CHAPTER 1

INTRODUCTION

1.1 Scope of Work

The rise of urbanization has exacerbated traffic congestion and environmental concerns, necessitating innovative solutions in the transportation sector. This work focuses on developing an advanced ride-sharing and carpooling application designed to optimize urban mobility. By connecting passengers and drivers with similar travel routes and schedules, this application aims to enhance vehicle occupancy, reduce carbon emissions, and provide a cost-effective transportation alternative.

1.2 Importance of the Study

The importance of this study lies in addressing the growing challenges associated with urban transportation. Ride-sharing services provided by Transportation Network Companies (TNCs) such as Uber and Lyft have gained widespread adoption due to their convenience and affordability. However, the low carpooling rates and increased reliance on single-occupancy vehicles have contributed significantly to traffic congestion, environmental degradation, and elevated carbon emissions.

By promoting carpooling within ride-sharing systems, this research offers an effective solution to mitigate the negative externalities associated with urban commuting. The proposed application integrates features such as real-time driver tracking, GPS-powered matching, and a user-friendly interface to enhance the overall user experience while maintaining a commitment to sustainability.

1.3 Relation to Previous Work

Previous studies have examined the implications of urban transportation systems, focusing on the efficiency of ride-sharing services and their impact on traffic congestion. Existing literature has identified the limitations of current ride-sharing platforms, which often operate as mobile taxis without effectively promoting carpooling. The low utilization of carpooling services is

highlighted the potential of connected autonomous vehicles (CAVs) to enhance carpooling services by reducing operational costs and increasing safety. However, the integration of CAVs into existing TNC frameworks faces challenges, including security, privacy, and route management issues

1.4 Present Developments

The proposed ride-sharing platform incorporates several innovative features to enhance user experience and efficiency. It uses real-time **GPS** data for dynamic ride matching, minimizing waiting times for passengers. The Journey Mates feature allows users to select preferred companions based on travel schedules and compatibility, fostering **trust** and **comfort**. A cost-sharing mechanism ensures transparency by automatically dividing ride costs, while **OTP**-based authentication enhances security. **Flexible** scheduling options and support for non-work rides increase user **convenience**. The platform also integrates a rating system to maintain service quality and a route optimization algorithm to minimize detours. Additionally, users can track the environmental impact of their rides, promoting sustainability.

CHAPTER 2

LITERATURE SURVEY

A literature survey or a literature review in a project report is that section which shows the various analyses and research made in the field of your interest and results already published, taking into account the various parameters of the project and the extent of the project.

2.1 Introduction

Urban transportation systems worldwide face increasing challenges, including traffic congestion, air pollution, rising fuel costs, and limited infrastructure capacity. With the rapid growth of cities, these challenges are becoming more acute, leading to longer commute times and reduced quality of life for urban residents. In response to these issues, there has been a growing interest in alternative transportation solutions that can alleviate the burden on existing infrastructure while promoting sustainability and cost-effectiveness. One such solution is ride-sharing and carpooling, which not only helps reduce the number of vehicles on the road but also lowers carbon emissions and travel costs for commuters.

This project proposes a comprehensive ride-sharing and carpooling platform aimed at addressing the challenges faced by urban commuters. The platform leverages advanced technologies such as GPS-based matching, real-time tracking, and OTP-based authentication to ensure secure and efficient ride-sharing experiences. By connecting passengers with drivers who are traveling along similar routes, the platform helps reduce traffic congestion while offering users a convenient, cost-effective, and eco-friendly transportation alternative.

A key feature of the platform is the *Journey Mates* system, which allows users to select preferred travel companions based on personal preferences such as schedules, routes, and compatibility. This fosters trust and comfort among users, encouraging more frequent use of the service. In addition, the platform provides a flexible scheduling system that accommodates both regular commuters and users seeking rides for non-work-related activities, such as shopping or social events.

To further enhance the user experience, the platform includes a built-in cost-sharing mechanism that automatically calculates and divides the ride cost among passengers, ensuring fairness and transparency. The platform also incorporates a route optimization algorithm,

minimizing detours and maximizing the number of passengers per trip, which improves efficiency for both drivers and passengers.

Safety is a top priority, with features like OTP-based ride verification, real-time tracking, and user profile ratings. These security measures help build trust between drivers and passengers, fostering a positive user experience. Furthermore, the platform tracks the environmental impact of each shared ride, providing users with information about their carbon footprint reduction, thereby promoting eco-conscious behavior.

This ride-sharing solution not only addresses transportation inefficiencies but also contributes to a more sustainable urban environment by reducing the number of vehicles on the road, lowering emissions, and providing a socially engaging experience for users. Through its innovative features and user-friendly design, the platform aims to revolutionize the way people commute in urban areas, offering a practical, safe, and environmentally friendly alternative to traditional transportation methods.

2.2 SUMMARY OF PAPERS

2.2.1 Share Route: Mobile Application for PickUp &DropOff Services
Authors: Buddi Jahnavi, Sk Fathimabi, E Siva Chaitanya Swamy, N Trisali
Published Year:2024
Methodology
The proposed ride-sharing application operates through a well-defined process that caters to both passengers and drivers, ensuring convenience, safety, and efficiency. For passengers, the process begins by selecting their pickup and drop-off locations through the app. Once these locations are entered, the system displays a list of available drivers in the area, along with relevant details such as vehicle type and capacity. The passenger then selects a driver based on their preferences and enters the number of passengers for the ride. The system ensures that the chosen vehicle can accommodate the specified number of passengers before proceeding with the booking.

Once the ride details are confirmed, a one-time password (OTP) is generated for security purposes. This OTP is displayed to the passenger and must be communicated to the driver to authenticate the ride.

additional instructions, such as specifying the exact pickup point, ensuring seamless coordination between the driver and passenger.

For drivers, the process starts by registering their information, including personal details, vehicle capacity, and pricing. Once registered, the driver can log in to their account and activate the "active" status, signaling their availability for rides. When the driver is active, they will receive ride requests from passengers based on their current location and the capacity of their vehicle. The driver can then review and accept these requests. Once a ride is accepted, the driver receives the passenger's OTP, which they must enter to initiate the ride.

Throughout the ride, the passenger can track the driver's location using GPS, ensuring transparency and safety. This real-time tracking feature allows both parties to monitor progress and enhances the overall user experience. By integrating both driver and passenger processes into a cohesive system, the application ensures an efficient, secure, and user-friendly ride-sharing experience.

Limitations

One major drawback of this study is that it heavily relies on multi-agent simulation models, which may not capture the real-world complexities of human behavior in carpooling scenarios. Additionally, the need for extensive testing and validation using actual user data is highlighted, as the virtual simulation cannot fully predict transient effects or outcomes in actual deployments. This gap between simulation results and practical implementation remains a significant challenge

2.2.2 Mobile Application for Carpooling with Journey mate Feature

Authors: Parth Bhatnagar, Gurushankar H B, Gururaj H L, Soundarya B C, Shreyas J

Published Year:2024

Methodology

The proposed carpooling application is designed to address various issues observed in existing carpooling systems while offering new, user-centric features. Initially, passengers can log in or register by providing their travel details and preferences. After login, users can specify their

users to select travel companions based on shared preferences, adding a social aspect to the experience. Moreover, passengers can opt for environment-friendly options such as Electric Vehicles (EVs) or Autonomous Vehicles (AVs). The inclusion of an OTP-based authentication ensures secure rides, while real-time ride matching and GPS tracking streamline the process, providing passengers with constant updates on their driver's location.

For drivers, the application begins with a registration process where they input their personal information, vehicle type, and pricing details. Once logged in, drivers receive ride requests based on their location and vehicle capacity. The application promotes flexibility by allowing dynamic carpooling, where users can share a ride even during an ongoing journey. Additionally, the app includes features like cost-sharing based on distance traveled, ensuring transparency and fairness for all users. User preferences are also considered, enabling the selection of travel partners with compatible habits, which improves the overall experience. This methodology emphasizes user security, cost-effectiveness, and an environmentally sustainable approach, making carpooling more appealing and accessible for urban and remote areas alike.

Limitations

The proposed carpooling application faces several challenges that could hinder its effectiveness. User preferences for selecting Journey Mates may limit ride availability in less populated areas. Security concerns persist despite OTP-based authentication, as trust between passengers and drivers remains essential. Additionally, the platform's urban focus may not cater well to rural regions with low.

2.2.3 Mobile Application for Carpooling with Journey mate Feature

Authors: Wang Peng and Lili Du

Published Year:2022

Methodology

This study will build a mathematical program to describe the CSP problem rigorously and then develop SCM approach to find a local optimal solution efficiently by taking advantage of the unique features of the problem structure.

Limitations

The proposed SCM approach to the carpooling service problem, while innovative, has several drawbacks. First, the reliance on community detection for rider partitioning may lead to suboptimal groupings, compromising overall system performance. Additionally, the complexity of modeling user preferences and behavior could complicate implementation, potentially deterring user adoption. The assumption that riders will always accept carpooling solutions if time windows are met may not hold true in real-world scenarios, where flexibility and personal choice are important. Finally, integrating traffic flow uncertainty and rider demand prediction adds layers of complexity that may hinder the effectiveness of the solution.

2.2.4 Ridesharing and Crowdsourcing for Smart Cities: Technologies, Paradigms and Use Cases

Authors: Kah Phooi Seng,Li-Minn Ang,Ericmoore Nghara Mike Eno Peter

Published Year:2023

Methodology

The methodology for this project focuses on developing a comprehensive ridesharing system that utilizes real-time data processing, crowdsourcing, and machine learning techniques. The system is designed to optimize urban transportation by efficiently matching passengers and drivers in dynamic environments, thereby reducing traffic congestion and emissions. In a typical ridesharing scenario, the key entities involved are the driver, the passenger with a GPS-enabled smartphone, and the ridesharing platform. The platform operates by matching drivers and passengers using advanced algorithms based on real-time location, preferences, and availability. The data collection process integrates various sources such as GPS-enabled devices, traffic cameras, roadside sensors, and satellite data to capture dynamic travel patterns. By leveraging these diverse data points, the system performs real-time route optimization and ensures efficient resource utilization, thereby improving the overall user experience while promoting sustainable urban mobility.

Limitations

The agent-based model presented in the paper has several drawbacks. First, it is **computationally intensive**, scalability issues, making it difficult to apply the model

simplistic, failing to account for more complex human behaviors such as trust or safety concerns that often arise when sharing a ride with strangers. This limits the model's ability to capture the full complexity of real-world carpooling dynamics.

2.2.5 Mobile Application for Carpooling with Journey mate Feature

Authors: Anne Aguilera ,Eleonore Pigalle
Published Year:2021
Methodology

This study employs an agent-based simulation approach to model interactions within carpooling systems. The model comprises several core elements, including agent profiles**,** matching mechanisms**,** negotiation protocols**,** and feedback loops. Agents, or carpoolers, are given specific attributes like route preferences, driving behavior, and schedules. These agents interact with each other by negotiating to form carpool groups under predefined conditions, such as shared departure and arrival times. The model simulates how agents decide to join carpool groups and manage their travel routes based on individual schedules and preferences.

The simulation operates within a microscopic transportation model, replicating real-world traffic networks. Agents dynamically adjust their routes based on various environmental factors, such as traffic density and road conditions. To optimize their travel paths, agents use algorithms like *A search*, enabling real-time adjustments. Additionally, the model incorporates a broader Traffic Analysis Zone (TAZ) system, which allows for the evaluation of how individual travel decisions influence larger traffic patterns. This comprehensive approach helps assess the overall efficiency of carpooling and its impact on traffic flows across different regions(carpolling4).

Limitations

The proposed carpooling application faces several challenges that could hinder its effectiveness. User preferences for selecting Journey Mates may limit ride availability in less populated areas. Security concerns persist despite OTP-based authentication, as trust between passengers and drivers remains essential. Additionally, the platform's urban focus may not cater well to rural regions with low

CHAPTER 3

LIMITATIONS OF EXISTING SYSTEM

The limitations of current ridesharing models can be grouped into several key areas. First, many studies demonstrate a **limited exploration of complex ride-sharing models**, often focusing on simple scenarios and overlooking more sophisticated and dynamic systems. Additionally, there is **insufficient user trust and security mechanisms**, leaving users hesitant to fully adopt such platforms due to privacy and safety concerns. Moreover, the **overreliance on advanced technologies like Connected Autonomous Vehicles (CAVs)** introduces challenges related to infrastructure and availability, making the solutions inaccessible to many regions. Another issue is **limited scalability**, as many models struggle to accommodate growing user bases and demand spikes efficiently. Furthermore, most solutions emphasize **commute-based carpooling**, neglecting other potential use cases, and suffer from a **lack of long-term sustainability considerations**, often focusing on short-term gains over lasting impact. The **underdeveloped user experience and interface** are common drawbacks, as many systems lack user-friendly designs, making the adoption process cumbersome. In addition, the absence of **real-world case studies** reduces the practical validation of these systems, limiting insights into their real-world applicability. **Non-technical barriers**, such as social, regulatory, and legal challenges, are frequently overlooked. Lastly, the **limited focus on driver incentives** fails to encourage more drivers to participate, which is critical to maintaining an efficient and reliable ride-sharing service.

CHAPTER 4

PROBLEM STATEMENT

The rapid urbanization and rising vehicle density have worsened traffic congestion, carbon emissions, and inefficiencies in transportation. Existing ride-sharing services, such as UberPool, struggle with low adoption rates due to issues like travel delays, poor user matching, and security concerns. These systems often function as mobile taxis, adding to traffic and pollution instead of mitigating them.

This project seeks to develop an optimal ride-sharing application that tackles these challenges by providing a real-time **GPS**-powered matching system for passengers with similar routes and schedules. With secure **OTP**-based authentication, **fair cost-sharing**, and a journey mates feature to **foster trust**, the platform aims to enhance user experience and increase adoption. By targeting both work and non-work trips, the solution will reduce single-occupancy vehicles, lower emissions, and promote social connections among users.

CHAPTER 5

OBJECTIVES OF THE PROPOSED WORK WITH JUSTIFICATION

5.1 Optimizing Vehicle Utilization

Justification: By matching passengers with similar routes, the system reduces the number of empty seats in vehicles, thereby improving vehicle occupancy. This leads to more efficient use of existing transportation resources, reducing the number of vehicles needed on the road.

5.2 Reducing Traffic Congestion

Justification: Encouraging more people to share rides instead of driving alone decreases the total number of cars during peak hours. This alleviates traffic jams, shortens travel times, and enhances overall urban mobility, especially in congested city areas.

5.3 Lowering Carbon Footprint

Justification: Fewer cars on the road translate to reduced fuel consumption and lower CO_2 emissions. This makes ride-sharing an environmentally friendly option, contributing to cleaner air and a smaller carbon footprint.

5.4 Enhancing Passenger Safety

Justification: By implementing secure features such as OTP-based authentication and user verification, the system ensures that passengers and drivers feel safe, which builds trust in the platform and encourages more users to adopt the service.

5.5 Providing Cost Savings

Justification: Sharing rides helps split the travel costs (fuel, tolls, etc.) between multiple passengers, making the journey more affordable compared to solo driving or traditional taxi services. This cost efficiency is an appealing factor for budget-conscious users.

5.6 Increasing Adoption of Sustainable Mobility

Justification: By making ride-sharing accessible and efficient, the system encourages more people to adopt sustainable transportation options, reducing reliance on personal vehicles and promoting shared mobility.

5.7 Promoting Social Interaction

Justification: Features like the 'Journey Mates' functionality allow passengers to choose travel companions based on preferences, fostering a sense of community and trust while making rides more enjoyable.

5.8 Addressing Non-Work Ride Needs

Justification: The system is designed to cater not only to work commutes but also non-work-related rides like social outings or shopping trips. This expands the scope of carpooling, encouraging more frequent use across different purposes.

5.9 Providing Real-Time Flexibility

Justification: With dynamic ride-matching, the system allows last-minute ride bookings and offers flexibility in scheduling, making it a practical alternative to fixed-schedule public transport or ride-hailing services.

CHAPTER 6

PROPOSED SYSTEM

6.1. System Overview

The proposed system is a **ride-sharing platform** that connects drivers with available seats in their vehicles to passengers who have similar routes and schedules. The platform focuses on optimizing vehicle occupancy, reducing traffic congestion, and providing an eco-friendly and cost-effective alternative to solo driving. The system is accessible through a mobile application, offering real-time ride matching, GPS tracking, secure user authentication, and ride-sharing features like cost-sharing and user preferences.

6.2. Key Features

6.2.1 Real-Time Ride Matching

The system uses GPS data to dynamically match passengers with drivers who are traveling along similar routes. Matching is done in real time, ensuring efficiency and minimal waiting times for users.

6.2.2 Journey Mates Feature

Users can create profiles and choose their "Journey Mates" based on preferences such as travel schedule, routes, and personal compatibility. This enhances trust and comfort between passengers and drivers, encouraging more frequent use.

6.2.3 Cost Sharing

A built-in cost-sharing mechanism automatically calculates and divides the cost of the ride (fuel, tolls, etc.) among passengers, ensuring transparency and fairness.

6.2.4 OTP-Based Security and Authentication

For every ride, a one-time password (OTP) is generated for secure authentication between drivers and passengers. This ensures that only verified users can access the ride, enhancing safety and user confidence.

6.2.5 User Profiles and Rating System

The platform allows users to create detailed profiles and rate each other after every ride, building a reputation-based system that fosters trust and ensures accountability.

6.2.6 Flexible Scheduling

The app allows both drivers and passengers to schedule rides in advance or book rides on-demand. This flexibility ensures that users can plan their journeys or find last-minute rides efficiently.

6.2.7 Route Optimization

The system incorporates a route optimization algorithm that minimizes detours and travel time while maximizing the number of passengers per trip, ensuring efficient travel for both drivers and passengers.

6.2.9 Environmental Impact Tracking

Users can track the carbon footprint reduction from their shared rides, encouraging continued use and promoting environmental consciousness.

6.3. System Workflow

6.3.1 User Registration:

Users register as either a driver or passenger, entering their route preferences, journey timings, and personal preferences (for Journey Mates).

6.3.2 Ride Request

A passenger requests a ride for a specific route. The system automatically matches them with nearby drivers based on GPS data and similar routes.

6.3.3 Matching and Confirmation:

The system suggests drivers to the passenger. Once matched, the driver receives a notification and both parties confirm the ride. The OTP is generated for verification.

6.3.4 Ride Execution:

The driver picks up the passengers, guided by GPS. Passengers can track the driver's location in real time via the app.

6.3.5 Cost Sharing:

At the end of the journey, the app calculates the cost based on distance and splits it among passengers, processing the payment through the integrated payment gateway.
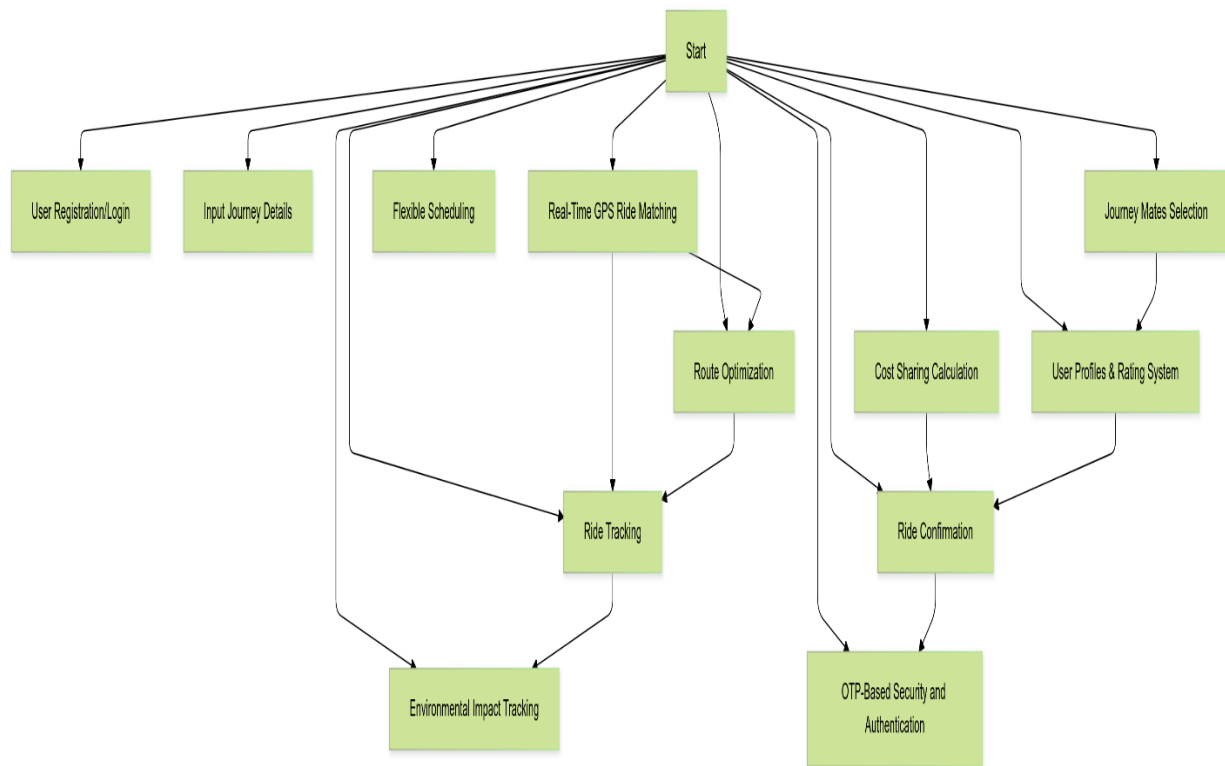
6.4 FLOWCHART OF THE PROPOSED SYSTEM

Fig No: 6.1 Flowchart representing workflow of proposed system

CHAPTER 7

HARDWARE AND SOFTWARE REQUIREMENTS

7.1 Hardware Requirements

The minimum hardware requirements of this project are as follows:

- Operating System - Intel i5/2.4GHz
- HardDisk - 500 GB
- RAM - 4/8 GB
- GPU - For process acceleration

7.2 Software Requirements

The minimum software requirements of this project are as follows:

- **Frontend Framework** – React Native

  Used for building a cross-platform mobile application with a smooth user interface for both drivers and passengers.

- **Backend Framework** – Node.js + Express.js

  Handles the server-side logic, ride-matching, user authentication, and API communication with the frontend.

- **Database** – MongoDB

  NoSQL database used to store user profiles, ride details, GPS coordinates, and payment transactions.

- **API Integration** – Google Maps API

  Enables real-time route tracking, nearby driver/passenger identification, and distance calculations for ride fare.

- **Authentication** – JSON Web Tokens (JWT)

  Provides secure user authentication and session management.

- **Payment Processing** – Stripe / PayPal SDK

  Used for secure, real-time payment transactions and ride cost sharing.

- **Real-Time Communication** – Socket.io (Optional)

  Facilitates live updates between users (drivers and passengers), such as location tracking and ride status.

- **Development Environment** – Visual Studio Code / IntelliJ IDEA

  The preferred IDE for writing and managing both frontend and backend code efficiently.

- **Version Control** – Git + GitHub

  Used for source code management, version tracking, and collaboration between team members.

- **Testing Tools** – Postman (for API testing), Jest (for unit testing)

  Postman is used to test API endpoints, while Jest ensures the proper functioning of individual components and overall integration.

- **Deployment Platform** – Heroku / AWS (for backend), Vercel (for frontend)

  Cloud hosting services for deploying the backend and frontend of the ride-sharing platform.

CHAPTER 8

SYSTEM ARCHITECTURE

The system architecture consists of several components that work together to provide a seamless ride-sharing experience. The architecture can be broken down into the following layers:

8.1 Client Layer (Frontend)

Mobile Application: Developed using **React Native**, this layer provides the user interface for both drivers and passengers. Users can register, request rides, view nearby drivers, and manage their profiles.

User Interfaces: Various screens include login, ride request, driver confirmation, journey mates feature, and rating systems.

8.2 Server Layer (Backend)

API Server: Built using **Node.js** and **Express.js**, it handles incoming requests from the mobile app and processes ride-matching logic, user authentication, and data retrieval.

Database Integration: Connects to **MongoDB** for storing and managing user data, ride details, GPS coordinates, and transaction histories.

8.3 Data Layer

MongoDB Database: A NoSQL database to store user profiles, ride requests, historical data, and ratings. This allows for flexible and scalable data management.

Payment Processing: Integrates with payment gateways (e.g., **Stripe** or **PayPal**) to handle ride payments securely.

8.4 External Services

Google Maps API: For real-time geolocation services, route optimization, and distance calculations.

Real-Time Communication: Optionally using **Socket.io** for instant updates and communication between users.

8.5 METHODOLOGY

The development methodology to be followed for the ride-sharing project consists of the following phases:

8.5.1 REQUIREMENTS GATHERING

Conduct discussions with stakeholders to identify and document the system requirements, including features, user interface, security needs, and performance metrics.

8.5.2 SYSTEM DESIGN

8.5.2.1 Architectural Design: Create a high-level architectural diagram illustrating the interactions between frontend, backend, and external services.

8.5.2.2 Database Schema Design: Design the database schema for MongoDB to ensure efficient data storage and retrieval.

8.5.3 IMPLEMENTATION

- **Frontend Development**: Build the mobile application using React Native, implementing user authentication, ride request forms, and the Journey Mates feature.
- **Backend Development**: Set up the Node.js server, create RESTful APIs for user management, ride matching, and payment processing.
- **Database Setup**: Establish the MongoDB database with the designed schema, and integrate it with the backend.

8.5.4 INTEGRATION

Integrate external services like Google Maps API for routing and geolocation.

Connect payment processing services to handle transactions securely.

8.5.5 TESTING

- **Unit Testing**: Test individual components of both the frontend and backend using frameworks like Jest for JavaScript.
- **API Testing**: Use Postman to verify that all API endpoints function correctly and return the expected results.
- **User Acceptance Testing (UAT)**: Conduct testing with real users to gather feedback on the application's functionality and usability.

8.5.6 DEPLOYMENT

Deploy the backend server on a cloud platform like Heroku or AWS and the frontend on Vercel.

Set up continuous integration/continuous deployment (CI/CD) pipelines for efficient updates and version control.

8.5.7 MONITORING AND MAINTENANCE

Implement monitoring tools to track system performance, user feedback, and potential issues post-deployment.

Regularly update the system based on user feedback and emerging needs.

8.5.8 DOCUMENTATION:

Document the system architecture, API endpoints, database schema, and user manuals to facilitate future development and maintenance.

CHAPTER 9

APPLICATIONS

Daily Commuting

The primary application of the ride-sharing platform is to facilitate daily commutes for individuals traveling to work or school, helping to reduce traffic congestion and costs.

Social Outings

Users can arrange shared rides for social events, such as concerts, parties, or family gatherings, making it easier for groups to travel together while sharing expenses.

Shopping Trips

Passengers can coordinate shared rides for trips to shopping centers or grocery stores, allowing them to save on transport costs and reduce the number of cars on the road.

School Rides

The application can be utilized for organizing carpools for students traveling to and from school, ensuring a safe and efficient transport option for families.

Event Transportation

Ride-sharing can be used for transportation to community events, festivals, or conferences, promoting group travel and minimizing parking issues.

Emergency Transport

In emergency situations (e.g., natural disasters), the platform can be adapted to help users find rides to evacuation centers or safe locations quickly.

Healthcare Transportation

Users can share rides for medical appointments, making it easier for individuals without personal vehicles to access healthcare services, especially in remote areas.

Tourist Travel

Tourists can use the platform to connect with local drivers for sightseeing tours or travel between popular attractions, enhancing their travel experience while reducing costs.

Corporate Ridesharing

Businesses can implement the platform to organize shared rides for employees attending conferences or client meetings, promoting sustainability and reducing corporate transport expenses.

Non-Work Ride Programs

The system can support community initiatives aimed at reducing vehicle usage by providing a platform for shared rides for non-work activities, such as sports practices or volunteer events.

REFERENCES

[1] Aguilera and E. Pigalle, "*The Future and Sustainability of Carpooling Practices. An Identification of Research Challenges,*" Sustainability, vol. 13, Art. no. 11824, Oct. 2021. DOI: 10.3390/su132111824.

[2] W. Peng and L. Du, "*Investigating Optimal Carpool Scheme by a Semi-Centralized Ride-Matching Approach," in* IEEE Transactions on Intelligent Transportation Systems, vol. 23, no.9, pp.14990-15004, Sept. 2022, doi: 10.1109/TITS.2021.3135648.

[3] K. P. Seng, L. -M. Ang, E. Ngharamike and E. Peter, "*Ridesharing and Crowdsourcing for Smart Cities: Technologies, Paradigms and Use Cases,*" in *IEEE Access*, vol. 11, pp. 18038-18081, 2023, doi: 10.1109/ACCESS.2023.3243264.

[4] P. Bhatnagar, G. H. L, G. H. B, S. B. C and S. J, "*Mobile Application for Carpooling with Journey mate Feature," 2024 16th International Conference on COMmunication Systems & NETworkS (COMSNETS)*, Bengaluru, India, 2024, pp. 1088-1093, doi: 10.1109/COMSNETS59351.2024.10427139.

[5] Jahnavi, S. Fathimabi, E. S. Chaitanya Swamy and N. Trisali, "*ShareRoute: Mobile Application for PickUp & DropOff Services," 2024 5th International Conference on Electronics and Sustainable Communication Systems (ICESC)*, Coimbatore, India, 2024, pp. 1878-1883, doi: 10.1109/ICESC60852.2024.10689919.