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Platform for Stop-based Carpooling

Krushna Jaybhaye[1], Aniket Chavan[2], Aneesh Wath[3], Omkar Sherkar[4], Sheetal Kapse[5]
Department of Computer Engineering[1,2,3,4,5]
Smt. Kashibai Navale College of Engineering, Pune, Maharashtra, India
Savitribai Phule Pune University, Pune, India

Abstract: *This paper introduces a transformative stop-based carpooling app designed to address the limitations of existing solutions. By strategically placing designated stops, such as bus stops, our innovative model restricts ride creation and participation exclusively between these stops, ensuring consistent availability, mitigating privacy concerns, and providing users with alternative transportation options. Through a comprehensive study in a representative urban setting, we examine the impact on car occupancy rates, traffic reduction, and user satisfaction, highlighting the model's ability to cater to diverse user needs. The integration with existing public transport systems extends its eco-friendly footprint, while strategically placed stops enhance coverage in areas with fewer active drivers, overcoming the limitations of conventional carpooling solutions. This paper contributes a blueprint for a sustainable and efficient shared mobility system, showcasing the potential of the stop-based approach in revolutionizing urban transportation.*

Keywords: Carpooling, Ride-sharing, Sustainable Urban Transportation, Ride-sharing Platform

I. INTRODUCTION

In the rapidly evolving landscape of urban transportation, addressing the challenges of traffic congestion, environmental impact, and individual commuting costs has become imperative. This paper introduces a pioneering solution to these challenges through the implementation of a stop-based carpooling app. Recognizing the limitations inherent in current carpooling systems, we propose a novel model that strategically places designated stops, akin to bus stops, shaping a user-centric and environmentally sustainable approach to shared mobility. By restricting ride creation and participation exclusively between these stops, our innovative model aims to optimize the availability of rides, alleviate privacy concerns, and provide users with reliable alternative transportation options. This introduction sets the stage for a comprehensive exploration of the stop-based carpooling app, delving into its potential to revolutionize urban transportation and contribute to the ongoing discourse on sustainable and efficient shared mobility systems. Our goal is to create a user-friendly and convenient way of finding a joining carpooling.

II. LITERATURE SURVEY

The first set of studies delves into the multifaceted aspects of carpooling, with particular emphasis on its impact on urban transportation. Padiya & et al.'s [1] investigation in Ahmedabad reveals the potential to enhance car occupancy rates, decrease traffic by 34.42%, and reduce pollution. The study emphasizes the importance of security-related features in carpool applications while acknowledging hindrances like lack of flexibility and privacy. A separate study by Julagasigorn & et al. [2] explores the psychological factors motivating carpooling, proposing a conceptual framework derived from social psychology, marketing, sociology, and information systems. This framework aims to enhance our understanding of carpooling decision-making mechanisms.Moving beyond the local context, Ostrovsky & et al.[3] delve into the interplay between autonomous transportation, carpooling, and road pricing. They propose a market-based solution and highlight the potential advantages of self-driving cars in boosting carpooling systems. However, the study acknowledges the need to incorporate real-world uncertainties into the model for a more accurate representation. Yu (Marco) & et al.'s [4] futuristic exploration of a world where all travelers participate in carpooling demonstrates the potential for nearly perfect matches, although challenges arise in cross Origin-Destination (O-D) pairs, calling attention to the study's assumptions and the need for real-world considerations.

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The second set of studies provides practical insights and implementations of carpooling systems. Lee & et al.[5] evaluate a carpooling program in South Korea, revealing its popularity among middle-aged employees and its potential to ease congestion and reduce emissions. R. Hasan & et al.[6] propose a smart peer carpooling system that addresses contemporary urban mobility challenges, incorporating features like real-time ride-matching and secure payment options. D. Dimitrijević & et al. [7] gives an optimized real-time carpooling system. It offers a user-friendly interface, considers factors like interactive credit systems and also to a degree police cooperation. A. Lugo & et al. [8]present Ucarpooling, emphasizing shared car journeys to reduce traffic congestion and environmental impact, utilizing smartphone apps and web platforms for seamless connections.Finally, O. Dakroub & et al.[9]] introduce an intelligent carpooling app aiming to tackle traffic and parking congestions through real-time scheduling and optimization using a genetic algorithm. The paper emphasizes the efficiency of the model based on simulation results and user surveys. Other papers explore optimizations such as the Common Departure (CCD) problem, personality-based matching using machine learning, and flexible capacity constraints to enhance the effectiveness of carpooling systems. Collectively, these studies contribute valuable insights and innovations to the evolving landscape of carpooling for sustainable urban transportation.

III. GAP ANALYSIS

Current carpooling solutions face several limitations that hinder their widespread adoption. One significant challenge is the inconsistent availability of rides between two points. Users often encounter difficulties in finding suitable rides, especially during peak hours or in less populated areas. This inconsistency can lead to frustration and inconvenience for those relying on carpooling as a reliable mode of transportation. Privacy and trust concerns pose another barrier to the success of carpooling platforms. Users may be hesitant to share their commuting information, including details about their destinations and schedules. This lack of transparency can undermine the trust between users, making it challenging to establish a robust and reliable carpooling community. Moreover, the limited flexibility of current solutions becomes evident when there are no available rides. Users may find themselves without alternative transportation options, leading to increased reliance on personal vehicles or other less sustainable modes of commuting.

Additionally, the inconvenience associated with carpooling, such as the need for drivers to pick up and drop off passengers from arbitrary points, can discourage both drivers and users. This inconvenience contributes to a harder-to-plan route for drivers and can result in a less enjoyable experience for users. Furthermore, the limited coverage of carpooling services, particularly in areas with fewer active drivers, restricts the overall reach and accessibility of these solutions. These limitations collectively highlight the need for more refined and adaptable carpooling models to address the diverse challenges faced by users and providers alike.

IV. PROPOSED SYSTEM

The proposed online carpooling system serves as a convenient platform connecting car owners with individuals in their vicinity seeking transportation. This innovative system effectively bridges the gap between supply and demand, offering

a novel mobility solution. Through this platform, users can easily access rideshare opportunities, facilitating efficient and cost-effective travel arrangements. The fare for each ride is determined by the car owner, typically based on the distance travelled, ensuring transparency and fairness. Additionally, the system handles administrative tasks seamlessly, streamlining the entire carpooling experience for both drivers and passengers.

User Module:

- Start: Users access the carpooling system.
- Registration: New users register with necessary details.
- Login: Registered users log in using credentials.
- View Rides: Users browse available rides.
- Select Ride: Users choose based on destination and schedule.
- Pickup Point: Users select nearby stop.

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- Request Ride: Users send requests to selected driver.
- Driver Confirmation: Driver confirms ride request.
- View Driver Details: Users verify driver information.
- Ride Confirmation: Users receive trip details upon confirmation.
- Start Ride: Users board vehicle to start journey.
- Complete Ride: Users finish the ride and provide feedback.

Driver Module:

- Start: Drivers access carpooling system.
- Registration: New drivers register with vehicle details.
- Login: Registered drivers log in using credentials.
- View Requests: Drivers see ride requests.
- Review Details: Drivers check pickup and destination.
- Accept Request: Drivers accept requests based on availability.
- Set Pickup Point: Drivers choose pickup location.
- Confirm Ride: Drivers confirm ride details.
- Notify User: Users receive ride confirmation.
- Pick Up User: Drivers go to pickup point.
- Start Ride: Drivers begin journey upon user boarding.
- Complete Ride: Drivers complete the ride

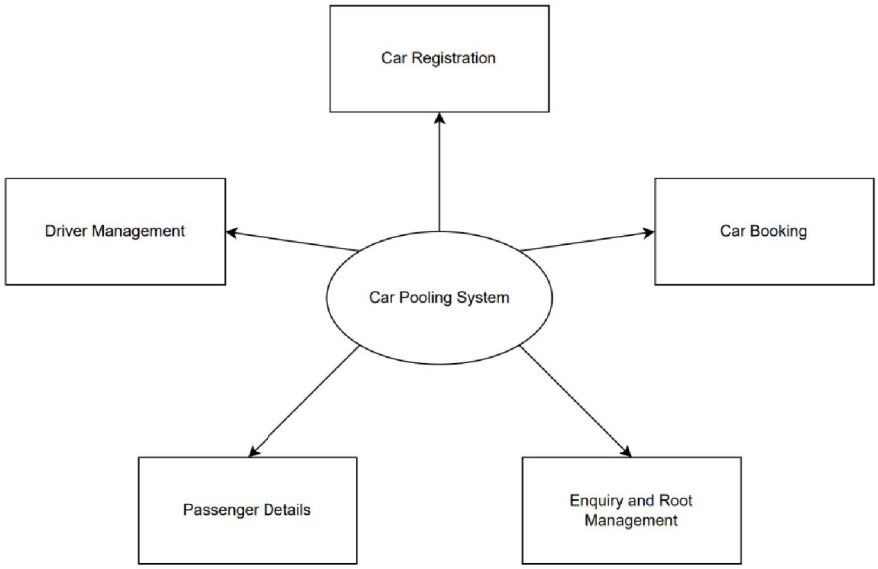

Fig.1: System Architecture

To address the limitations of current carpooling solutions, we are implementing a stop-based approach. This involves establishing designated stops at strategic locations, currently aligned with bus stops, where users can create and join rides. This approach offers several advantages in overcoming the existing challenges. Firstly, the availability of rides is significantly improved with the stop-based model. By restricting rides to travel between specific stops, where more

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people tend to commute, the likelihood of finding a suitable match increases. This results in better availability and more reliable transportation options for users.

Privacy and trust concerns are mitigated by the fact that users do not need to share their exact commuting destinations. The focus is on the common stops, ensuring that users can maintain a level of anonymity while still participating in a shared transportation system. To address the limited flexibility and potential inconvenience, users now have alternative options such as public transport between designated stops. This not only enhances flexibility but also provides users with a backup plan when carpooling is not available.

The stop-based approach makes route planning more straightforward, as it can be seamlessly integrated as an extension to existing public transport systems. This simplifies the overall commuting experience for both drivers and users, reducing the potential inconvenience associated with arbitrary pick-up and drop-off points.Lastly, the stop-based model leads to improved coverage. By strategically placing stops, we can ensure that a broader area is covered, even in regions with fewer active drivers. This expanded coverage enhances the accessibility of carpooling services and contributes to the overall success of the system.

V. CONCLUSION

In conclusion, the introduction of a stop-based carpooling app represents a significant leap forward in the realm of urban transportation solutions. Our comprehensive study and evaluation of this innovative model have demonstrated its potential to overcome prevalent limitations in existing carpooling systems. By strategically placing stops at key locations, we have shown that the app can ensure consistent ride availability, mitigate privacy concerns, and provide users with convenient and reliable alternative transportation options. The integration with existing public transport systems further extends the eco-friendly impact of this model, contributing to a holistic approach to shared mobility. The findings from our study underscore the positive impact of the stop-based approach on car occupancy rates, traffic reduction, and user satisfaction. This paper not only presents a viable solution to current challenges but also lays the groundwork for future developments in sustainable and efficient shared urban mobility systems. As cities globally seek innovative solutions to urban congestion and environmental concerns, the stop-based carpooling app emerges as a promising avenue for reshaping the future of urban transportation.

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