COLLEGE TRANSPORT SCHEDULING APP

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ABSTRACT :

The transport scheduling system targets at improving the transportation efficiency and also seat availability for the students.It mainly aims in providing these mentioned essential features only within the college campus. This system enables students to reserve individual seats for their respective bus,particularly when the hostellers travel in the bus to move their native or any other issues many students from other bus travel in another bus which makes reduced seats availability for the actual students who belong to that bus.This feature therefore enables better crowd management.Here, the system enables the students to provide feedback on driver behaviour and report any issues with the provided application or if encountered any problem during the travel can report here.There is another important feature in the application is that emergency alert system which can be used by both drivers and the students.Drivers can also send the real-time alerts if in case any problem while travelling ,could be delays ,unforeseen incidents too.Admininistrators ability is to receive the notification and record them and help the needy as per the requirement. The proposed system also offers transparent, secure and scalable solutions which are used to manage the college transportation.

Keywords – Bus Transportation,Seat Allocation, Student Safety, Emergency Alert System,Student Feedback, Notification Management,Real-time Updates,Incident Reporting,Route Optimization

I. INTRODUCTION :

In the past decades before, the transport system was totally managed by Rigid scheduling systems. In which the management is poorly structured, the buses and bus routes are based on the priorities of students[1]. And most of the colleges were not equipped with a Transport Management System. Technological integration in daily life is essential in Today's World. The contribution of technology in the Transportation system has grown crucial in the past few decades to improve the user experience, safety and efficiency. Organizing college transportation for everyday and for special events remains a challenging issue for colleges[2]. Delay of bus, Uncertainty in route allocation and seating are major common issues in Traditional Bus Systems. Therefore, the development of the Transport Scheduling App is to modernize and accelerate the College Transportation Operations. The college Transportation App is developed by understanding the issues faced by the students and college faculty, which has been developed through extensive research and analysis to further enhance and address both current limitations and future enhancements to incorporate Safety[4]. The main objective of this project is to offer an effective platform that allows Students to reserve their bus seats for college activities on Special Occasions. Each Student and Admin login module has Distinct functionalities. Administrators have the authority to send real-time notifications to students in real time about the route changes, delays of the bus, cancellations of the bus for that particular route or combining the cancelled bus with another nearby route bus[5]. Student have authority to Provide feedback regarding the transport service based on the issues of overcrowding, drivers behaviour and Challenges encountered during transit .students can also book seat as seat per person on special occasions in college and can Send emergency notifications to the admin by Emergency Alert System based on Such as breakdowns, accidents, health emergencies, or other unforeseen events. As an additional feature, it has GPS tracking, which facilitates secure and reliable travel by monitoring live on the College Transport System. Both the students and college employees can benefit from the features which dramatical increase clarity and quality of usage. The proposed system ensures the eradication of common problems that have been faced with past traditional methods, Enhanced safety protocols and Centralized responsibility through a unified digital platform[6].

II. RELATED WORKS :

There have been many transport related apps created to enhance the daily work experience. Apps like Moovit, RedBus, and Chalo are aimed at offering city-wide bus routes, real-time tracking, and ticket booking functionalities. These systems use GPS and cloud-based APIs to provide bus transport data to users, often adopting a mobile-first strategy with technologies such as Flutter, React Native, and Firebase for backend functions. Though these apps are optimized for urban contexts, their architectures tend not to be tailored to reflect localized or institutional transportation systems like those found on college campuses.

A comparative analysis finds that the majority of current platforms focus on user-side features but do not support administrator-specific controls for dynamic updating of schedules or seating. For example, the apps that we have used for bus transportation have static schedules and cannot adjust to day-to-day changes proposed by the bus management. On behalf of it required a constant internet connection and sub-level API to make uniform functioning. It shows only ETA based data and notification. That is Estimated Time of Arrival where estimated time is only calculated and presented in it, which is widely used in Tracking, Tracking-based Applications. Most college Transport systems lag down on the connection between students and administrators, like reporting of combined bus lists or route cancellation lists. Emergency alert Service is also absent in major transport apps that have been seen in the last 15 years. Moreover three three-fourths of transport apps or websites have no provision for students to raise complaints. While taking a brief study on transportation systems, our project targets to be more useful for students as well as administrators to be responsive, real-time time and on live location Tracking.

III. PROPOSED SYSTEM :

a) Methodology :

The proposed College Transport Scheduling System has developed a structured methodology which streamlines the campus transport operations.Initially,the requirements were considered from the students as well as the administrators which defines the major key modules such as bus scheduling,smart seat allocation and also mainly emergency alert handling.

A client-server architecture is selected therefore enabling the centralized control and also the real time updates.Here,the role based access is being implemented which is used to differentiate the functionalities for the students and the admins. Smart Seat Allocation logic which dynamically allows students to reserve seats online and drivers as well as students ability to notify admins during delays or accidents ,thereby improving safety and communication. The application was developed using web technologies which integrates a responsive frontend with a secure backend and relational database.Testing here,ensures functionality, usability and accuracy across modules results in a robust and efficient scheduling platform.

b) Flow Chart :

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 feedback.
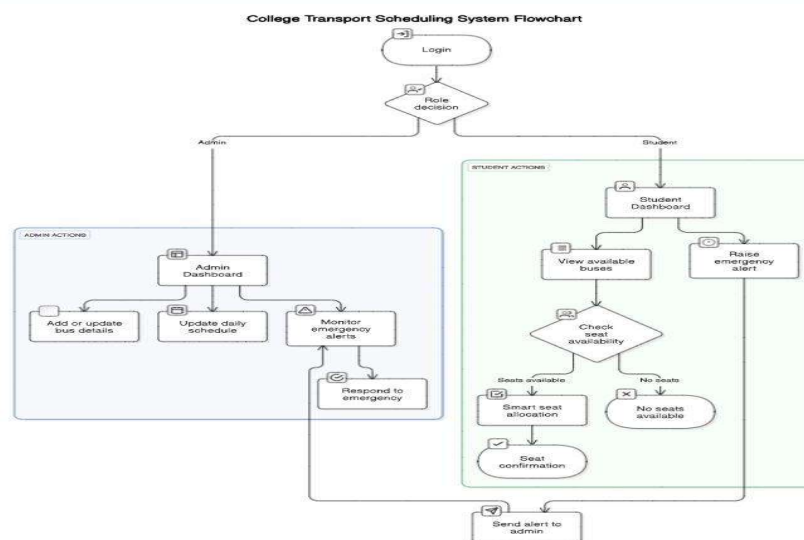

Figure 1 Flow Chart of College Transport Workflow

Figure 1 The College Transport System demonstrates the roles along with the procedures which apply to Admin personnel and Student account holders. Users automatically enter their designated dashboards after completing login authentication. Through their dashboard Admin users can access features for handling bus information and

timetables and deal with emergency notifications. Students can see available buses on the system using Smart Seat Allocation to check free seats before making seat reservations. The system will provide the student with a notification whenever all seats are occupied. Students have access to an Emergency Alert System that enables them to file reports about travel issues which the admin supports accurately. Through this approach both transportation execution and student protection are efficiently maintained.

c) System Overview Architecture and Workflow :

College transport scheduling app has a three tier architecture which ensures modularity,security and scalability.The system has been designed for both administrator and the students with separate functionalities and access.The architecture comprises Presentation layer,application layer and the data layer.

A. PRESENTATION LAYER:
This layer serves as the front end which facilitates interaction between users and the system.It is been built using web technologies and thereby providing two distinct portals:

ADMIN INTERFACE:
This enables administrators to create ,read,update and delete(CRUD)operations on bus data, schedules and seat allocation records.Admins will have the authority to update the number of buses available for the day,modify the bus routes accordingly and its timings also which thereby manages system-wide alerts.

STUDENT INTERFACE:
This interface allows students to view the updated bus schedules,to check for seat availability to book the seats priorly.Additionally,the students can access the trigger emergency alert buttons which enables students to send immediate notification to the admin .This helps in miscommunication for attendance and if any accidents or other problems can be informed priorly to the admin which avoids miscommunication.Thereby,experiencing responsive design and user friendly navigation across various devices.

B.APPLICATION LAYER
This layer implements the core functionality and its respective business logic of the system. It's role is to process the user requests,enforces role based access control and therefore manages communication between the front end and the database.
 Key Functionalities include:
        - Authentication as well as Authorization based on the respective user roles(admin/student).
        -Smart Seat Allocation for students based on current availability.
        -Emergency Alert System which allows the students or the drivers to send the notifications to admins whenever there are any issues.
        -Real-time data synchronization across interfaces.

C. DATA LAYER
This layer is responsible for storage and retrieval of the system data.A relational database is employed to store and manage:

USER CREDENTIALS AND PROFILES:
-Bus details(IDs,routes,seat count and availability status)
-Daily transport schedules
-Reserved seat logs
-Emergency Alert Records

Therefore,the database schema is normalised and maintains referential integrity through the respective foreign key constraints. It is designed in such a way for querying and scalability for future enhancements such as GPS tracking.

D.COMMUNICATION FLOW

Client requests are handled by the application layer,which thereby processes the input, performs validations and also interacts with the database.Therefore,results are then returned to the user through the presentation layer and therefore successfully resulting in a seamless and secure user experience.
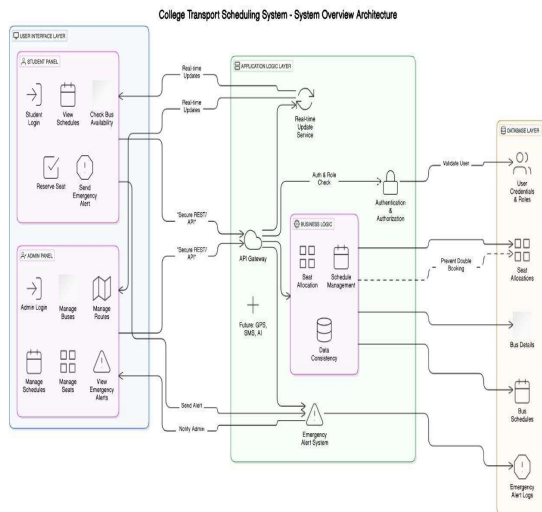
Figure 2 Architecture diagram

Figure 2 This is the architecture diagram of the college transportation system. A Separate student and admin panel is created.Student login can view the schedule,can check the availability of bus,reserve the seat and can send emergency alerts to admin.Admin can manage the buses,routes,schedules,seats and can view alerts from students.All the working progress is runned real time update service and API gateway.

d) Class diagram:

The class diagram given here is an object-oriented structure of the college transport scheduling app.It represents the relationships between many components and its responsibilities.The design therefore produces encapsulation, inheritance and principles to enhance maintainability and scalability.The components and its functions are explained below:

A. USER CLASS:

This class considered as the super class for all the users in the system.It contains attributes such as user id,name,role,password and respective contact number and details.It is then extended to 2 sub classes:

ADMIN:

It inherits from users and produces elevated privileges.They are also authorised to manage number of buses available,its schedule,updation of number of seats in each bus for updated information.

STUDENT:

It is been inherited from user and possesses elevated privileges.Here,student has the ability to view the available buses,reserved seats,and has important feature to use the emergency alert button whenever bus meets with some problems

B. BUS CLASS
It models the bus entities within the system.It also contains attributes such as bus id,route timing,status and the seat count.Each bus is associated with one or more schedule entries and respective emergency alerts.

C. SCHEDULE CLASS
It defines the scheduling of available buses.It includes attributes such as schedule id,busid,date and assigned seats.It helps in the connection between Bus and Seat allocation classes,which enables real time availability checks.

D. SEAT ALLOCATION
It handles a smart seat allocation system.It helps the students to reserve seats priorly in the bus according to the available seats schedule thereby helping in fair seat distribution.

E. EMERGENCY ALERT
This class manages the real time emergency signals.Whenever a student presses the alert button the notification is sent immediately to the admin of the college to avoid miscommunication.Attributes include alert id,sender id,sender role(driver/student),resolved status.

F. RELATIONSHIPS
User is associated with seat allocation with the respective student id
User related to emergency alert through their respective senderid
Bus is related to schedule through the respective bus id

G. DESIGN IMPORTANCE
This class diagram therefore ensures role based control,immediate emergency notifications,smart seat allocation priorly by the students.
Future enhancement: To provide GPS tracking or AI Based delay predictions.Whenever a student misses the bus,this GPS tracking helps to catch the nearby bus by students.
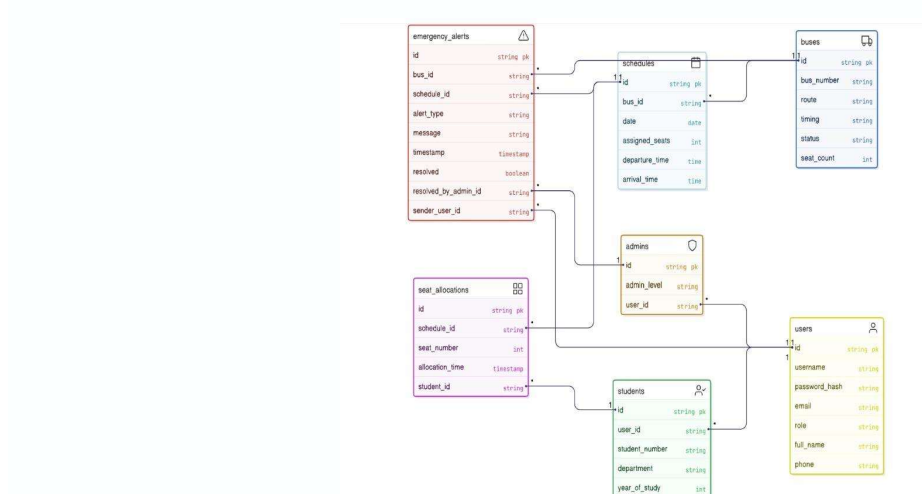
Figure 3 Class diagram

Figure 3 The College Transport Scheduling App uses the class diagram to depict its object-oriented design structure that demonstrates important components and their connectivity. Users connect to the User class before they advance to Admin or Student status. Each addition to the user base receives specific access privileges. The application includes four core entities Bus and Schedule and Seat Allocation and Emergency Alert to enable effective data management. The system enables instant seat booking as well as emergency alerts and administrative authorities. The classes exist in relationships for maintaining secure communication and functional operations. The system design allows growth through future features which integrate GPS tracking systems with AI-based delay forecasting capabilities.

IV. RESULTS AND EVALUATION :
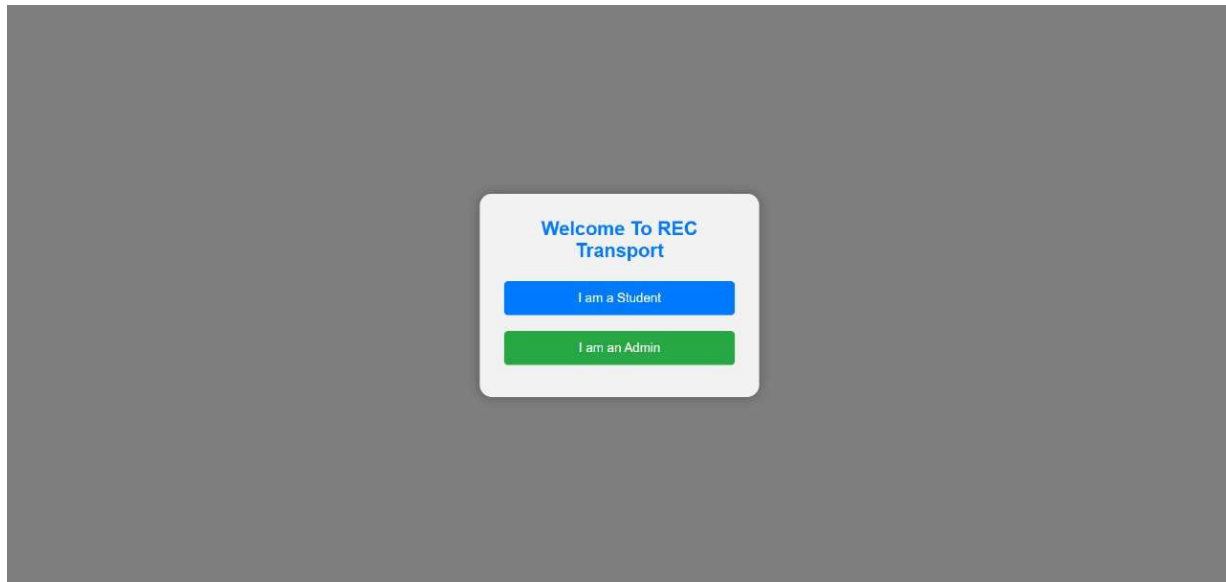
Figure 4 Main page.
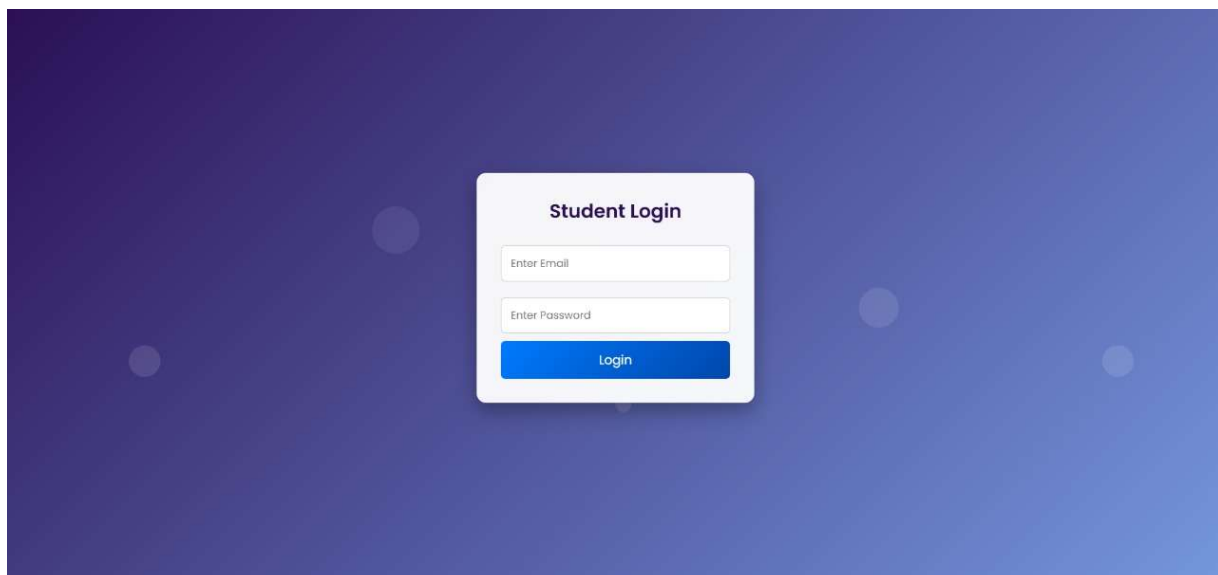
Figure 5 Student Login page.
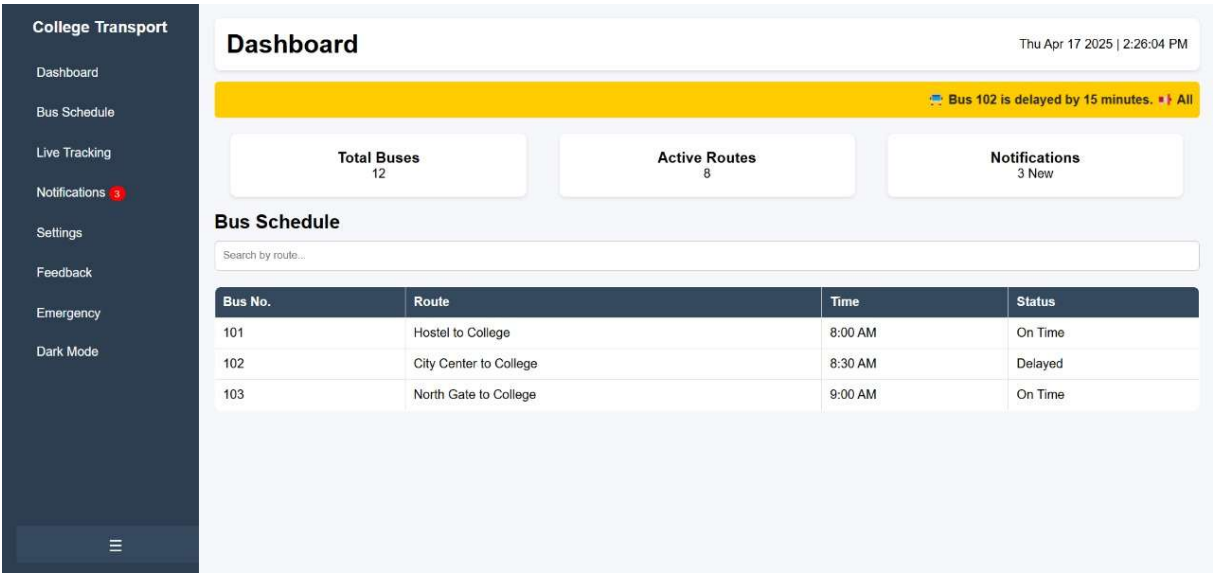
Figure 6 Dashboard of Student login.
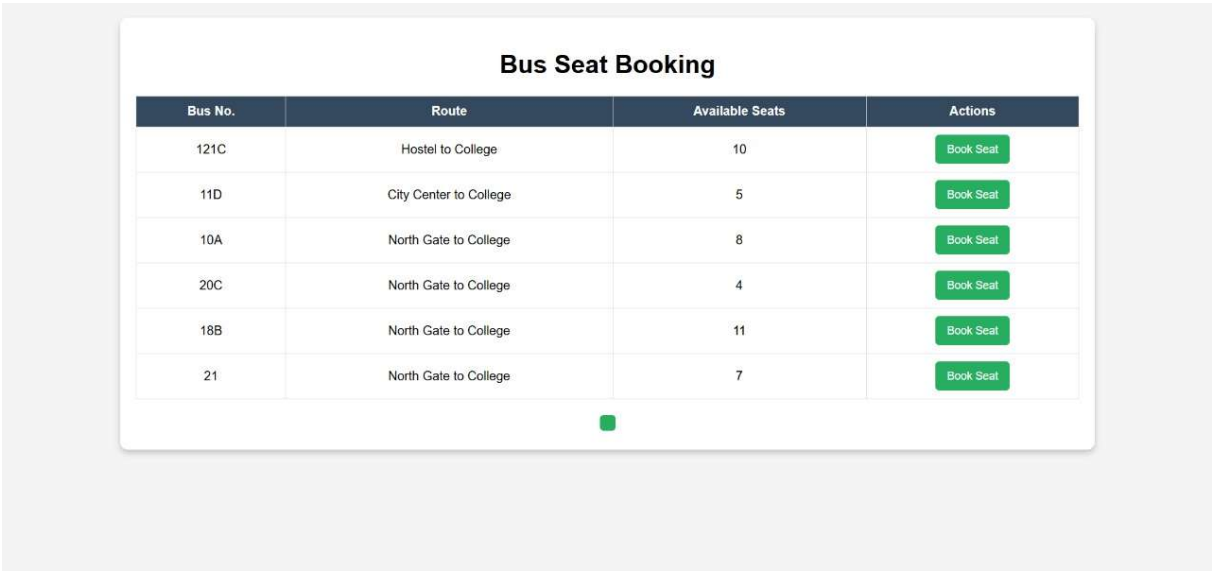
Figure 7 Prior seat allocation page.
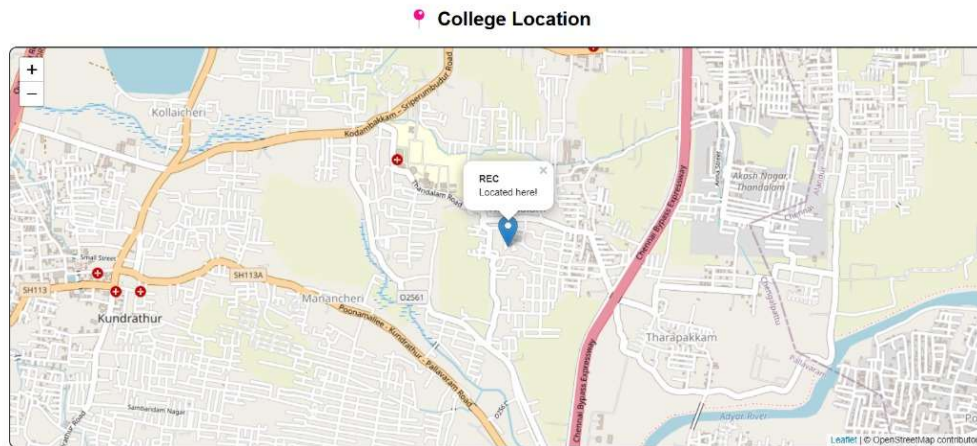
Figure 8 **GPS Live Tracking page**
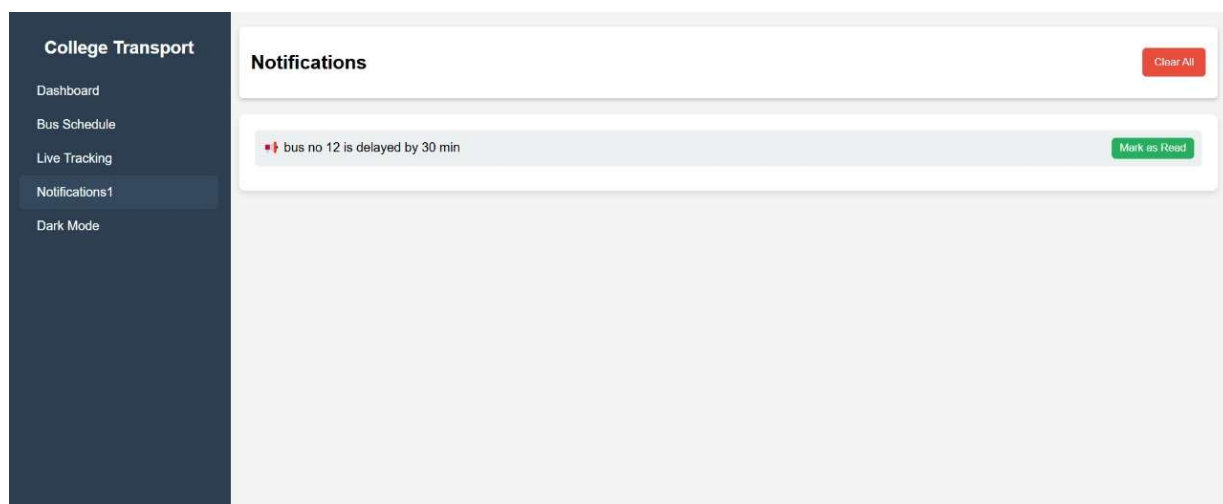
Figure 9 **Notification Page**

Figure 10 Feedback panel.

Figure 11 Emergency Alert System.

Figure 12 Admin panel.

Figure 13 Notification Panel of Admin.

Figure 14 Feedback Summary Page

Figure 4 This is the main page of the College Transport System, Choosing which user needs to login whether student or admin .

Figure 5 This is the Student Login page. It has two checkboxes to enter a valid email address and password to access the student page of College Transport System.

Figure 6 This is the Dashboard of Student login,it has the view of features like Bus schedule, live tracking, notifications, settings, feedback, emergency, switching of dark mode from light(default) mode,date and time and with a rough static schedule of the bus list.

Figure 7 This is a seat booking system to book a seat specifically on any special events in college.Has various buses in the list.According to the availability of seats, students can book their seat.

Figure 8 This is a GPS Live Tracking page where the live location of Bus is seen by students.

Figure 9 This is the Notification page where students get notified regarding the change in the bus timings.

Figure 10 It is a feedback panel of student login where students have to enter the name, bus number, issue type and if choice additional comments can be typed.

Figure 11 The Emergency Alert system page accessible by drivers as well as students. They use this feature incase of any emergency such as accidents or identification of bus delay reaching to college.

Figure 12 This is the admin panel where administrators are allowed to alter the bus schedules to notify students.

Figure 13 This is Notification of admin. It has a checkbox to send notifications to students about bus delays and any kind of text message can be sent.

Figure 14 The feedback gets summarized by itself and provides a crisp short form of content to the admin.

The College Transport Scheduling App was tested by the R&A department and College Management to check the utilities and how feasible it is. The seat allocation is working as expected that each person can select one seat per person, which prevents fake or duplicate seat booking. Admin and Student worked as per the norms we expected, with the admin being able to send alerts and notifications like bus delays, route cancellations, and route changes at a particular place. On the student side, the notification is received on time without any noticeable delay.

The Emergency Alert Feature(EAF) is useful to students to quickly report issues they face while **travelling**, for example bus breakdown, an accident to their bus, or any medical emergency involving a driver or student, or faculty. These EAF alerts the admin panel to provide quick action and response to the query they received. The feedback and complaint system is functioning correctly so that each student can submit their own concerns and queries about the bus and the bus route they are on.

EVALUATION :

Our project, Transport Scheduling App, is focused on QOS(Quality Of Service), reliability and usability. Evaluation was conducted by testing our app on a small set of groups comprising students or faculty, and admins, with ten members of each group. The Seat booking and allocation were highly appreciated for its simplicity and fairness. The EAF is evaluated as a high priority, which has importance in the lives of students, faculty and drivers.

In comparison with traditional Systems like notifying in WhatsApp groups, displaying static data and estimated time value, this app has proven that it is more feasible and responsive towards the users they use .

Overall our Transport Scheduling App has convinced us to the expectations we expected and has shown well potential in real-world deployment in college for Bus Transport Management .

V. 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.

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