VROOM – SEAMLESS AND ECO-FRIENDLY CARPOOLING FOR MODERN COMMUTERS

PHASE I REPORT

Submitted by

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BONAFIDE CERTIFICATE

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ABSTRACT

Carpooling (also known as car sharing, ride sharing and lift sharing), is the sharing of car journeys so that more than one person travels in a car. Carpooling reduces each person's travels costs such as fuel costs, tolls, and the stress of driving. Carpooling is one method that can be easily instituted and can help resolve a variety of problems that continue to plague urban areas, ranging from energy demands and traffic congestion to environmental pollution. Authorities often encourage carpooling, especially during high pollution periods and high fuel prices. We intent on making an ANDROID based application that will enable to let people know if vehicles are available for carpool in their desired path they can sign in for it. This will enable people using this application to share expense, not worry about hiring a cab and making new connections. People having this application on their cell phone with advance facilities can easily carpool with unacquainted people without worrying about security. It will also helpful for blind or lack of knowledge of using gadgets such a people they can operate this application using speech reorganization technique. It will show the accurate time requires to reach at particular location. It gives a better way for pooling a car with a very efficient environment that is easy to use. This is a Web-based collaboration, communications, and content delivery framework.

Keywords — carpool, traffic, route, travel, private, public, location.

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INTRODUCTION

1.1 PREFACE

This carpooling project, known as *Vroom*, leverages the power of the MERN Stack technology. MERN, an acronym for MongoDB, Express.js, React.js, and Node.js, offers a robust and efficient framework for developing web applications. With *Vroom*, our primary objective is to create a comprehensive carpooling app that enables convenient ride-sharing among commuters. By providing a user-friendly platform, we aim to simplify the process of registering as either a driver or a passenger. Users will be able to create profiles, specify their travel preferences, and connect with other individuals traveling on the same route. To enhance the overall user experience, *Vroom* incorporates various features. One such feature is a secure payment system that ensures smooth and efficient transactions between users. This eliminates the need for cash exchanges and streamlines the financial aspect of the carpooling experience. Furthermore, *Vroom* prioritizes user safety by implementing a rating system and user verification mechanisms. The rating system allows users to provide feedback on their experience with drivers and passengers, promoting accountability and trust within the community. User verification adds an extra layer of security by confirming the identities of individuals participating in the carpooling system. By promoting carpooling, *Vroom* aims to address common commuting challenges while contributing to a more sustainable future. By reducing the number of private vehicles on the road, we can mitigate traffic congestion, decrease carbon emissions, and promote environmentally friendly transportation alternatives. Overall, *Vroom* represents a comprehensive solution that combines technology, convenience, and environmental consciousness to improve the commuting experience for users and contribute to a greener world.

1.2 PROBLEM STATEMENT

The problem of traffic congestion and its associated challenges, such as increased travel time, fuel consumption, and environmental pollution, has become a critical issue in many urban areas. Private vehicles, often carrying only one or a few passengers, contribute significantly to the problem. Carpooling, the practice of sharing rides with others who are traveling in the same direction, has emerged as a potential solution to address these challenges and promote sustainable transportation.

1.3 AIM AND OBJECTIVE

1.3.1 AIM:

The aim of the carpooling System project is to develop a user-friendly, efficient, and secure platform for ride-sharing that promotes sustainable and eco-friendly transportation, reduces traffic congestion, and enhances the overall commuting experience for users.

1.3.2 OBJECTIVES:

To develop a carpooling app that enables users to register as drivers or passengers and provides a user-friendly interface for creating and managing ride requests and offers. To incorporate features that ensure the safety and security of all users. To provide a scalable and robust platform that can handle a large user base and high volume of ride requests efficiently, while ensuring optimal server performance and data management. To continuously improve and innovate the app by gathering user feedback, analyzing performance metrics, and incorporating new features and technologies that enhance the carpooling experience for users. By achieving these objectives, the Carpooling System project aims to provide a sustainable and efficient transportation solution.

CHAPTER 2

LITERATURE REVIEW

[1] The study by **Rutuja Pharande et al. (2022)** introduces a decentralized peer-to-peer car-sharing system aimed at alleviating urban transportation issues by reducing traffic congestion. The system identifies two key stakeholders: drivers and riders, each with distinct functionalities supported through dedicated dashboards. While effective, the study does not address scalability and its broader applicability in diverse urban scenarios.

[2] **Alejandro Lugo et al. (2021)** explore traffic decongestion through carpooling using automated pairings. The research focuses primarily on backend design and modeling, leaving frontend development for future work. Despite its promising approach, the system's user experience and interface remain underexplored, potentially limiting adoption.

[3] The work by **Yueshen Xu et al. (2021)** presents a real-time, demand-aware ridesharing service designed to prioritize quality-of-service by matching users with vehicles on their route. It integrates route optimization to enhance efficiency, but the study lacks insights into its scalability in highly congested urban environments.

[4] **Kaushalya Thopate et al. (2022)** developed "VISHWACONNECT," a carpooling application tailored for campus students. The app, built using React Native, JavaScript, Firebase, and VS Code, provides an environmentally friendly, time-saving, and cost-effective travel solution. However, its functionality is restricted to specific geographical areas, limiting its broader applicability.

[5] The platform **mT-Share** proposed by **Zhidan Liu et al. (2022)** leverages geographical and travel direction data to efficiently match taxi requests with

available vehicles. The system optimizes taxi sequences and incorporates a unique payment model, benefiting both drivers and passengers. Nonetheless, it may face challenges with real-time adaptability in dynamic traffic conditions.

[6] **Kamaruddin et al. (2020)** proposed "UiTM Share Ride," a campus-specific ride-sharing application to address parking shortages, reduce costs, and lower fuel emissions. The solution effectively targets campus environments but lacks consideration for scalability to larger, off-campus populations.

[7] The framework **TMATCH** by **Xiufeng Xia et al. (2021)** examines distributed route matching over road networks using a random server selection algorithm and an innovative indexing method. While efficient in task management, the study does not evaluate the performance of the system in real-world, high-load scenarios.

[8] The study by **Mustafa Burak Amasyali and Ensar Gul (2017)** focuses on integrating VoIP into mobile ridesharing applications to enable secure communication between drivers and riders without exposing personal details. However, the paper does not address how the solution performs under varying network conditions.

[9] **Sasikumar and Jaganathan S (2017)** propose a dynamic carpooling system with social network-based filtering, enabling users to share rides with friends and relatives while restricting others. This approach fosters trust and encourages adoption in less developed areas, though its reliance on social networks may limit accessibility in regions with lower digital penetration.

[10] **Baza et al. (2019)** introduce B-Ride, a blockchain-based ridesharing service addressing privacy and trust issues prevalent in centralized systems. By removing third-party intermediaries, the solution enhances security and prevents single points of failure. However, it requires significant computational resources, potentially raising concerns about cost and scalability.

CHAPTER 3

PROPOSED SYSTEM

The *Vroom* carpooling system aims to create a seamless, efficient, and eco-friendly ride-sharing platform for urban commuters. Utilizing the MERN stack—MongoDB, Express.js, React.js, and Node.js—*Vroom* is designed to facilitate safe and convenient carpooling, reduce environmental impact, and ease traffic congestion. This chapter discusses the main components and features of the proposed system, focusing on enhancing user experience, security, and sustainability.

3.1 SYSTEM OVERVIEW

The *Vroom* platform provides users the ability to register as drivers or passengers, set up travel preferences, and connect with others along similar routes. The application emphasizes a user-friendly interface and integrates secure payment options, real-time tracking, and effective user verification measures to ensure safety and trustworthiness within the carpooling community.

3.2 SYSTEM ARCHITECTURE

The proposed system architecture follows a client-server model, where:

- Frontend: Built with React.js to deliver an interactive user interface. It supports smooth navigation and responsive features for both mobile and desktop users.
- Backend: Powered by Node.js and Express.js to handle API requests, manage user data, and perform authentication.
- Database: MongoDB is used for flexible and scalable data storage, facilitating efficient management of user profiles, ride details, and transaction records.

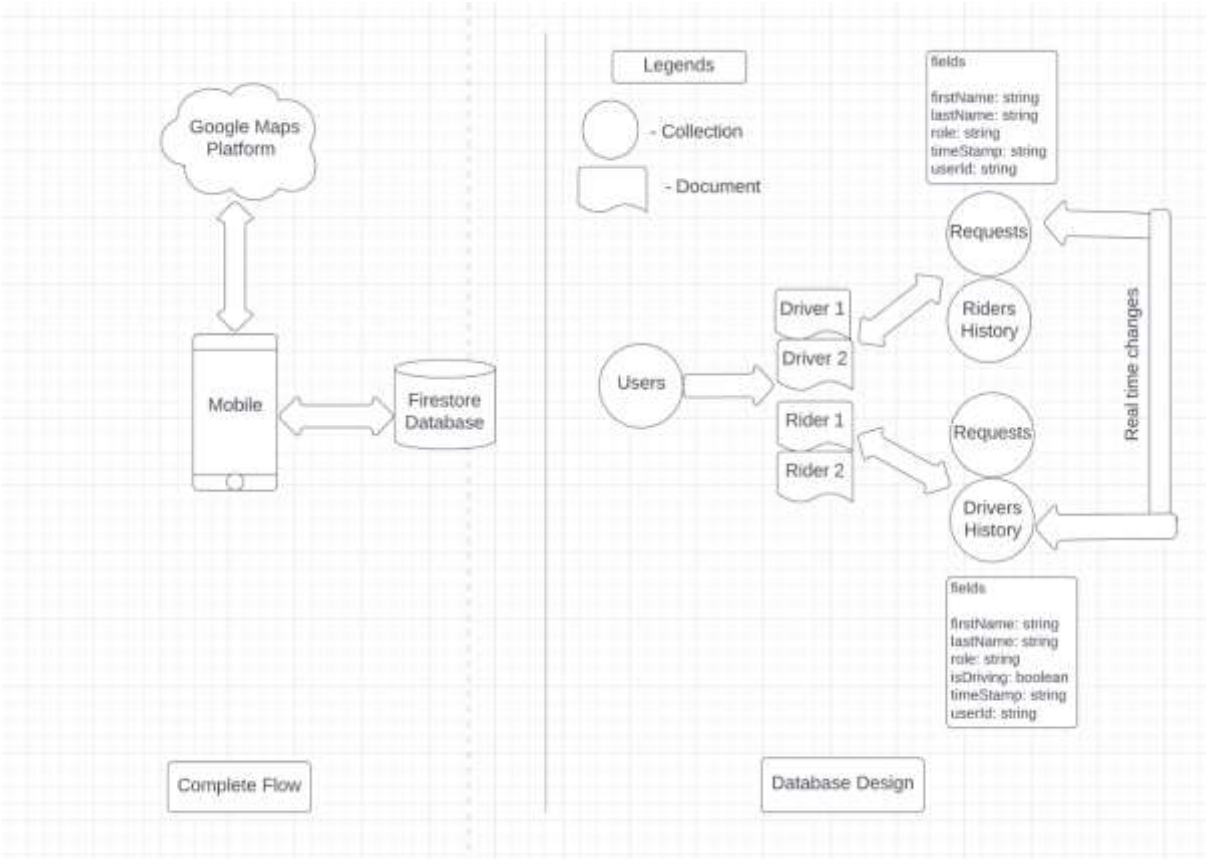

Fig. 3.1 System Architecture

Figure 5.2 consists of a client-server model where the mobile app interacts with a centralized server for user authentication, ride matching, and route optimization.

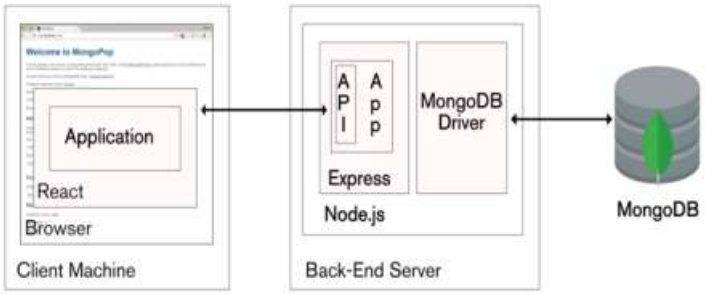

Fig. 3.2 Concept map of API'S

The figure 5.1 illustrates the client-server relationship.

CHAPTER 4
MODULE DESCRIPTION

This chapter provides an overview of the various modules within the *Vroom* carpooling application. Each module has a specific role to enhance the user experience and streamline the carpooling process. The modules work together to create a secure, efficient, and user-friendly platform.

4.1 MODULES

4.1.1 VIEW DETAILS

The View Details module allows users to view profiles of drivers and riders, along with ride details such as date, time, pickup and drop-off locations, and estimated cost. This feature helps users make informed decisions by reviewing important information before booking a ride.

4.1.2 BOOKING

The Booking module facilitates ride booking by connecting passengers with available drivers based on location and travel preferences. Once a user selects a suitable ride, the booking module confirms the reservation, providing details for both parties, including pickup location, time, and estimated arrival time.

4.1.3 POST FEEDBACK

The Post Feedback module allows users to share their experiences by providing feedback after a completed ride. Users can rate the driver or passenger and leave comments on the ride quality. This feedback promotes accountability and helps maintain a high standard of service within the community.

4.1.4 VIEW FEEDBACK

The View Feedback module enables users to view ratings and reviews from previous passengers or drivers. By reviewing feedback, users can make informed choices, improving the platform's trustworthiness and helping to establish a safe and reliable environment.

4.1.5 MAKE PAYMENT

The Make Payment module provides a secure way for passengers to complete payments. This module integrates with an escrow wallet system, which holds funds until the ride is completed. Upon confirmation from both the driver and the passenger, the funds are released to the driver. This feature ensures secure transactions and prevents any payment disputes.

4.1.6 SECURITY

The Security module is responsible for the overall security of the *Vroom* platform. It includes user verification, data encryption, and secure login procedures. This module helps to protect user information, prevent unauthorized access, and ensure that only verified individuals can use the carpooling services.

4.1.7 POST DETAILS

The Post Details module allows drivers to post details of upcoming rides, including date, time, pickup and drop-off locations, available seats, and fare. This information is visible to potential passengers, allowing them to find rides that match their travel preferences easily.

CHAPTER 5

IMPLEMENTATION

The implementation of *Vroom* involves a series of well-defined steps that streamline the process of building a fully functional, efficient, and user-friendly carpooling application. This chapter outlines the step-by-step strategy, hardware, and software platforms used, as well as the key technologies employed.

5.1 IMPLEMENTATION STRATEGY

The following steps outline the approach taken to develop *Vroom*, from initial design to deployment:

5.1.1 DESIGN THE APPLICATION

Begin by creating a wireframe or prototype to visualize the application's layout and functionality. This helps in planning the user interface and defining how various components will interact.

5.1.2 SET UP THE DEVELOPMENT ENVIRONMENT

Install essential software and tools, such as Node.js for backend development, MongoDB for the database, and a code editor (like VS Code) for coding. Ensure all dependencies are up-to-date.

5.1.3 BACKEND DEVELOPMENT WITH NODE.JS AND EXPRESS

Develop the backend using Node.js and Express. Define the necessary routes and endpoints to handle operations like user authentication, data storage, and retrieval. Set up middleware to manage requests and responses effectively.

5.1.4 USER AUTHENTICATION

Implement a secure user authentication system to ensure only registered users can access specific features. This step is critical for maintaining data security and controlling user access.

5.1.5 DATABASE SETUP WITH MONGODB

Create a MongoDB database to store information like user profiles, ride details, booking history, and feedback. Design collections to manage and organize data efficiently, ensuring quick retrieval and scalability.

5.1.6 FRONTEND DEVELOPMENT WITH REACT

Using React, build a responsive and intuitive frontend. React components enable a modular design, enhancing the user interface and providing a seamless connection with backend APIs.

5.1.7 IMPLEMENT CRUD OPERATIONS

Enable Create, Read, Update, and Delete (CRUD) functionality for essential user data and rides. This allows users to manage their profiles, view ride details, modify bookings, and delete records as needed.

5.1.8 INTEGRATION OF THIRD-PARTY APIS

Integrate third-party APIs, such as Mapbox for location mapping and navigation, and a payment API to support secure in-app transactions through an escrow wallet system. The escrow wallet holds funds securely until both parties confirm the ride, adding a layer of trust.

5.1.9 DEPLOYMENT

After successful testing, deploy *Vroom* to a hosting platform, making it accessible to users. This final step involves configuring servers, setting up security protocols, and ensuring the system remains scalable for future growth.

CHAPTER 6

OUTPUT

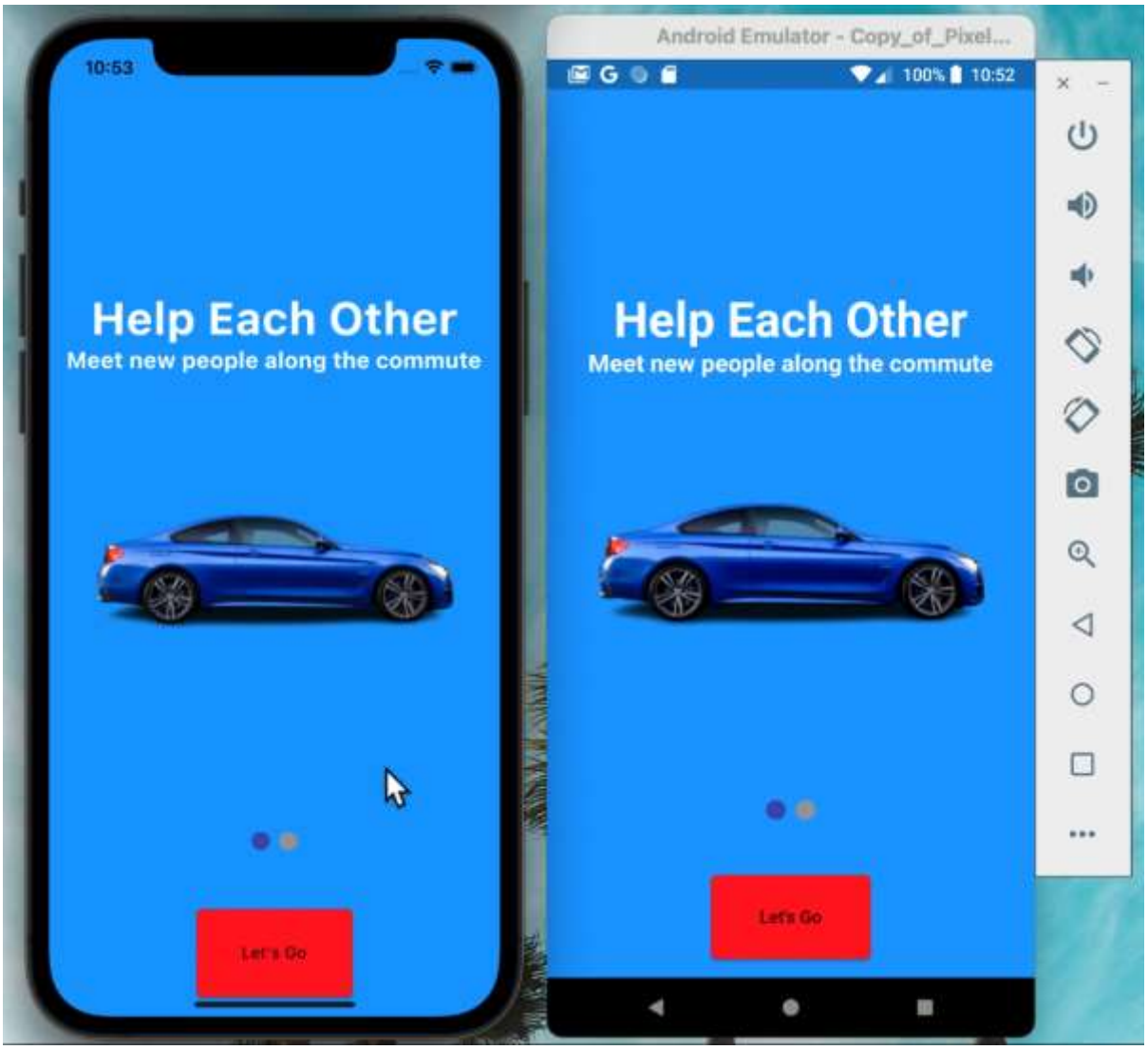

Fig 6.1 Login Welcome Page

This is the welcome page of the application that greets users and sets the tone for the carpooling experience. It features a user-friendly design with a "Let's Go" button to proceed further.

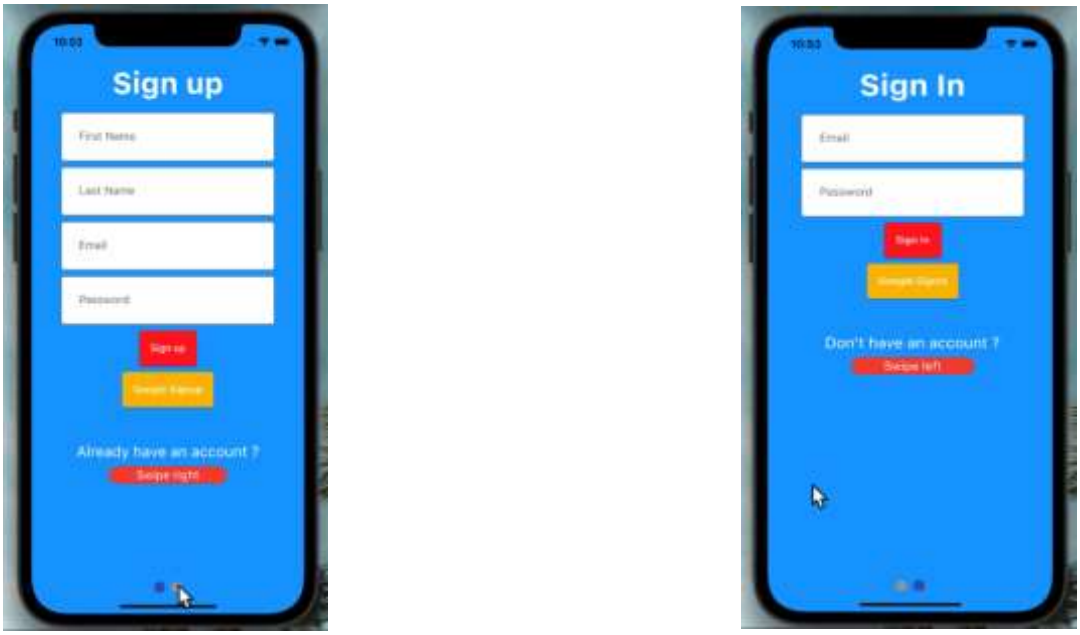

Fig 6.2 Sign In and Sign Up page

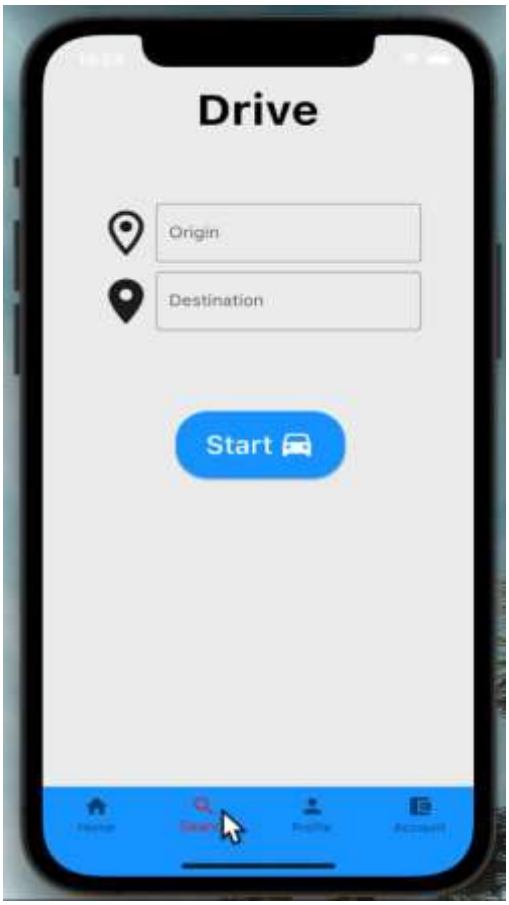

Fig 6.3 Drive Search Page

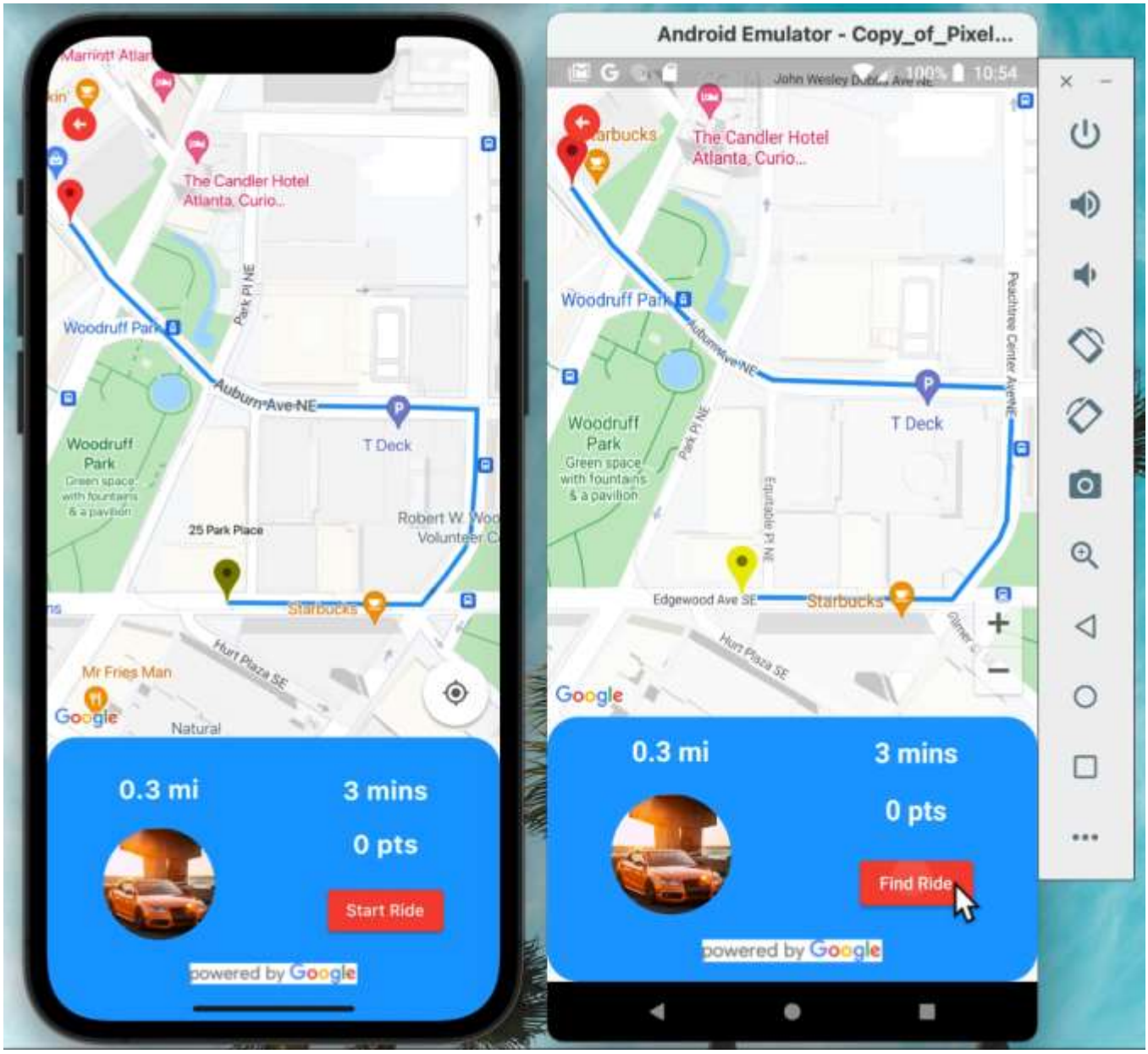

Figure 6.4 - Route Selection

This screen displays a map with the selected route from the origin to the destination. Below the map, details like distance, estimated time, and the "Start Ride" option are available, allowing the user to proceed.

Figure 6.5 - Ride Confirmation

Once a ride is selected, the screen shows the driver's name, route details, and an option to accept or reject the ride. On the Android emulator view, it shows a loading state where the system is awaiting driver confirmation.

CHAPTER 7
CONCLUSION

In conclusion, the Carpooling System (Vroom) developed using the MERN stack technology aims to revolutionize the commuting experience by providing a user-friendly platform for ride-sharing and carpooling. By leveraging MongoDB, Express.js, React.js, and Node.js, Vroom offers a robust and efficient solution for connecting drivers and passengers traveling on the same routes. With Vroom, users can easily register as drivers or passengers, create profiles, and search for compatible rides. The system facilitates communication and coordination between users, ensuring a smooth pickup and drop-off process. A secure payment system ensures hassle-free transactions, eliminating the need for cash exchanges. To prioritize user safety, Vroom implements a rating system and user verification mechanisms, fostering trust and accountability within the community. Users can provide feedback on their experiences, enhancing transparency and improving the overall carpooling ecosystem. By promoting carpooling, Vroom contributes to an eco-friendly and cost-effective solution for commuting problems. By reducing the number of private vehicles on the road, Vroom aims to alleviate traffic congestion, lower carbon emissions, and promote a greener future. Overall, the Carpooling System (Vroom) developed using the MERN stack combines convenience, safety, and sustainability. It offers a comprehensive solution to address commuting challenges while improving the overall commuting experience for users.

CHAPTER 8
FUTURE WORK

The carpooling system made with MERN stack technology has a lot of potential for future development and improvement. Here are some potential future scopes: Integration with public transportation: The carpooling system can be integrated with public transportation systems to create a seamless and efficient transportation network. This will allow users to easily plan and book rides that combine both public transportation and carpooling. Real-time tracking and notifications: Real-time tracking and notifications can be added to the carpooling system to provide users with accurate information about the status of their ride. This will include information such as the location of the driver, estimated time of arrival, and any updates about delays or changes in the ride schedule. Intelligent matching algorithms: The carpooling system can use intelligent matching algorithms to match riders and drivers based on their location, destination, and preferences. This will improve the efficiency of the system and make it easier for users to find compatible rides. Integration with smart city technology: The carpooling system can be integrated with smart city technology to create a more sustainable and efficient transportation system. This can include features such as dynamic pricing based on traffic congestion, rewards for using eco-friendly vehicles, and incentives for carpooling during peak hours. Expansion to new markets: The carpooling system can be expanded to new markets, both domestically and internationally. This will allow the system to reach more users and provide a more comprehensive transportation solution for different regions and cultures.

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