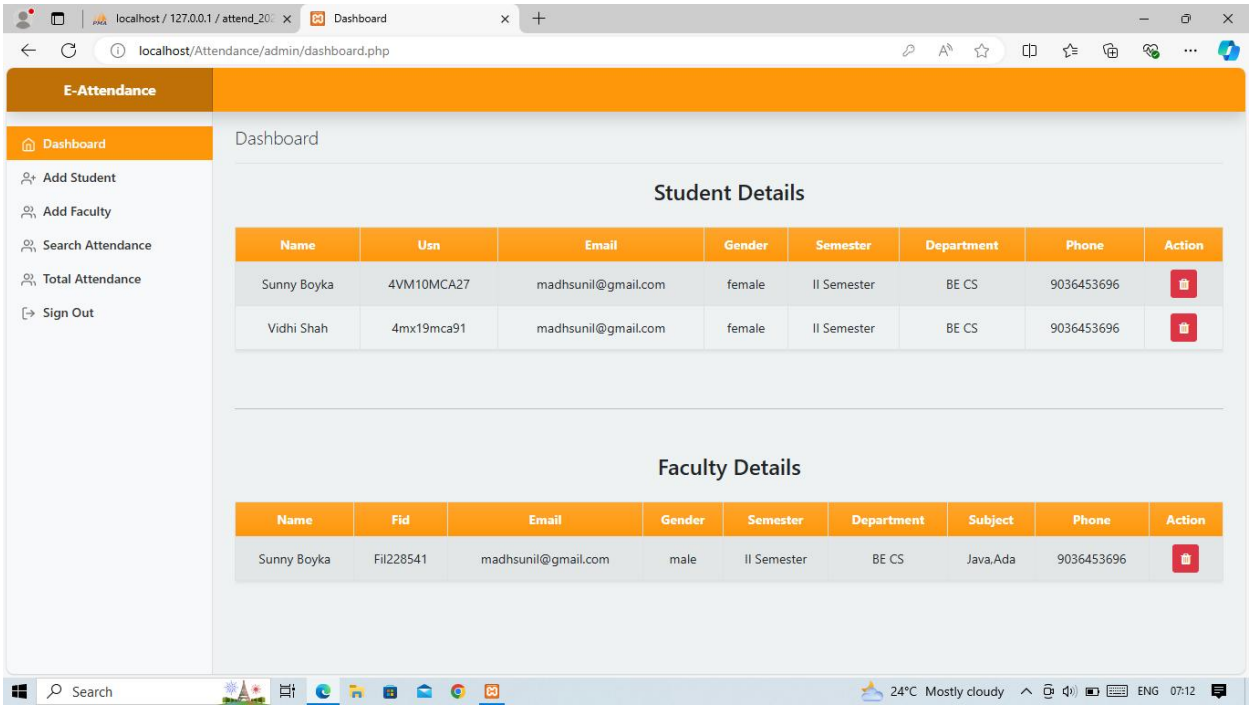

FIG 7.3:DASHBOARD PAGE

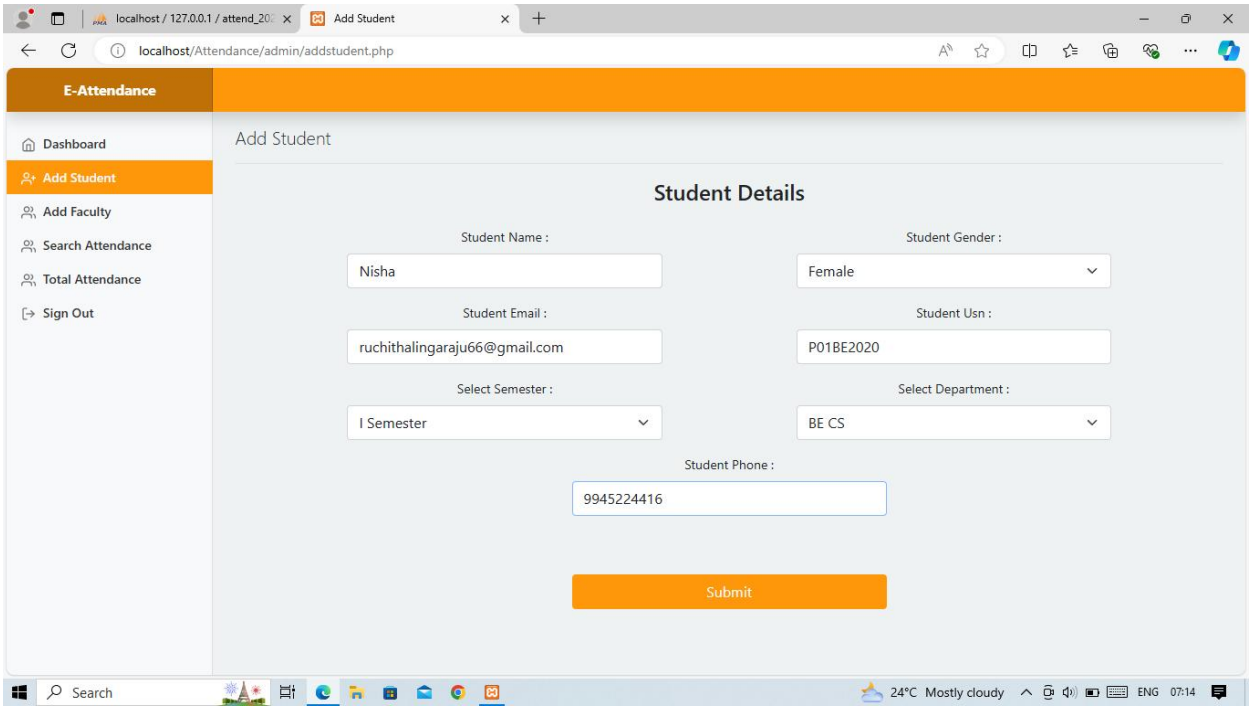

FIG 7.4: ADD STUFDENTS PAGE

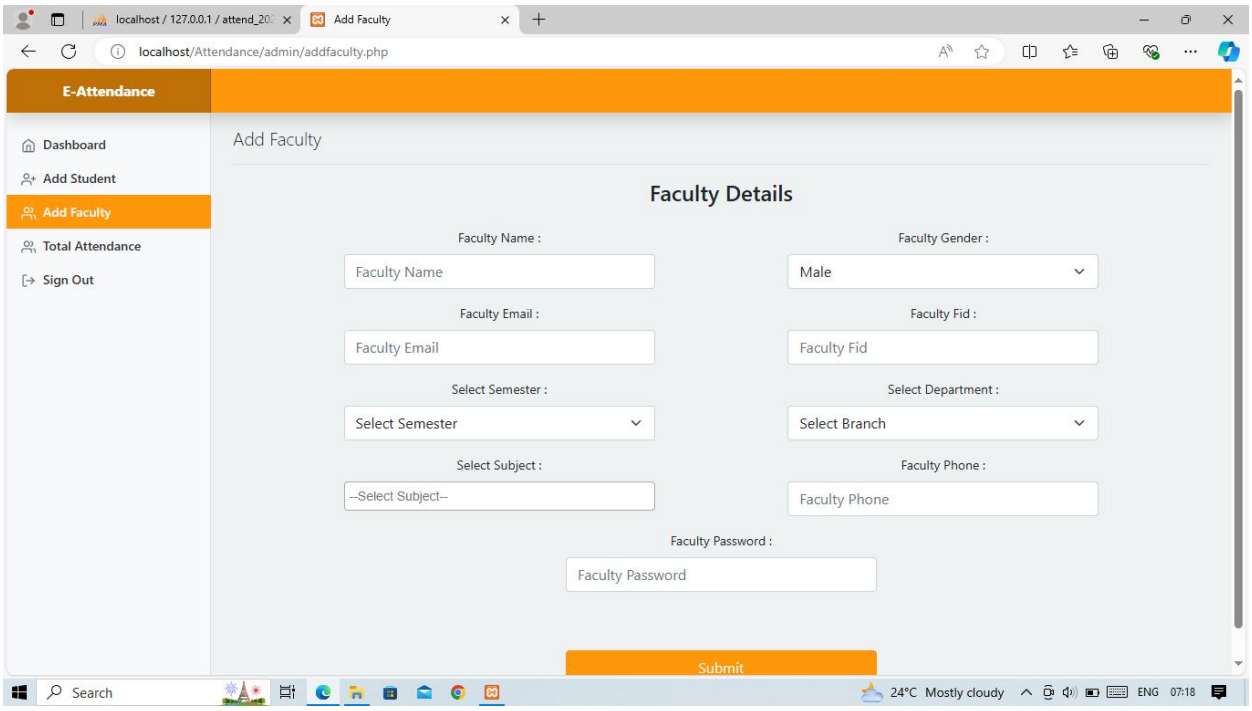

FIG 7.5: ADD FACULTY PAGE

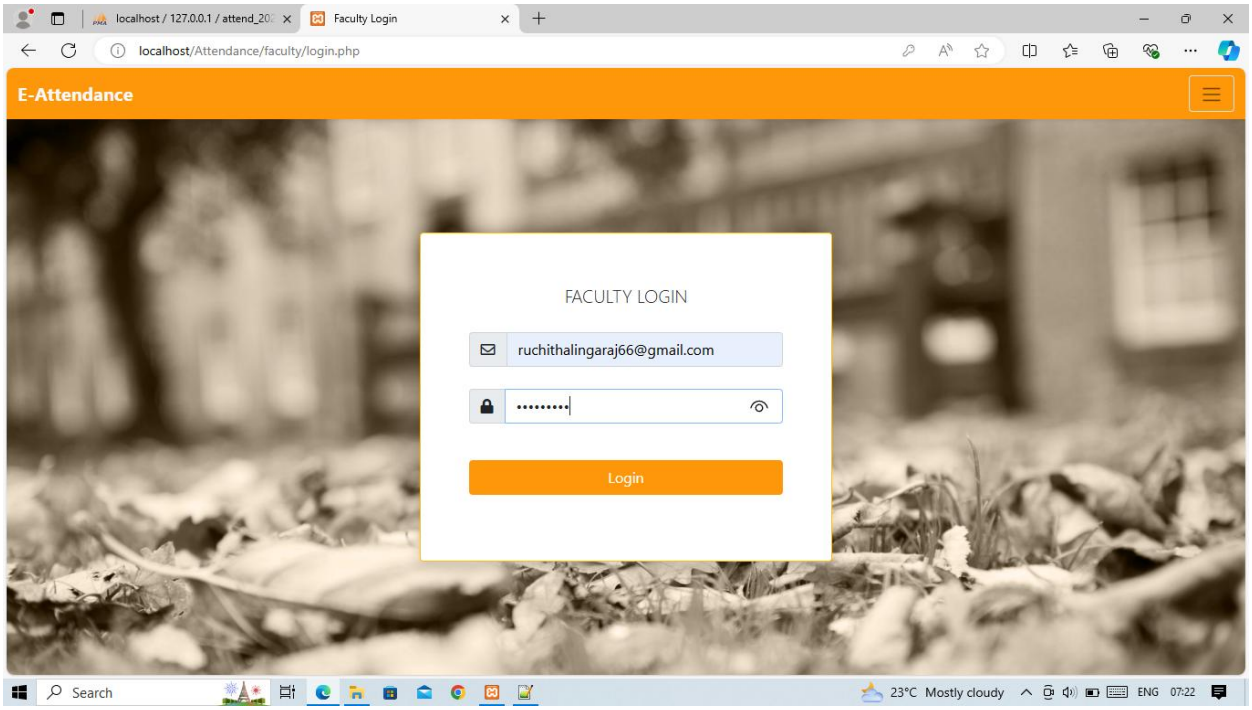

FIG 7.6:FACULTY LOGIN PAGE

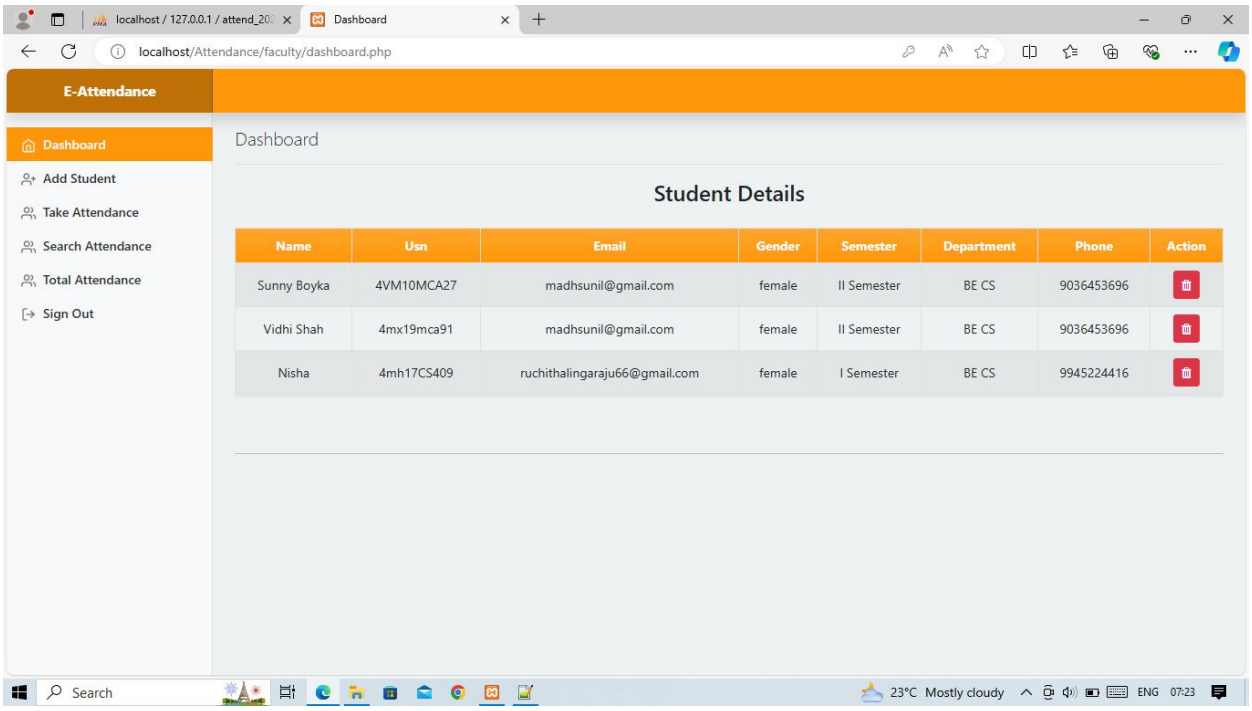

FIG 7.7: STUDENT DETAILS PAGE

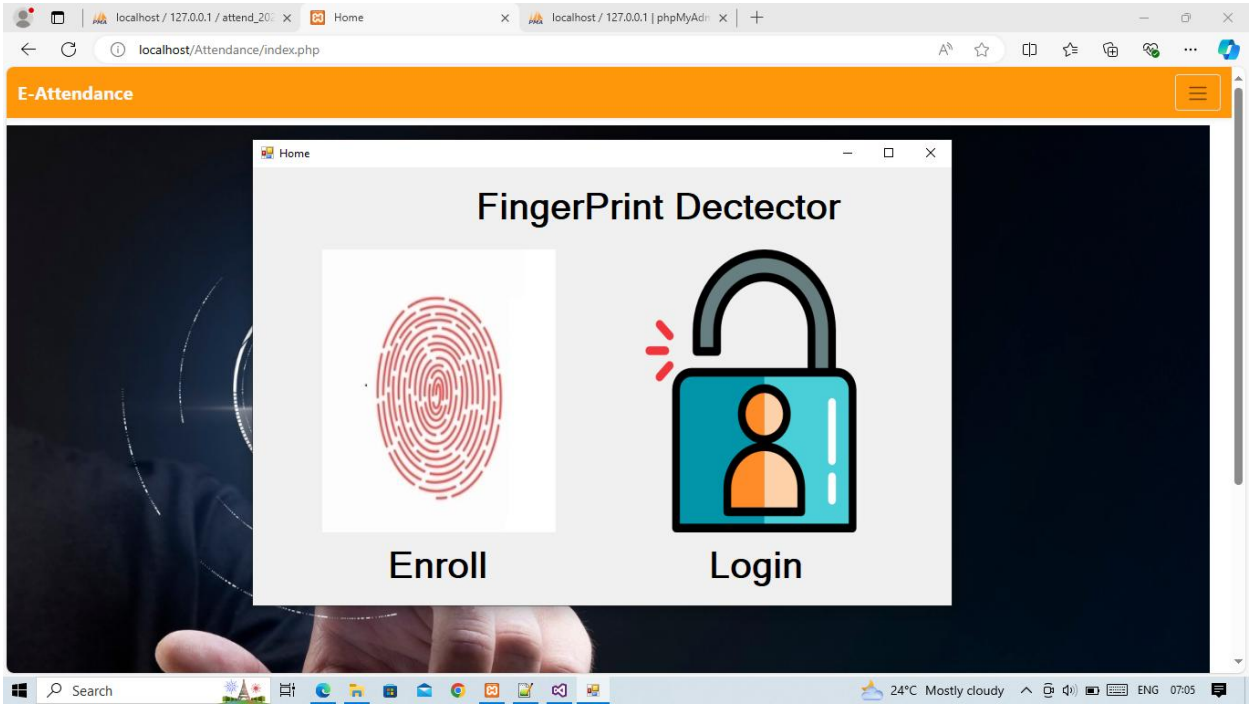

FIG 7.8:FINGERPRINTDETECTER PAGE

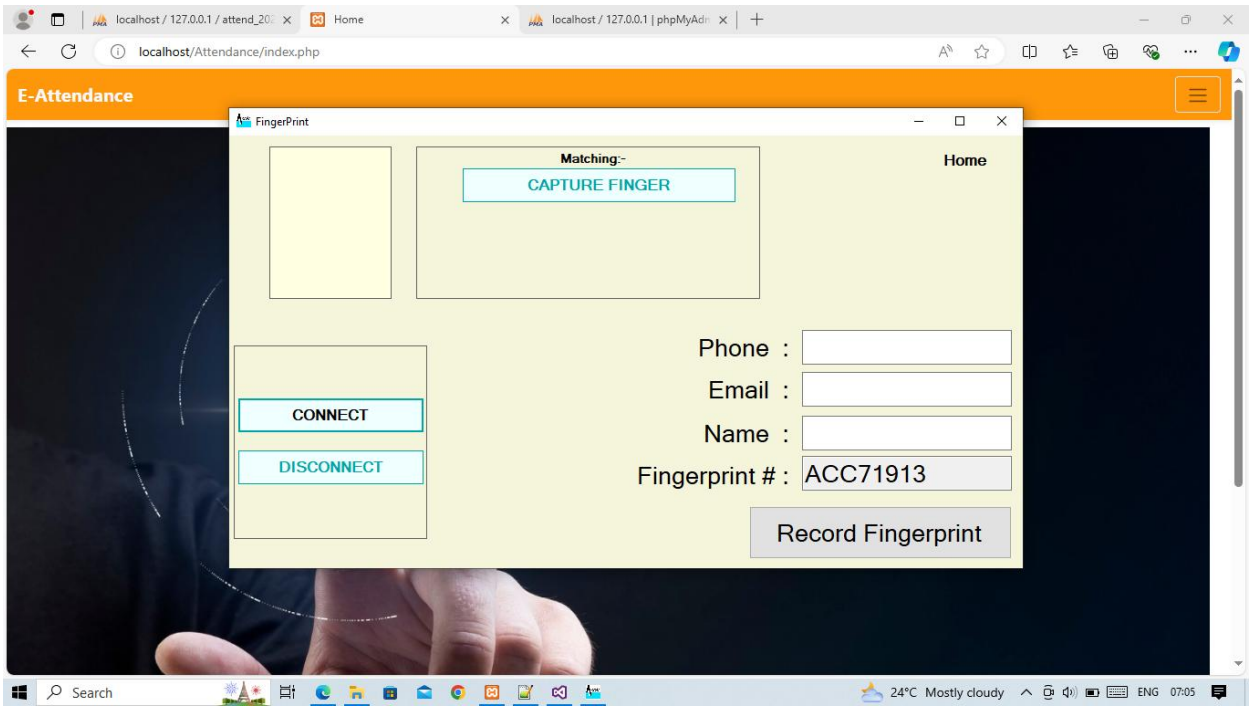

FIG 7.9: FINGERPRINT RECORD PAGE

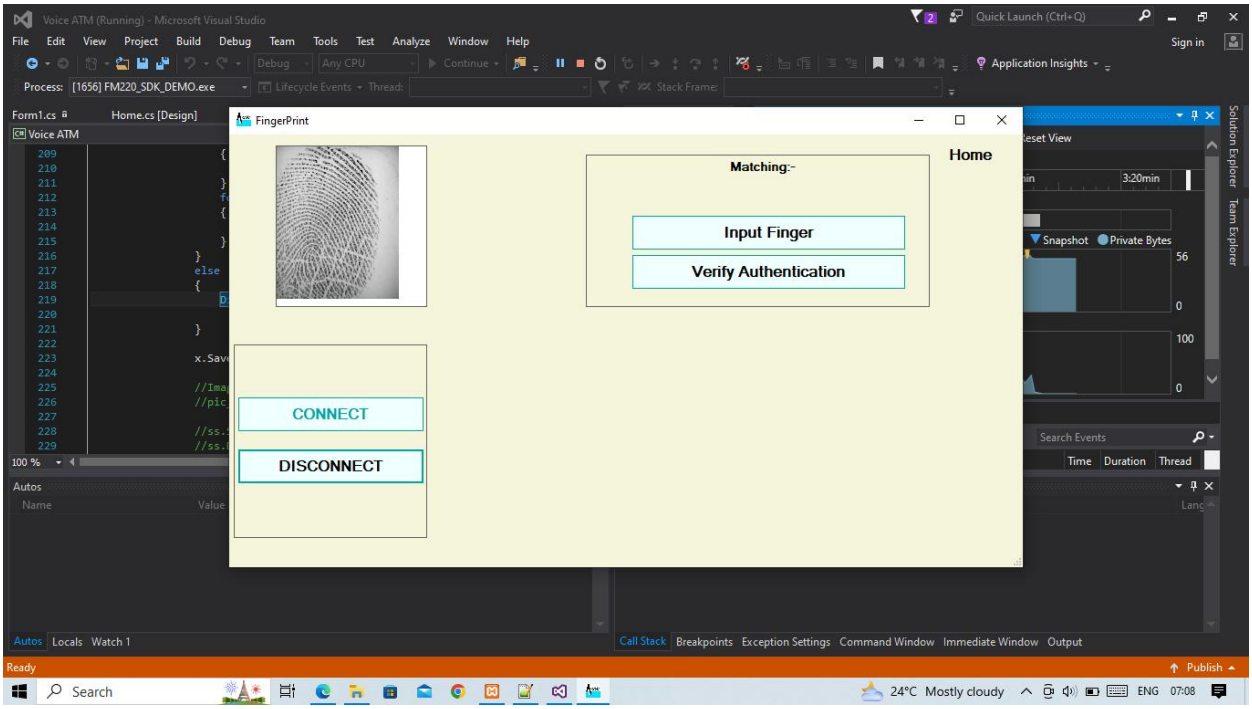

FIG 7.10:FINGERPRINT MATCHING PAGE

CONCLUSION AND FUTURE ENHANCEMENT

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

8.1 CONCLUSION

The fingerprint-based attendance system presents a modern solution to the challenges of traditional attendance methods. By leveraging biometric technology and advanced pattern matching algorithms, the system offers a secure, efficient, and accurate approach to tracking attendance in educational institutions. The integration of a fingerprint scanner with a web application portal simplifies the attendance process for faculty and administrators, minimizing manual errors and reducing the potential for fraudulent activities. The system's design emphasizes ease of use and real-time data synchronization, ensuring that attendance records are promptly updated and accessible. The web application provides a comprehensive interface for managing student and faculty information, generating detailed reports, and monitoring attendance trends. This enhances administrative efficiency and supports better decision-making.

Moreover, the use of fingerprint technology ensures that each individual's attendance is recorded accurately and securely, with a high level of tamper-proof verification. The system's scalability and adaptability make it suitable for various institutional sizes and evolving needs, while its focus on data security and compliance with privacy regulations safeguards sensitive information. Overall, the proposed system not only streamlines attendance management but also contributes to a more organized and accountable educational environment. Its combination of biometric accuracy, user-friendly design, and robust data management capabilities represents a significant advancement over traditional attendance methods.

8.2 FUTURE ENHANCEMENT

Integration with Other Biometric Systems: Future developments could include integrating additional biometric methods, such as facial recognition or iris scanning, to further strengthen security and provide multi-factor authentication options.

AI and Machine Learning Enhancements: Incorporating AI and machine learning algorithms could improve the accuracy of fingerprint recognition and pattern matching. These technologies could also help in identifying and mitigating potential fraud or anomalies in attendance data.

Mobile and Cloud Integration: Expanding the system to include mobile applications and cloud-based services could provide greater flexibility and accessibility. Users could manage attendance and view reports from any device, and data could be stored securely in the cloud for better scalability and disaster recovery.

Enhanced Analytics and Reporting: Developing advanced analytics features to provide deeper insights into attendance patterns, trends, and student performance could help institutions make data-driven decisions and improve educational outcomes.

Automated Notifications and Alerts: Integrating automated notification systems for attendance-related events, such as absences or tardiness, could enhance communication between faculty, students, and parents, fostering a more responsive and engaged learning environment.

BIBLIOGRAPHY

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[1]. B. Swain, J. Halder, S. Sahany, P. P. Nayak and S. Bhuyan, "Automated Wireless Biometric Fingerprint Based Student Attendance System," 2021 1st Odisha International Conference on Electrical Power Engineering, Communication and Computing Technology(ODICON), Bhubaneswar, India, 2021, pp. 1-7, doi: 10.1109/ODICON50556.2021.9428983.

[2]. R. Memane, P. Jadhav, J. Patil, S. Mathapati and A. Pawar, "Attendance Monitoring System Using Fingerprint Authentication," 2022 6th International Conference On Computing, Communication, Control And Automation (ICCUBEA, Pune, India, 2022, pp. 1-6, doi: 10.1109/ICCUBEA54992.2022.10010791.

[3]. K. Jayakumar, V. Surendar, A. Sheela, P. Javagar, K. A. Riyas and K. Dhanush, "Internet of Things based Biometric Smart Attendance System," 2022 International Conference on Sustainable Computing and Data Communication Systems (ICSCDS), Erode, India, 2022, pp. 1492-1497, doi: 10.1109/ICSCDS53736.2022.9761045.

[4]. M. Idhom, I. Y. Purbasari, A. Fauzi and I. G. Susrama Mas Diyasa, "IoT-Based Portable Fingerprint Attendance System Using the Minutiae Based Algorithm," 2021 IEEE 7th Information Technology International Seminar (ITIS), Surabaya, Indonesia, 2021, pp. 1-5, doi: 10.1109/ITIS53497.2021.9791575.

[5]. S. Al Amin, M. A. Islam and M. S. Islam, "A Fingerprint Based Smart Attendance and Security System Using IoT and Ultrasonic Sensor," 2021 International Conference on Automation, Control and Mechatronics for Industry 4.0 (ACMI), Rajshahi, Bangladesh, 2021, pp. 1-5, doi: 10.1109/ACMI53878.2021.9528092.