Automated Scheduling System for College Transportation Using Modern Web Technologies

GE19612 - PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP PROJECT REPORT

Submitted by

ABHILASH A **(2116220701004)**

AKIELESH B **(2116220701021)**

HARINI A **(2116220701084)**

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BONAFIDE CERTIFICATE

Certified that this Project titled **" Automated Scheduling System for College Transportation Using Modern Web Technologies"** is the bonafide work of **" ABHILASH A (2116220701004), AKIELESH (2116220701021), HARINI A (2116220701084)"** who carried out the work under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

SIGNATURE
Dr. P. Kumar., M.E., Ph.D.,
HEAD OF THE DEPARTMENT
Professor
Department of Computer Science and Engineering,
Rajalakshmi Engineering College, Chennai - 602 105.

SIGNATURE
Dr. M. Ayyadurai , M.E., Ph.D.,
ACADEMIC SUPERVISOR
Assistant Professor
Department of Computer Science and Engineering,
Rajalakshmi Engineering College, Chennai-602 105.

Submitted to Mini Project Viva-Voce Examination held on _____

Internal Examiner **External Examiner**

ABSTRACT

Managing college transportation efficiently is a growing concern, particularly when it comes to seat availability, route management, and student safety. This project proposes a comprehensive College Transport Scheduling System designed to improve transportation efficiency and optimize seat allocation within the campus environment. The system primarily focuses on streamlining seat reservations and addressing common issues faced by students during inter-campus or native place travel—especially when hostellers board different buses, leading to overcrowding and reduced seat availability for regular bus commuters.

To address this, the platform allows students to reserve individual seats in advance for their designated routes, ensuring better crowd management and fair access. Additionally, the system provides a feedback mechanism where students can report driver behavior, technical issues within the application, or any challenges encountered during travel.

A notable feature of the proposed system is its built-in emergency alert mechanism, available to both students and drivers. In case of unforeseen incidents such as delays or emergencies, drivers can send real-time alerts, which are immediately accessible to the administrators. This facilitates quick response and support as needed.

The administrator dashboard is equipped to receive, monitor, and act upon these alerts and feedback, ensuring that transportation operations remain safe, responsive, and organized. Furthermore, the system is developed with scalability, transparency, and security in mind, offering a reliable solution for managing college transport logistics in a modern educational institution.

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ABHILASH A **2116220701004**

AKIELESH B **2116220701021**

HARINI A **2116220701084**

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LIST OF ABBREVIATIONS

S. No	ABBR	Expansion
1	AI	Artificial Intelligence
2`	API	Application Programming Interface
3	AJAX	Asynchronous JavaScript and XML
4	ASGI	Asynchronous Server Gateway Interface
5	AWT	Abstract Window Toolkit
6	CSS	Cascading Style Sheet
7	DFD	Data Flow Diagram
8	JSON	JavaScript Object Notation
9	SQL	Structure Query Language

CHAPTER 1
INTRODUCTION

1.1 GENERAL

In today's technology-driven academic environment, the need for efficient, transparent, and well-organized transportation systems within college campuses has become increasingly important. Managing daily commutes, tracking seat availability, ensuring safety, and addressing unforeseen travel issues are critical challenges faced by both students and college administrators. Traditional college transport systems often lack the flexibility and precision needed to handle these concerns, leading to overcrowding, poor communication, and limited visibility for stakeholders.

Recognizing these issues, this project introduces a College Transport Scheduling System—a centralized platform designed to streamline and enhance the management of campus bus services. The primary objective is to provide students with an efficient, real-time seat reservation system while improving operational oversight for administrators. A common issue arises when students, especially hostellers traveling to their hometowns, occupy buses other than their assigned routes, which results in a shortage of seats for actual route-allotted students. This system directly addresses that problem through prior seat booking and digital validation, thereby improving crowd management and reducing conflicts.

The platform features an intuitive and user-friendly interface that allows students to reserve seats, receive notifications, and report travel-related issues easily. An integrated feedback mechanism enables users to report driver behavior or application-related bugs, fostering accountability and continuous improvement. Moreover, the system includes an emergency alert module—accessible to both students and drivers—for

communicating travel delays, technical issues, or safety concerns in real time. Administrators are instantly notified of such alerts, allowing them to respond swiftly and offer timely assistance.

1.2 OBJECTIVE

The main objective of this project is to create a centralized and user-friendly platform that simplifies the process of managing college transportation by allowing students to reserve bus seats, report issues, and receive timely travel updates, all in one place. The platform is designed to promote seat availability, enhance user convenience, and streamline the travel experience by providing clear, organized, and accessible transport services. It aims to reduce overcrowding, mismanagement, and confusion caused by students boarding buses outside their designated routes, while ensuring fair and efficient seat allocation. Additionally, the system supports real-time emergency alerts and issue reporting, allowing both drivers and students to communicate urgent information to administrators instantly. The platform is built with scalability in mind, allowing for future enhancements such as GPS integration, route optimization, automated attendance tracking, and feedback analysis. Ultimately, the project seeks to make college transportation more reliable, transparent, and safe, benefiting both students and management by saving time and improving overall operational efficiency.

1.3 EXISTING SYSTEM

In many colleges, transportation management is handled manually or through basic digital systems that lack integrated functionality. Students often rely on fixed schedules displayed on notice boards or unofficial communication channels such as messaging groups to track bus timings or availability. Seat reservations are typically not enforced, leading to overcrowding, especially when students use buses outside their designated routes. Feedback mechanisms for reporting issues related to driver behavior or travel

incidents are either non-existent or inefficient, often requiring physical reporting or informal word-of-mouth complaints. Emergency response systems are also inadequate, with no structured way for drivers or students to raise alerts or notify administrative authorities in real-time. These limitations result in poor crowd management, communication gaps, and delayed responses during critical situations. The absence of a centralized, intelligent platform to manage college transportation reduces operational efficiency and user satisfaction, indicating the need for a more organized and responsive transport scheduling system.

CHAPTER 2
LITERATURE SURVEY

The evolution of college transportation systems has seen remarkable progress in recent years, driven by technological advancements in mobile platforms, real-time data processing, and the growing demand for flexible and efficient mobility solutions. As campuses continue to expand and student populations increase, the necessity for effective transport systems that minimize delays, optimize resource use, and ensure student safety has become a critical challenge for many educational institutions. Research has highlighted several key challenges faced by colleges, including fleet management, vehicle scheduling, and ensuring that buses or shuttles are available at the right times to accommodate the unpredictable nature of student schedules. Singh et al. [9] discussed the use of GPS technology to provide real-time tracking of vehicles, which has become a staple feature of modern campus transport systems. The ability to track buses in real-time allows students to monitor vehicle locations, reducing uncertainty and improving satisfaction. Additionally, many systems now allow students to reserve seats in advance, helping to manage demand and reduce overcrowding, ultimately enhancing the efficiency and reliability of transportation services.

A significant challenge identified by several studies is fleet underutilization, where buses are not fully occupied during certain periods, leading to wasted resources and higher operational costs. Optimization techniques that dynamically adjust bus allocation based on demand forecasts have been shown to reduce operational costs and improve resource utilization. Liu et al. [10] proposed the integration of dynamic scheduling algorithms that take real-time traffic data and student demand into account to adjust routes and vehicle assignments, ensuring optimal use of available buses and minimizing wait times for students. Moreover, optimization models based on machine learning algorithms can continuously learn from historical data and adjust their predictions to account for seasonal variations or sudden spikes in demand. The integration of such predictive models into campus transport scheduling can significantly reduce wait times

and ensure buses are available when needed. Li et al. [12] applied optimization models using real-time data to manage fleet distribution and parking assignments, achieving a reduction in delays and increasing operational efficiency.

Mobile technology has revolutionized the way transportation services are delivered, and this holds true for campus transport systems as well. The integration of mobile apps into transportation scheduling provides students with the ability to access a wealth of real-time data at their fingertips, making the commuting experience much more user-friendly. Jha and Gupta [13] examined how mobile apps with real-time vehicle tracking, seat reservations, and push notifications can improve the student experience by providing convenience, reducing uncertainty, and optimizing bus utilization. Mobile platforms enable students to book seats in advance, check the real-time location of buses, and receive notifications about delays or changes to routes. This functionality increases the transparency and predictability of the service, making it more reliable and attractive to users. Furthermore, mobile apps that allow students to rate their experiences or provide feedback on their rides help transportation managers identify areas for improvement and enhance service quality. Apps also allow for features like in-app payment systems, streamlining the booking and payment process, which is critical for improving the convenience and accessibility of the transport service.

Understanding user behavior is central to optimizing the functionality and success of any transportation system. Research has consistently shown that students value convenience, reliability, and flexibility in campus transportation. A study by Wilson et al. [14] indicated that students tend to favor systems that allow them to book seats in advance, track vehicles in real-time, and receive timely notifications. These features address the main concerns of students, such as the unpredictability of wait times and the anxiety of potentially missing a bus. Moreover, the design and usability of the mobile application play a significant role in shaping student satisfaction. Research by White et al. [15] found that students are more likely to use a transport system if the app is intuitive, easy to navigate, and provides features that meet their daily needs. Features

like route selection, real-time bus tracking, seat reservation, and instant notification systems are all key drivers of user engagement. In addition to these features, providing users with a platform to rate their experiences can help transport authorities monitor service quality and identify areas for improvement.

Students also prioritize systems that accommodate their flexibility. The ability to adjust their transportation plans based on changing schedules or urgent situations is a key factor in user satisfaction. Offering students the option to modify their bookings or change their pick-up/drop-off locations in real-time increases system responsiveness and enhances the overall user experience.

Student safety is a paramount concern in any transportation system, and the integration of emergency alert systems within campus transport apps is essential for ensuring student security. Studies have shown that integrating GPS-based location tracking, real-time notifications, and emergency alert features can significantly improve the safety and response times in the event of an emergency. Yadav and Sharma [16] proposed a framework that includes emergency alerts triggered by students or drivers during incidents such as breakdowns, accidents, or medical emergencies. These systems send immediate alerts to campus authorities, who can then respond swiftly and deploy help. Additionally, the use of voice recordings and the ability to share real-time locations enhances safety by providing authorities with accurate and immediate data, allowing them to assess the situation and coordinate a rapid response. Integrating such features into mobile platforms ensures that students have a sense of security during their commutes, knowing that help is readily available in case of emergencies.

As environmental concerns continue to grow, there is an increasing demand for sustainable transportation options within campuses. Several studies suggest that campuses could benefit from introducing shared ride options, such as carpooling or electric vehicle (EV) fleets, to reduce the environmental impact of campus transport. Li et al. [17] suggested that integrating electric buses into campus fleets could help reduce

carbon footprints, and this can be incentivized by offering students discounts for choosing eco-friendly transport options. Future developments in campus transport apps will likely focus on improving personalization and sustainability. Machine learning models that analyze user behavior can be used to suggest eco-friendly transport options based on a student's past preferences or sustainability goals. Additionally, integrating a rewards system that offers incentives for using sustainable transport options could encourage more students to participate in environmentally friendly initiatives.

While considerable advancements have been made in campus transport systems, significant gaps remain. Few existing systems provide an integrated platform that combines transportation scheduling, real-time tracking, emergency alerts, and sustainability features. Moreover, research on integrating personalized recommendations based on past behaviors or loyalty programs in transport apps is sparse, presenting an opportunity for future systems to offer more tailored and intelligent services. Further research into the integration of AI and machine learning for predictive scheduling, fleet optimization, and personalized recommendations could take campus transport systems to the next level, offering enhanced reliability, efficiency, and user satisfaction.

CHAPTER 3
PROPOSED SYSTEM

3.1 GENERAL

The College Transport Scheduling App is a comprehensive software solution designed to streamline the transportation process for students, ensuring efficient seat allocation and effective crowd management within the college campus. The system allows students to easily reserve individual seats on their respective buses, especially during times when hostellers travel back to their native places, and other students from different buses may occupy available seats. This feature enhances seat availability and prevents overcrowding, ensuring a smoother transportation experience.

For administrators, the system facilitates better control and management of bus schedules, fleet availability, and real-time updates, improving operational efficiency. Additionally, the system allows students to provide feedback on driver behavior and report any issues encountered during travel. An emergency alert system is also integrated, enabling both students and drivers to send real-time alerts in case of unforeseen incidents, delays, or emergencies, which are then logged for administrative action.

By automating various aspects of seat reservation, feedback collection, and emergency notifications, the system reduces manual work, ensures accurate seat management, and fosters a safer, more reliable transportation environment. This centralized system ultimately aims to improve the overall transportation experience for all students while maintaining transparency and security for administrators.

SYSTEM ARCHITECTURE DIAGRAM

The system architecture for the College Transport Scheduling App is designed to

provide an efficient, secure, and scalable platform for managing transport schedules, seat reservations, and emergency notifications. The system is divided into three main layers: Presentation Layer, Application Layer, and Data Layer, each serving distinct functions to ensure smooth interaction between the user interfaces and the backend operations.

The Presentation Layer serves as the front-end interface, allowing users to interact with the system. Built using modern web technologies, the layer includes two distinct portals. The admin portal allows administrators to manage the transport system by performing Create, Read, Update, and Delete (CRUD) operations. Administrators can modify bus routes, update bus availability, adjust timings, and manage system-wide alerts. This interface provides a dynamic dashboard for easy management and monitoring of the transport services. The student portal allows users to view real-time bus schedules, check seat availability, and book seats in advance. Students can also trigger emergency alerts to notify admins about any issues, such as accidents or miscommunication regarding attendance. The interface is designed to be responsive and user-friendly, ensuring accessibility across different devices.

The Application Layer handles the core business logic and processes user requests. It connects the front-end interfaces with the backend database, ensuring proper functionality and communication between the two. The system enforces role-based access control (RBAC) to ensure that users (both admins and students) can access only the features relevant to their roles. The application layer implements algorithms to automatically allocate available seats to students based on current availability and booking data. The system allows students and drivers to send emergency alerts to admins, ensuring that critical issues are communicated in real-time. The application ensures that all interfaces reflect the most current data, such as updated bus schedules and seat availability, in real time.

The Data Layer is responsible for the storage and management of the system’s data. The database ensures the proper retrieval, storage, and management of critical

information, including user credentials, bus details, booking records, and emergency alert records. The system stores user information, such as admin and student profiles, including login credentials and personal details. Information related to buses, such as bus IDs, routes, seat availability, and timing schedules, is stored in the database. The system maintains logs of student seat reservations, ensuring that seat availability is accurately tracked. The database also stores records of any emergency alerts triggered by students or drivers, enabling efficient issue resolution. The data layer utilizes a relational database management system (RDBMS) to store and organize data, ensuring referential integrity through foreign key constraints. The schema is designed for optimal querying and scalability, with future enhancements such as GPS tracking and real-time bus monitoring in mind.

The communication flow within the system is designed to ensure efficient handling of user requests and smooth interaction between all components. When a user submits a request (e.g., seat reservation or schedule view), the application layer processes the input, performs necessary validations, and communicates with the database to retrieve or update relevant data. The results are then sent back to the user via the presentation layer, providing a seamless and secure user experience. This architecture ensures that all user interactions, whether from admins or students, are managed efficiently, providing real-time information and updates while maintaining system integrity and performance.

3.2 DEVELOPMENTAL ENVIRONMENT

3.2.1 HARDWARE REQUIREMENTS

To develop and run the car rental comparison platform, basic hardware such as a computer with at least an Intel i3 or i5 processor, 4–8 GB RAM, and 256 GB storage is sufficient. For hosting the platform, a cloud server or local server with a minimum of 4-core CPU, 8 GB RAM, and stable internet connectivity is recommended to ensure smooth performance and reliable access for users.

Table 3.1 Hardware Requirements

COMPONENTS	SPECIFICATION
PROCESSOR	Intel Core i3
RAM	4 GB RAM
POWER SUPPLY	+5V power supply

3.2.2 SOFTWARE REQUIREMENTS

The car rental comparison platform requires a web server software such as Apache or Nginx, along with a backend framework like Flask or Django for handling API requests and business logic. A relational database like MySQL or PostgreSQL is needed to store user data and booking information. For frontend development, modern web technologies such as HTML, CSS, JavaScript, and frameworks like React or Angular are required. Additionally, tools for version control (e.g., Git) and cloud services (e.g., AWS, Google Cloud) are recommended for deployment and scalability.

Table 3.2 Software Requirements

COMPONENTS	SPECIFICATION
Operating System	Windows 7 or higher
Frontend	HTML, CSS, Javascript
Backend	PHP
Database	MYSQL

3.3 DESIGN OF THE ENTIRE SYSTEM

3.3.1 FLOWCHART DIAGRAM

The College Transport System workflow specifies the Operations and Processes of both users- students and Admins. The College Transport System begins with both Admin and the Student. Different login as Different roles. If the user is an Admin, He or she is directed to the Admin dashboard. From that Admin can add, delete, or update the bus details. The admin can update the daily Schedule of Buses. As an add-on feature, the admin can monitor the emergency alerts and respond to the emergency alert when it is received. If the user is a Student, He or she is directed to the Student dashboard, where the student can view the available buses, check seat availability (If seats are available means then the system is redirected to Smart Seat Allocation. If seats are available means the student can select a seat and confirm it by saving. If there are no seats it will mention that No Seats Available. For a Safety measure, the student has the Emergency Alert System to raise an emergency when a student meets any problem, like an accident, medical issues on the bus during their travel. Further the alert was sent to admin to take appropriate action. The flowchart highlights the operations and processes of the College Transport System and ensures the transport management, seat allocation, secure communication and responsiveness towards Student feedbackbooking experience**.**

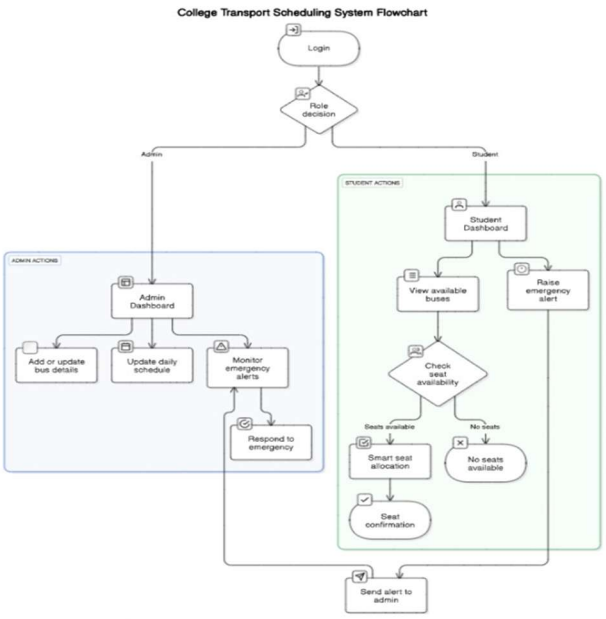

Fig 3.2: Flowchart Diagram

3.4.2 CLASS DIAGRAM

The class diagram for the college transport scheduling app represents an object-oriented structure that captures the relationships and responsibilities of various system components. It is designed using core principles like encapsulation and inheritance to improve maintainability and scalability. At the center of this design lies the User class, which acts as the superclass for all system users. This class includes common attributes such as user ID, name, role, password, and contact details. It is extended by two subclasses: Admin and Student. The Admin class inherits from User and is granted elevated privileges, enabling administrators to manage the number of buses available, update schedules, and modify seat counts for each bus, ensuring that real-time data is reflected across the system. Similarly, the Student class, which also inherits from User, has permissions tailored to their needs, such as viewing available buses, checking reserved seats, and using the emergency alert feature when a bus encounters issues.

The Bus class is responsible for modeling the bus entities in the system. It contains attributes like bus ID, route, timing, operational status, and total seat count. Each bus is linked to multiple schedule entries and can be the source of emergency alerts. The Schedule class manages the scheduling details of the buses. It includes the schedule ID, corresponding bus ID, date, and the list of assigned seats. It plays a crucial role in connecting the Bus and Seat Allocation classes, facilitating real-time checks for seat availability. The Seat Allocation class supports a smart system that allows students to reserve seats based on current availability, helping to ensure fair distribution and avoid overcrowding.

The Emergency Alert class handles real-time emergency communications. It allows both students and drivers to trigger alerts when needed, which are then immediately sent to the admin for appropriate action. The class includes attributes such as alert ID, sender ID, sender role (either student or driver), and the resolved status of the alert. Several relationships are defined among these classes: a student user is associated with seat

allocation using their student ID; users are also linked to emergency alerts through their sender ID; and buses are connected to schedules using the bus ID. The overall design of the class diagram emphasizes role-based access control, timely emergency responses, and intelligent seat allocation to streamline the college transport process. For future enhancements, features like GPS tracking and AI-based delay predictions can be integrated to further improve the system. GPS tracking, for instance, would help students locate nearby buses if they miss their designated ride.

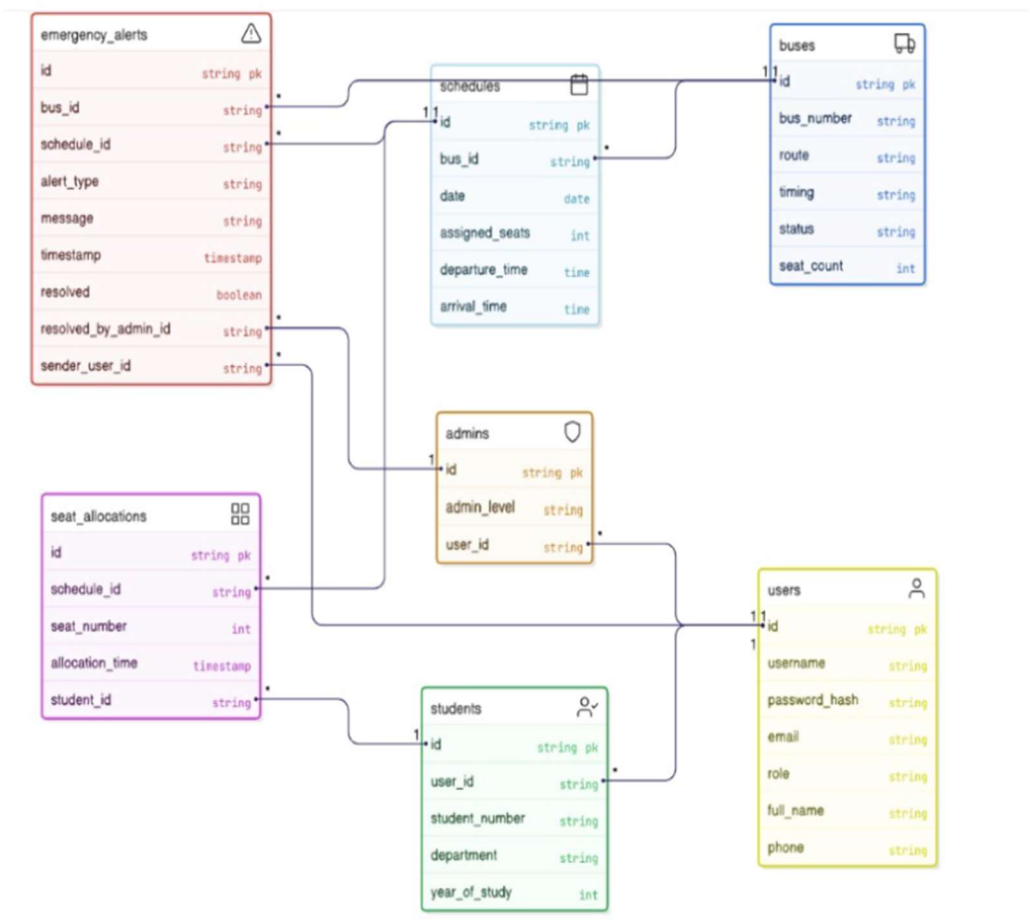

Fig 3.3:Class Diagram

3.4.3 SYSTEM ARCHITECTURE DIAGRAM

The college transport scheduling app has a three-tier architecture which ensures modularity, security, and scalability. The system is designed for both administrators and students with separate functionalities and access. The architecture comprises the presentation layer, application layer, and data layer.

The presentation layer serves as the front end that facilitates interaction between users and the system. It is built using web technologies and provides two distinct portals for different users. The admin interface enables administrators to perform create, read, update, and delete (CRUD) operations on bus data, schedules, and seat allocation records. Admins have the authority to update the number of buses available for the day, modify the bus routes and timings, and manage system-wide alerts. The student interface allows students to view the updated bus schedules, check for seat availability, and book seats in advance. Additionally, students can access the emergency alert button which sends immediate notifications to the admin in case of accidents or issues, thereby avoiding miscommunication regarding attendance and safety. This layer provides a responsive design and user-friendly navigation across various devices.

The application layer implements the core functionality and business logic of the system. It processes user requests, enforces role-based access control, and manages communication between the front end and the database. Key functionalities include authentication and authorization based on user roles (admin or student), smart seat allocation for students based on current availability, an emergency alert system that allows notifications to be sent to admins, and real-time data synchronization across interfaces.

The data layer is responsible for storing and retrieving system data. A relational database is employed to manage user credentials and profiles, bus details including IDs, routes, seat counts, and availability status, daily transport schedules, reserved seat logs, and emergency alert records. The database schema is normalized and maintains

referential integrity through foreign key constraints. It is designed for efficient querying and scalability to support future enhancements such as GPS tracking.

Client requests are handled by the application layer, which processes the input, performs necessary validations, and interacts with the database. The results are then returned to the user through the presentation layer, resulting in a seamless and secure user experience

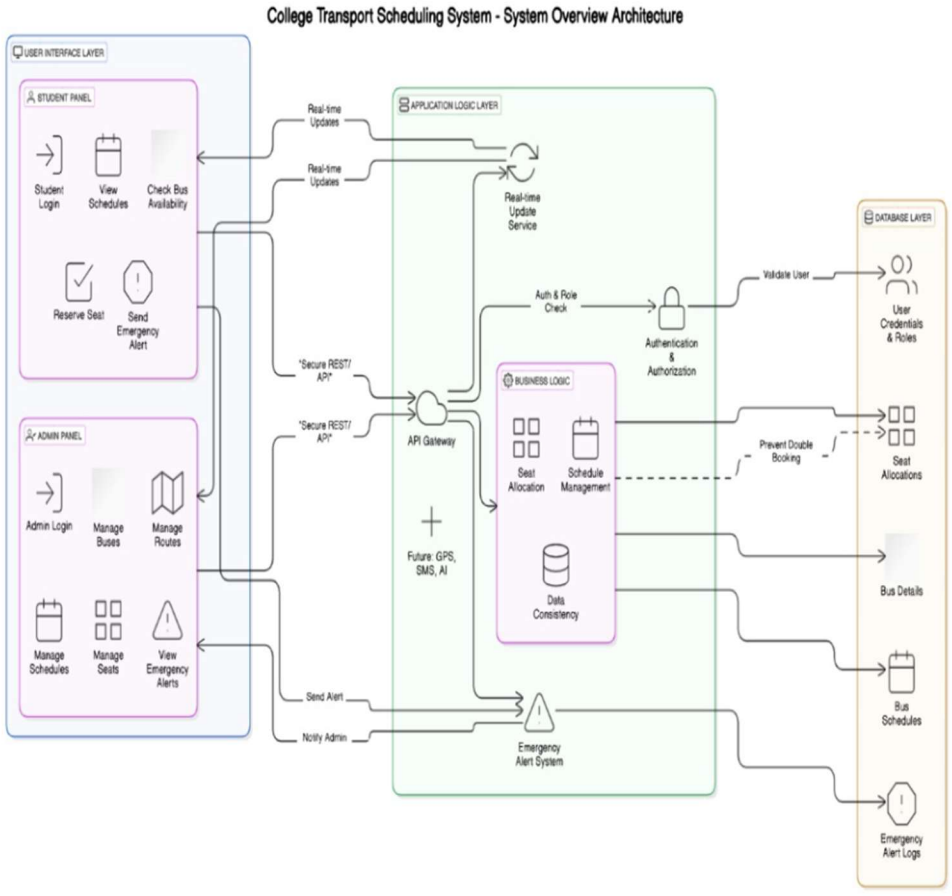

Fig 3.4 System Architecture Diagram

3.4 STATISTICAL ANALYSIS

The statistical analysis for the college transport scheduling app involves collecting and

evaluating data generated from user activity, bus schedules, seat bookings, and emergency alert triggers. Descriptive statistics such as mean, median, and standard deviation are calculated to analyze student usage patterns, bus occupancy rates, and the frequency of seat reservations. This helps in identifying peak usage hours, underutilized routes, and average seat demand across different time slots. Correlation analysis is also conducted to examine relationships between variables like time of reservation and seat availability, or frequency of alerts and specific bus routes. System performance is evaluated through metrics such as booking success rate, emergency alert response time, and user login frequency, which help in optimizing resource allocation and improving service efficiency. By leveraging this statistical insight, the app can enhance its seat allocation algorithm, refine bus scheduling, and improve overall user experience while ensuring the system remains responsive and reliable for both students and administrators.

CHAPTER 4

MODULE DESCRIPTION

The college transport scheduling app consists of multiple modules, each responsible for delivering specific functionalities. The User Interface Module allows administrators and students to interact with the system using a responsive web layout. Students can view bus schedules, check seat availability, and trigger emergency alerts. Administrators can manage bus data, update seat allocations, and monitor alerts in real-time. The Backend Module handles user requests, processes core business logic such as role-based access, seat booking validation, and emergency alert handling. The Database Module stores essential information including user profiles, bus schedules, seat reservations, and alert logs. All modules work together to ensure smooth operation, effective resource allocation, and real-time communication, thereby enhancing overall transport system efficiency and safety.

4.1 SYSTEM ARCHITECTURE

4.1.1 USER INTERFACE DESIGN

The user interface design of the college transport scheduling app emphasizes usability, clarity, and cross-device responsiveness. The homepage allows students to log in and immediately access updated schedules, available buses, and seat booking features. The admin portal provides a clean dashboard with options to add or edit bus records, view daily reservations, and respond to emergency alerts. Visual elements like tables and buttons are designed for quick readability and navigation, with color-coded statuses indicating seat availability and bus activity. The emergency alert feature is easily accessible to students, ensuring prompt communication during unexpected issues. Overall, the interface provides an intuitive, role-based experience tailored for both student and admin users, promoting efficiency, security, and real-time awareness throughout the system.

4.1.2 BACK END INFRASTRUCTURE

The back-end infrastructure of the college transport scheduling app is designed to handle user requests securely, manage transport-related operations, and ensure seamless communication between the frontend and the database. Developed using PHP, JavaScript, and MySQL, the server-side logic processes student and admin interactions, including login validation, seat reservation, and emergency alert handling. Role-based access control is implemented to distinguish between student and admin privileges. The backend manages real-time updates to bus schedules, seat availability, and emergency notifications. MySQL serves as the relational database for storing essential records such as user credentials, transport schedules, seat bookings, and alert logs. Secure APIs are employed to bridge the frontend and backend, ensuring fast, authenticated, and reliable data flow.

4.2.5 Performance Evaluation and Optimization

Performance evaluation of the college transport scheduling app is conducted by assessing system responsiveness, accuracy of seat availability updates, and user interaction rates. Metrics such as request-response time, database query efficiency, and system uptime are monitored regularly. Optimization strategies like database indexing, query optimization, and efficient session handling are applied to enhance performance under high traffic. The alert system is evaluated for real-time responsiveness to ensure emergency signals are delivered without delay. User feedback is collected to assess usability and system reliability. Based on these evaluations, improvements are implemented to maintain a smooth, secure, and responsive experience for both students and administrators.

4.2.6 Model Deployment

The College Transport Scheduling App is designed to support future deployment of smart models, such as AI-based delay prediction or GPS-based bus tracking. When implemented, these models will be integrated into the backend infrastructure to provide real-time recommendations, like notifying students of bus delays or suggesting the nearest alternative bus. Deployment will be managed through cloud-based platforms such as AWS or Azure to ensure scalability and continuous availability. The system will also support continuous monitoring and periodic updates of the model using newly collected data from schedules, routes, and student usage patterns, thereby ensuring reliable performance and improved decision-making capabilities

4.2.7 Centralized Server and Database

A centralized server handles all user requests, processes data, and manages communication with external rental agency APIs. The database securely stores user profiles, booking details, rental options, and system logs in a structured format. This centralized setup ensures data consistency, fast access, and easy system maintenance.

4.3 SYSTEM WORK FLOW

4.3.1 User Interaction:

In the College Transport Scheduling App, user interaction begins when students and administrators access the platform through their respective interfaces. Students log in using their credentials and are presented with an intuitive dashboard displaying bus schedules, seat availability, and the option to book seats in advance. They can search for specific buses based on route, time, and availability, with the system providing real-time updates to ensure accurate information.

For emergencies, students can trigger an emergency alert, which instantly sends a notification to the admin, helping to quickly address issues such as accidents or delays.

Students can also view past booking history, making it easier to track their transportation usage.

Administrators, on the other hand, access their interface to manage bus schedules, seat allocations, and emergency alerts. They can update bus availability, modify routes, and adjust timings based on demand or unforeseen circumstances. They also have the authority to manage seat bookings, resolve conflicts, and ensure overall system optimization.

The system operates smoothly through role-based access control, ensuring that both students and administrators only have access to the functionalities relevant to their roles. The interaction between the user interface, backend logic, and real-time data retrieval guarantees a seamless and responsive experience for all users.

4.3.2 User Registration and Login Flow

The user registration and login process in the college transport scheduling app begins with the user providing basic information such as name, contact details, and role (student or admin). After registration, users can log in with their credentials to access their respective dashboards. The system authenticates users and grants access based on their roles, ensuring students have access to seat reservations and schedules, while admins can manage bus details and routes. Secure authentication mechanisms like email verification or multi-factor authentication can be used to ensure that only authorized users can access the system.

4.3.3 Bus Search and Seat Reservation Flow

Students can easily search for available buses based on their desired pick-up location and travel dates. Once they input the required details, the system fetches available buses from the database and displays them with real-time seat availability. Students can view bus schedules, select seats, and reserve them for their chosen route. The seat reservation process is updated in real-time to ensure that double bookings are avoided. Students

receive a booking confirmation along with details of their reserved seat and bus schedule for the selected date.

4.3.4 Bus Search and Seat Reservation Flow

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4.3.5 Emergency Alert Handling

In case of an emergency, students can trigger an alert using the emergency button in the app. Once activated, the alert is sent immediately to the administrator, who can assess the situation and respond accordingly. The system also stores the emergency alert records with sender details, status, and timestamps for accountability. This ensures that issues such as accidents or miscommunication about attendance are communicated to the admin without delay, allowing for quick responses and resolution of problems.

4.3.6 Admin Dashboard and Bus Management

The admin interface allows administrators to manage bus schedules, routes, and seat allocations. Admins can add, update, or delete bus details, modify bus routes, and manage the availability of buses for each day. Through the admin dashboard, they can also set seat availability, manage real-time updates, and monitor any operational issues, such as bus breakdowns or delays. The admin has full access to modify and update the transport system to ensure smooth daily operations, preventing any mismanagement or communication errors.

4.3.7 Booking History and Tracking

Students can view their past seat reservations through their booking history, which shows detailed information about previous trips, including the bus, seat number, and reservation date. The app also allows students to track their current bookings and modify or cancel them if needed. In case of cancellations, the system automatically updates seat availability for others. By maintaining a record of past bookings, students can keep track of their travel patterns, making it easier to rebook or plan future travels.

4.3.8 System Notifications and Alerts

The system uses notifications to keep students and administrators informed about important events such as successful bookings, seat availability, schedule changes, or emergency situations. Notifications are sent via in-app alerts or emails, depending on user preferences. For example, students are alerted when a bus route is modified or when their seat reservation is confirmed. Similarly, administrators receive alerts regarding issues such as low seat availability, emergency alerts from students, or changes in bus schedules, helping them stay on top of operations.

CHAPTER 5

IMPLEMENTATION AND RESULTS

5.1 IMPLEMENTATION

On the main page of the College Transport System, users are prompted to select whether they wish to log in as a student or an administrator (fig. 5.1), ensuring that each type of user is directed to the appropriate interface. Once the student option is chosen, the student login page appears, requiring entry of a valid email address and password via two clearly labeled input fields (fig. 5.2). After successful authentication, the student dashboard displays features such as bus schedules, live tracking, notifications, feedback, emergency alerts, settings (including a light/dark mode toggle), and a static overview of the day's bus list along with the current date and time (fig. 5.3). When a special event requires seat reservations, students access the booking interface where multiple buses are listed, and seat availability is clearly marked—students can select and book exactly one seat per person to prevent duplicate or fake bookings (fig. 5.4). For real-time location updates, the GPS tracking page shows the live position of the selected bus on a map, helping students monitor its progress toward campus (fig. 5.5). Any changes to bus timings trigger notifications that appear in the student's notification feed, ensuring they are informed immediately of delays or schedule adjustments (fig. 5.6). The feedback panel allows students to submit their name, bus number, type of issue, and optional comments, providing a structured way to report concerns about routes or driver behavior (fig. 5.7). In urgent situations—such as breakdowns, accidents, or medical emergencies—students and drivers can use the emergency alert system to send immediate notifications to the admin dashboard, prompting rapid response and support (fig. 5.8). Administrators access a dedicated panel where they can create, update, or delete bus schedules and push notifications directly to students about delays, cancellations, or route changes (fig. 5.9). When composing notifications, admins use

checkboxes and text fields to select recipients and draft messages, which are then broadcast instantly (fig. 5.10). Student feedback submissions are automatically summarized into concise formats on the admin side, allowing quick review and action on common issues (fig. 5.11). Testing by the Research & Analysis department and college management confirmed that seat allocation works as intended, with each student able to reserve only one seat and admins able to send timely alerts and route updates. The emergency alert feature proved invaluable for reporting incidents such as bus breakdowns or medical emergencies, and the feedback system reliably captured student concerns for administrative follow-up.

5.2 OUTPUT SCREENSHOTS

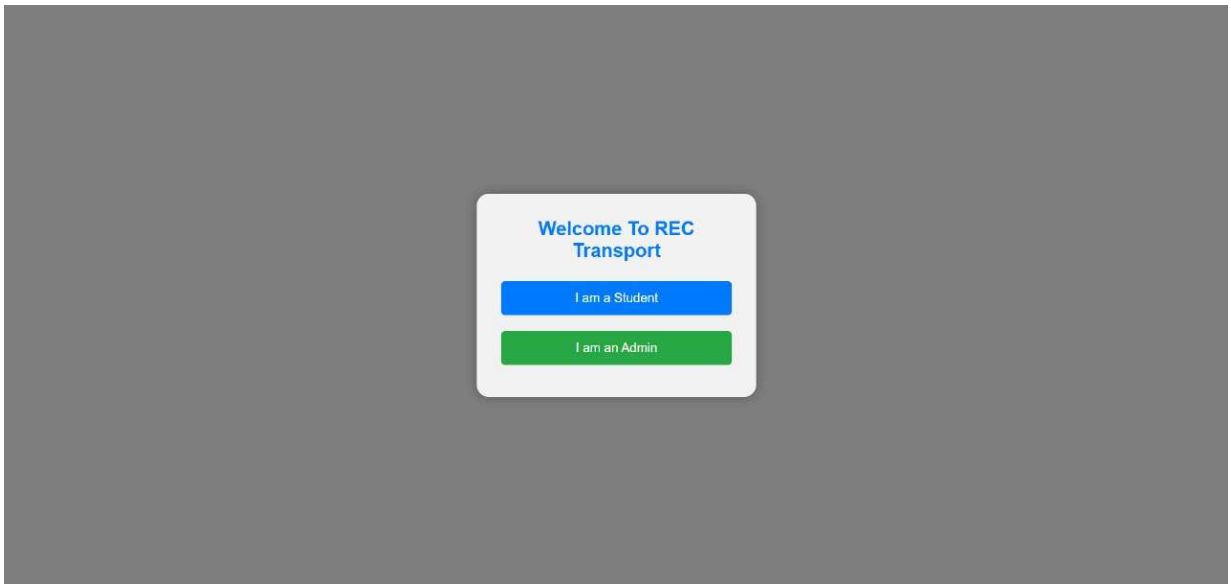

Fig 5.1 Main page.

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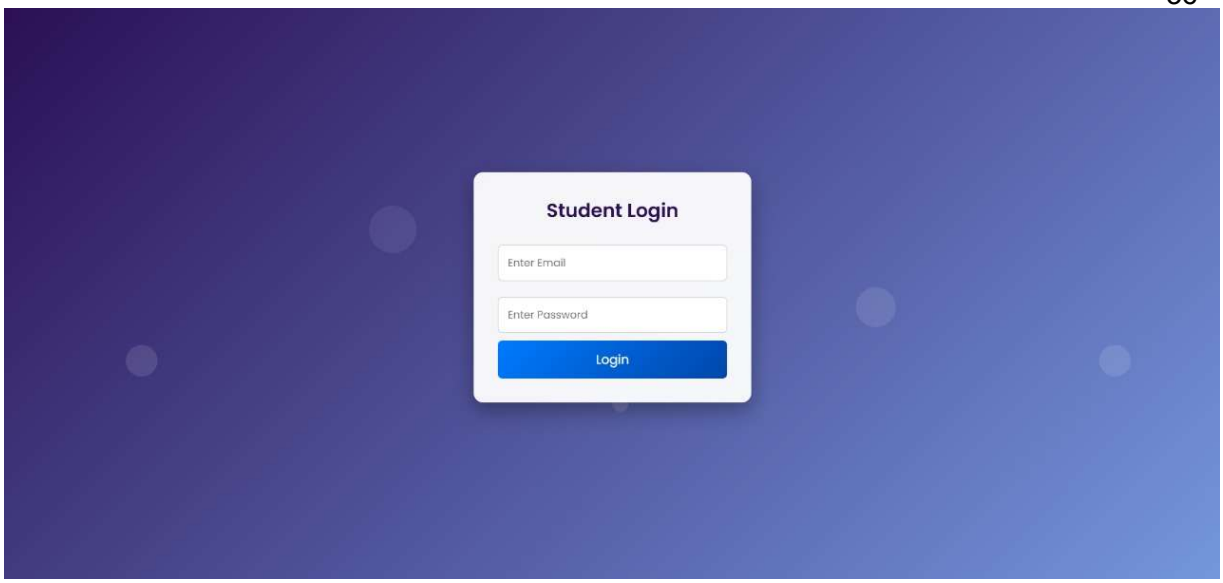

Fig 5.2 Student Login page.

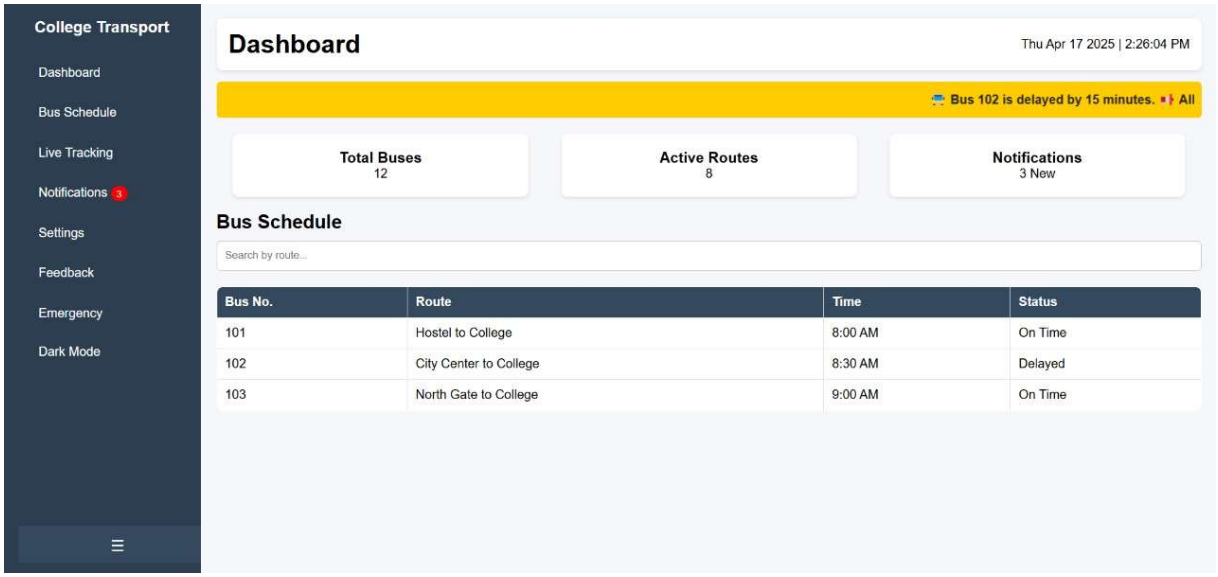

Fig 5.3 Dashboard of Student login.

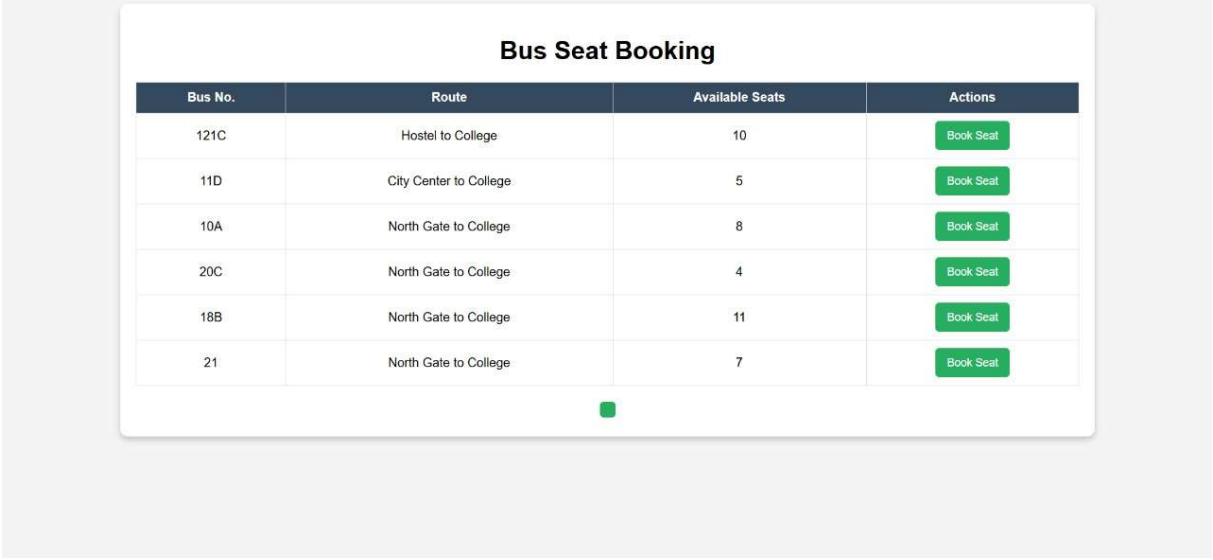

Fig 5.4 Prior seat allocation page.

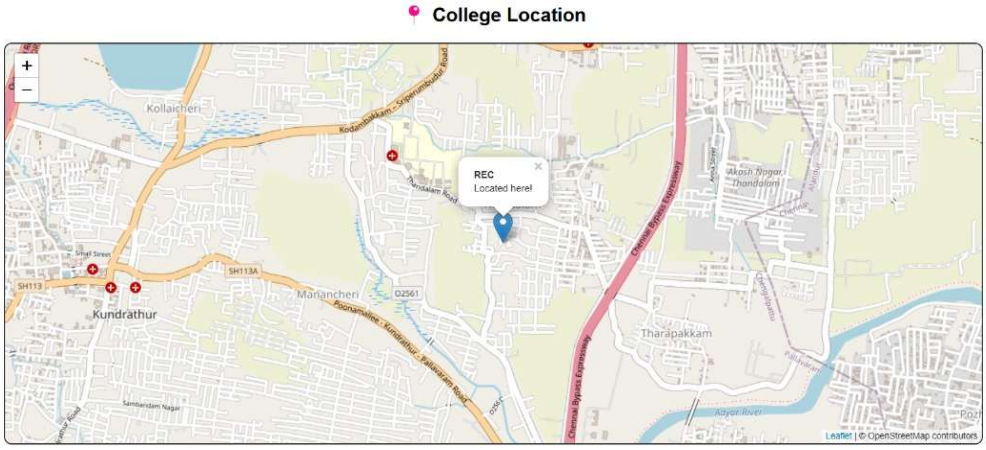

Fig 5.5 GPS Live Tracking page

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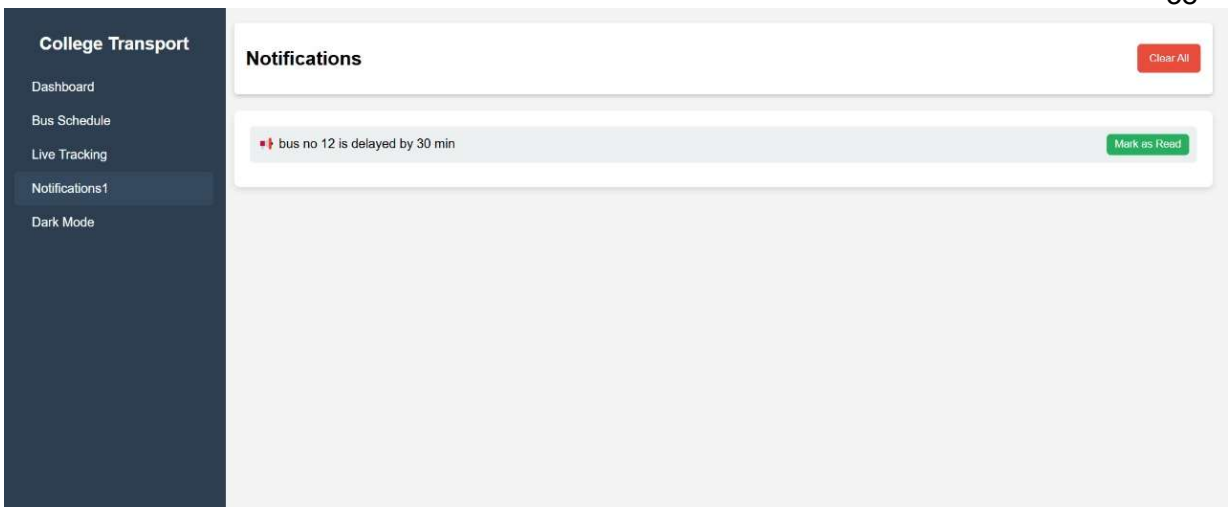

Fig 5.6 Notification Page

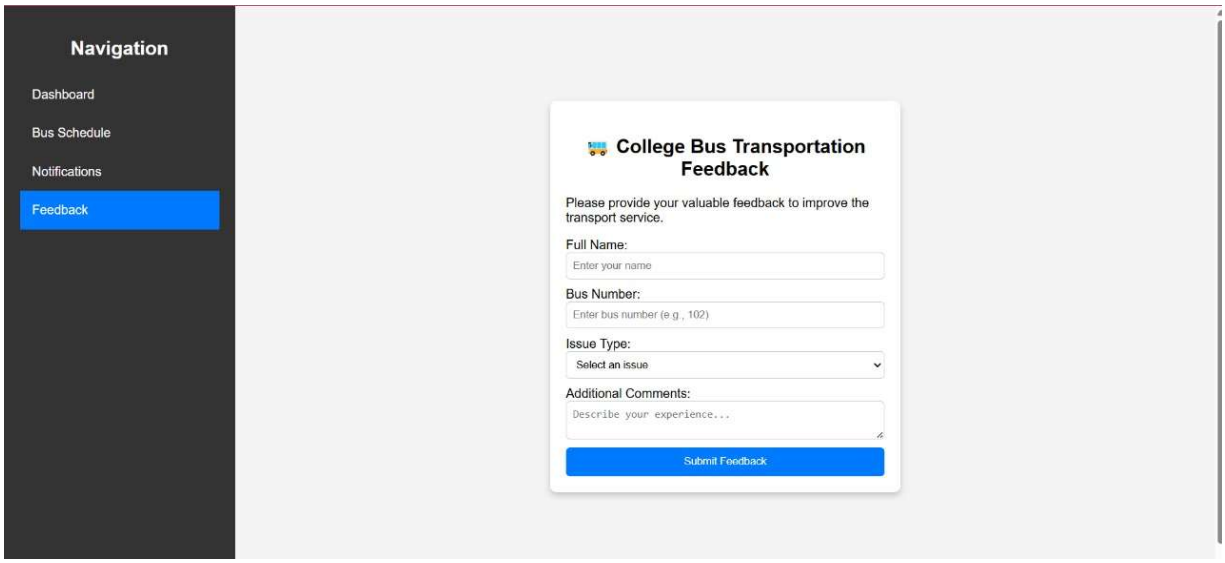

Fig 5.7 Feedback panel.

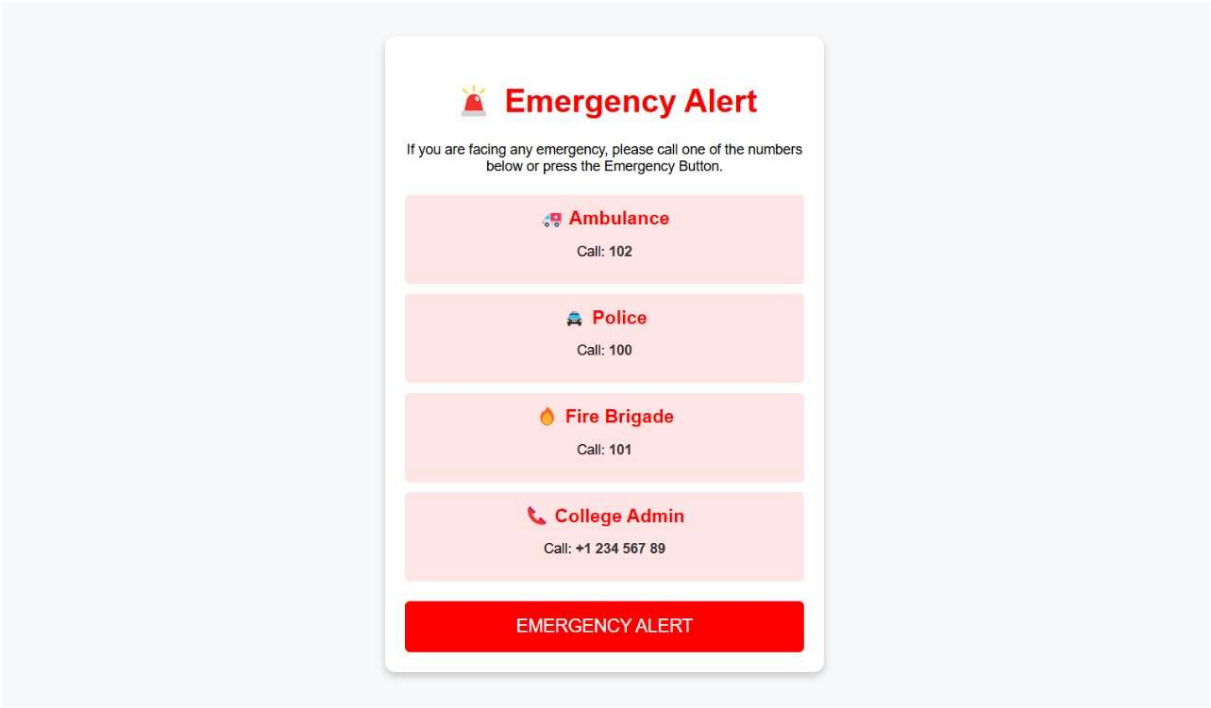

Fig 5.8 Emergency Alert System.

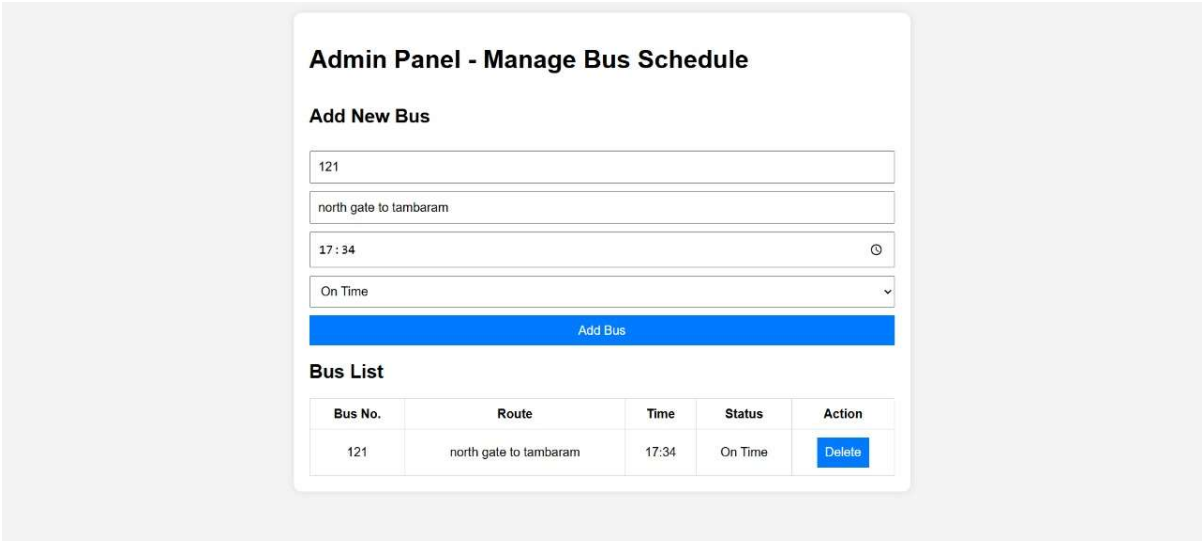

Fig 5.9 Admin panel.

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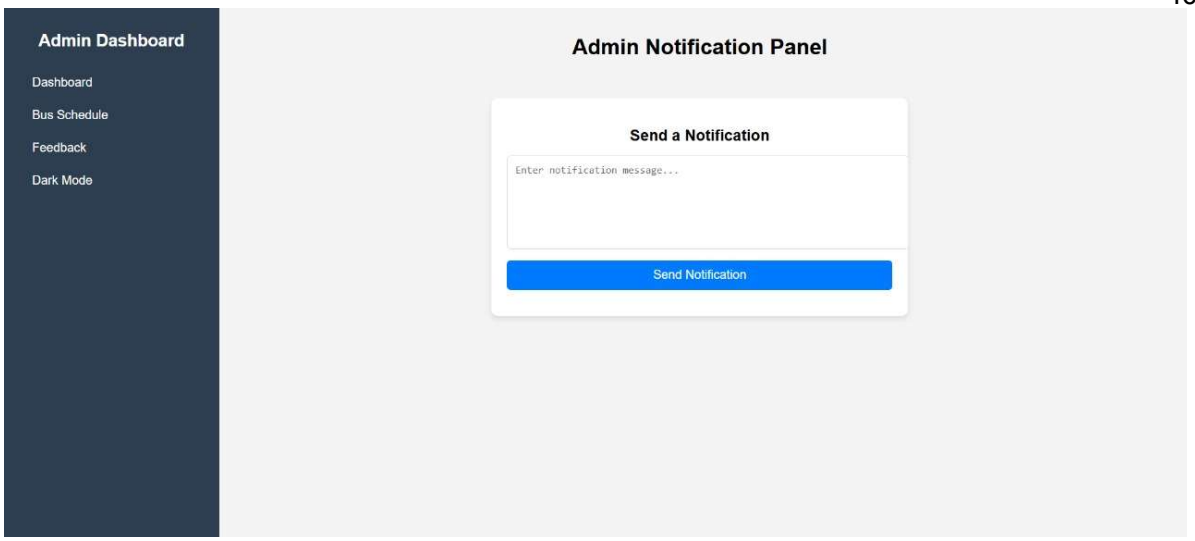

Fig 5.10 Notification Panel of Admin.

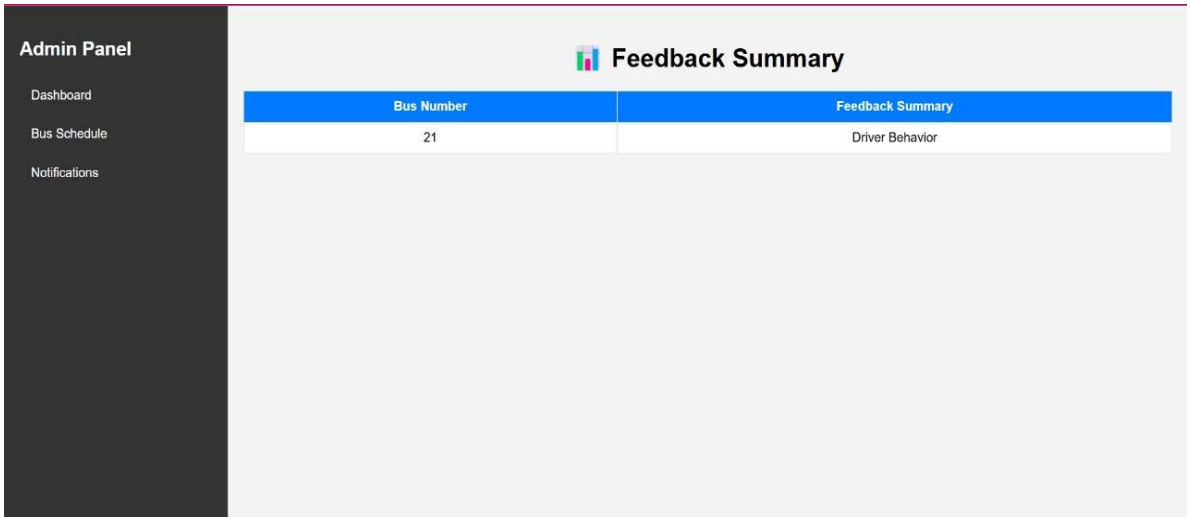

Fig 5.11 Feedback Summary Page

CHAPTER 6

CONCLUSION AND FUTURE ENHANCEMENT

6.1 CONCLUSION

The College Transport Scheduling System was developed with the goal of improving the overall efficiency, safety, and communication within college transportation systems. By introducing features like smart seat booking for special events, real-time notifications from admins, emergency alerts from students, driver feedback, and live bus tracking, the app successfully addresses many challenges faced by students and transport management coordinators. It ensures better coordination, reduces confusion during unexpected changes on bus issues, and enhances student safety during transit travel. The app also empowers users by giving them a voice through feedback and complaint mechanisms. Overall, this system presents a modern, student-friendly solution that bridges the communication gap and supports a more organized transport experience in colleges.

6.2 FUTURE ENHANCEMENT

In future iterations, the app will integrate active GPS tracking on every bus to provide students and administrators with real-time location updates, ETA predictions, and route analytics. This enhancement will enable dynamic rerouting in response to traffic conditions or unexpected delays, as well as automated alerts when a vehicle deviates from its scheduled path. To support long-scale deployment across multiple colleges, the system will be refactored into a multi-tenant architecture hosted in the cloud, allowing each institution to manage its own fleet, schedules, and user roles while sharing a centralized codebase and database infrastructure. Automated onboarding workflows, customizable route templates, and role-based configuration panels will streamline setup for new campuses, and centralized monitoring dashboards will provide transport managers with performance metrics .

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PUBLICATION/EVENTS DETAILS

The College Transport Scheduling App aims to enhance the transportation experience for both students and administrators by offering a seamless interface for seat reservations, emergency alerts, bus schedules, and feedback collection. The platform's success will be showcased through events and publications aimed at raising awareness about its capabilities and potential future enhancements. Events will be held to demonstrate the system’s functionality, particularly its ability to handle seat bookings for special college events, manage real-time bus tracking via GPS, and facilitate instant notifications regarding bus delays and schedule changes. Publications will highlight case studies from pilot institutions, emphasizing the app’s impact on improving communication, efficiency, and safety in college transportation. Future events will include workshops and seminars, focusing on the app's potential for scale, incorporating GPS tracking, and expanding to other institutions. These initiatives will also cover the platform's adaptability to various college-specific requirements, promoting its wider adoption in educational institutions.

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