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Ride Sharing and Car Pool Management System

Prof. Shahjahan Shaikh[1], Khan Mohd. Farhan[2], Nadaf Mohd. Ayan[3], Khan Furaq[4], Ansari Ibraaheem[5]
Rizvi College of Engineering, Mumbai, India

***Abstract*— The Car Pool website is basically this online thing that helps people share rides if they are going the same way. It connects drivers with passengers to make trips cheaper and better for the environment. I think that is one of the main points, since using fewer cars means less gas wasted and cleaner air or something like that.Users have to sign up and log in first, which keeps everything secure. Then they can either offer a ride or look for one by putting in where they are starting from, where they are headed, and the date and time. Drivers fill out stuff like how many seats are open, what the price is per person, and maybe what kind of car it is.Passengers just request a spot or book it directly. The whole setup lets you add, change, delete rides or even update your profile, which is called CRUD I guess. It seems straightforward but useful.That part about reducing traffic and pollution stands out, because not everyone drives alone anymore. The system matches routes pretty well, handles logins safely, and manages data in real time all through an interface that is easy to use. Some people might not notice how it cuts down on congestion, but it does. This project shows that kind of thing without getting too complicated.**

***Keywords*— Carpooling, Cost Sharing, Eco-friendly Transportation, Ride Sharing, Traffic Reduction.**

I. Introduction

In recent years, the rapid growth of urban populations has led to a significant increase in the number of vehicles on the roads. This has created serious problems such as traffic congestion, higher fuel consumption, and increased environmental pollution. A large number of people still prefer to travel alone in their personal vehicles, which results in inefficient use of available transportation resources. Carpooling offers a practical solution to these issues by allowing multiple people to share a single vehicle when traveling in the same direction. This not only helps in reducing travel expenses but also decreases the number of vehicles on the road, which in turn reduces traffic and harmful emissions.The proposed Carpooling System is a web-based platform designed to connect drivers and passengers with similar travel routes. Users can register on the platform, log in securely, and access features such as posting rides, searching for rides, and booking available seats. Drivers can share ride details like pickup location, destination, date, time, number of seats, and cost per passenger, while passengers can choose rides based on their needs.

The main objective of this system is to provide a simple, efficient, and secure way to promote shared transportation. It focuses on reducing travel costs, improving vehicle usage, and contributing to a cleaner environment. The system is also designed in such a way that it can be expanded in the future with features like real-time tracking and online payment options.

II. Literature Survey

Carpooling and ride-sharing systems have been widely explored as solutions to modern transportation challenges. Many research studies and existing platforms show that shared mobility can effectively reduce traffic congestion and environmental impact. Earlier carpooling systems were mostly manual, where users had to coordinate rides without real-time updates. With technological advancements, newer systems now include features such as GPS tracking, real-time ride matching, and mobile applications, making them more efficient and user-friendly. Research highlights that the success of such systems depends largely on accurate ride matching and ease of use. Popular platforms like Uber Pool and BlaBla Car have shown how ride-sharing can be implemented successfully on a large scale by using advanced matching techniques based on location and timing. However, there are still some challenges. Issues such as lack of user trust, data security concerns, and limited scalability affect many existing systems. In some cases, poor matching systems can lead to delays and inconvenience for users.The proposed system aims to overcome these limitations by focusing on secure user authentication, efficient ride management, and a simple interface that improves the overall user experience.

III. System Methodology

The development of the Carpooling System follows a structured and step-by-step approach to ensure proper functionality and reliability. The process includes requirement analysis, system design, implementation, testing, and deployment. In the initial stage, system requirements are identified based on user needs. These include features like user registration, login, ride posting, ride searching, booking, and profile management. After defining the requirements, the system design is prepared.

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This includes designing the overall architecture, database structure, and user interface. The aim is to make the system modular, scalable, and easy to maintain. During implementation, both frontend and backend components are developed. The frontend handles user interaction, while the backend manages business logic and data processing. The system supports CRUD operations, allowing users to create, view, update, and delete ride information. Drivers can manage their ride listings, and passengers can search and book rides as needed.Testing is carried out to ensure that all features work correctly. Both unit testing and integration testing are performed to identify and fix errors. Once testing is complete, the system is deployed and can be further improved based on user feedback.

As shown in Fig. 1, the ER model of the MongoDB database illustrates the relationships between the main collections used in the system. It defines how entities such as users, rides, and bookings are connected using references (ObjectIds) to maintain usability.

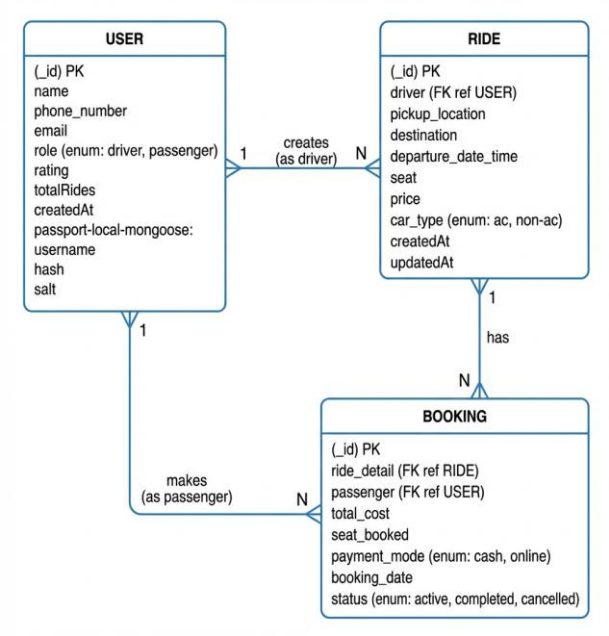

Fig. 1. ER model of Carpooling Project

The above ER diagram represents the logical database design of the system. It clearly shows how different modules of the application interact with each other through the database layer. This structured design ensures smooth operation of the carpooling platform by enabling efficient storage and retrieval of user and ride-related information.

IV. Hardware And Software Requirements

To develop and run the Carpooling System efficiently, certain hardware and software resources are required. These requirements are simple and easily available, making the system practical for everyday use.

A. Hardware Requirements

The system does not require high-end hardware. A basic computer setup is sufficient for development and usage.

- Processor: Intel Core i3 or higher
- RAM: Minimum 4 GB (8 GB recommended)
- Storage: 256 GB or more
- Internet Connection: Required for accessing the system
- Input/Output Devices: Keyboard, mouse, and monitor

These specifications are enough to ensure smooth performance of the application.

B. Software Requirements

The system is developed using commonly used software technologies that are reliable and easy to work with.

- Operating System: Windows, Linux, or macOS
- Frontend: HTML, CSS, Bootstrap, EJS
- Backend: Node.js and Express.js
- Database: MongoDB
- Programming Language: JavaScript
- Development Tool: Visual Studio Code
- Web Browser: Google Chrome, Microsoft Edge, or similar

These tools help in building a scalable, secure, and efficient web application.

V. System Design

The Carpooling System is designed using a client-server architecture that allows smooth communication between users and the system. It is divided into three main layers: presentation layer, application layer, and database layer. The presentation layer includes the user interface through which users interact with the system. It provides features such as registration, login, ride posting, searching, and booking. The interface is designed to be simple and user-friendly. The application layer handles all the main functionalities of the system. It processes user requests, manages ride matching, handles bookings, and ensures proper validation of data.

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The database layer stores all necessary information such as user details, ride data, and booking records. MongoDB is used because it is flexible and suitable for handling large amounts of data. The overall design ensures that the system is secure, efficient, and capable of handling multiple users without performance issues.

As shown in Fig. 2, the system architecture illustrates how the user interacts with the frontend, which communicates with the backend and database.

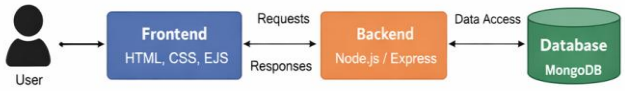

Fig. 2. System Architecture of Carpooling System

The system architecture diagram represents the overall working of the carpooling system. It shows the interaction between the user, frontend, backend, and database. The frontend handles user input, the backend processes requests, and the database stores and retrieves data efficiently.

VI. Implementation

The Carpooling System is implemented using modern web development technologies. The frontend is built using HTML, CSS, Bootstrap, and EJS to create a responsive and interactive interface. The backend is developed using Node.js and Express.js, which handle server-side operations and manage communication between different components of the system. Mongo DB is used as the database to store user and ride information. Mongoose is used to simplify database operations and manage data efficiently. User authentication is implemented using Passport.js, ensuring secure login and session management. Passwords are stored securely using encryption techniques. The system includes full CRUD functionality, allowing users to manage rides and profiles easily. This makes the application flexible and easy to use.

VII. Results And Discussion

The developed Carpooling System works effectively and meets its intended goals.

Users can easily register, log in, and access all features of the system without difficulty. Drivers are able to post rides, and passengers can search and book rides quickly. The system helps in reducing travel costs by allowing users to share expenses. It also contributes to reducing traffic congestion and environmental pollution by decreasing the number of vehicles on the road. The application performs efficiently and provides a smooth user experience. Overall, the results show that the system is practical and can be used in real-world situations to improve transportation.

VIII. Conclusion

The Carpooling System provides a simple and effective solution to common transportation problems. It promotes shared travel, reduces costs, and helps in minimizing traffic and pollution. The system is designed to be secure, easy to use, and scalable. It successfully combines different features such as ride posting, searching, booking, and user management into a single platform. In the future, the system can be enhanced by adding features like GPS tracking, mobile application support, and online payment options. In conclusion, the project demonstrates how technology can be used to improve transportation and support environmental sustainability.

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