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CAR POOLING SYSTEM USING FLUTTER

Mrs. C. Agjelia Lydia
(Asst Professor)
Department of Computer Science Sri Shakthi Institute of Engineering and Technology Coimbatore, India
agjelialydiacse@siet.ac.in

Manush Aditya S.M
Department of Computer Science
Sri Shakthi Institute of Engineering and Technology
Coimbatore, India
manushadityasm22cse@srishakthi.ac.in

Mithun K
Department of Computer Science
Sri Shakthi Institute of Engineering and Technology
Coimbatore, India
mithunk22cse@srishakthi.ac.in

Mahalakshmi K
Department of Computer Science
Sri Shakthi Institute of Engineering and Technology
Coimbatore, India
mahalakshmik22cse@srishakthi.ac.in

Ritheesh Krishna B
Department of Computer Science
Sri Shakthi Institute of Engineering andTechnology
Coimbatore, India
ritheeshkrishnab22cse@srishakthi.ac.in

Manjo K C
Department of Computer Science
Sri Shakthi Institute of Engineering andTechnology
Coimbatore, India
manojkc22cse@srishakthi.ac.in

Abstract* — The Smart Carpooling System presented in this research aims to address the growing challenges of urban congestion, environmental pollution, and transportation inefficiency by leveraging advanced technologies to facilitate efficient and convenient ride-sharing among commuters. The system utilizes a user-friendly mobile application and a sophisticated backend infrastructure to connect individuals with similar commuting routes, encouraging the sharing of rides and optimizing the utilization of available vehicles. Key features of the Smart Carpooling System include real-time matching algorithms, secure user authentication, and dynamic route planning. Users can input their travel preferences, schedule, and destination, and the system intelligently matches them with compatible co-riders, considering factors such as proximity, time constraints, and personal preferences. By promoting carpooling, the system contributes to reducing traffic congestion, lowering carbon emissions, and fostering a sense of community among users.

Keywords — Sustainable urban mobility, Mobile application, Real-time matching algorithms, Carbon emissions.

I. INTRODUCTION

Urbanization and population growth have led to an unprecedented increase in traffic congestion, environmental pollution, and inefficiencies in traditional transportation systems. As cities continue to expand, it becomes imperative to explore innovative solutions that not only alleviate these challenges but also promote sustainable and eco-friendly modes of transportation. One promising approach that has gained significant attention is the implementation of a Smart Carpooling System. Carpooling, or ride-sharing, presents an opportunity to optimize the use of existing vehicles, reduce the number of individual cars on the road, and decrease the overall carbon footprint associated with daily commuting. The concept is simple yet powerful: by connecting individuals with similar travel routes, we can create a shared economy of transportation, fostering a more efficient use of resources and contributing to a greener and more sustainable urban environment.

The Smart Carpooling System discussed in this context leverages advancements in technology, particularly through the use of mobile applications and intelligent backend algorithms. This system goes beyond the traditional concept of ride-sharing by incorporating real-time matching, dynamic route planning, and user-friendly interfaces. By doing so, it not only addresses the logistical challenges of finding suitable co-riders but also enhances the overall user experience, making carpooling a viable and attractive option for daily commuters.
In this era of digital connectivity, the integration of GPS tracking, secure authentication, and communication features ensures a seamless and secure carpooling experience. Furthermore, the system incorporates elements of gamification and incentives to encourage active participation, transforming the act of carpooling into a rewarding and socially responsible behavior. This research explores the potential impact of the Smart Carpooling System on mitigating traffic congestion, reducing carbon emissions, and fostering a sense of community among users. As we navigate the complexities of urban mobility, the implementation of such innovative solutions becomes crucial in building resilient, sustainable, and people-centric transportation ecosystems.

II. LITERATURE REVIEW

This book is presented in three parts: part 1, The Politics, reviews the postwar history of urban transport policy and advances some propositions for ranking potential innovations according to their political feasibility. Part 2, The Problems, examines the criteria for evaluating the transport system in terms of problems such as energy, air pollution, safety, equity, congestion and urban sprawl. Part 3, The Options, discusses eight broad policy categories in terms of political feasibility and cost effectiveness. The options examined include: highway capacity expansion, the extension of fixed-route services, demand responsive transport, car pooling, traffic priorities for high occupancy vehicles, performance standard regulation for car manufacturers, direct consumer regulation, and price disincentives intended to curtail car travel and/or fuel consumption. (TRRL) [1].

The present research deals with car pooling as a means of making better use of existing infrastructure and as a means of reducing traffic congestion with all its associated induced effects. Car pooling schemes involve several drivers getting together to share a private vehicle simultaneously, in order to reach their destinations points according to a semi-common route rather than each driver using their own vehicle. The Car Pooling Problem belongs to the non-polynomial computational complexity family of operations problems. In the current literature there are only a few studies on this optimization problem: the research group has designed several different new automatic and heuristic data processing routines to support efficient matching in car pool schemes.

These are based on savings functions and belong to two distinct macro classes of algorithms to give two different modelings of this problem. They offer average savings of more than 50% in traveled distances demonstrating the effectiveness of a trivial matching scheme for real applications.[2].

Car pooling is a transportation service organized by a large company which encourages its employees to pick up colleagues while driving to/from work to minimize the number of private cars travelling to/from the company site. The car pooling problem consists of defining the subsets of employees that will share each car and the paths the drivers should follow, so that sharing is maximized and the sum of the path costs is minimized. The special case of the car pooling problem where all cars are identical can be modeled as a Dial-a-Ride Problem. In this paper, we propose both an exact and a heuristic method for the car pooling problem, based on two integer programming formulations of the problem. The exact method is based on a bounding procedure that combines three lower bounds derived from different relaxations of the problem. A valid upper bound is obtained by the heuristic method, which transforms the solution of a Lagrangean lower bound into a feasible solution. The computational results show the effectiveness of the proposed methods. [3].

In this paper we present a novel taxi on demand (ToD) management system that implements a location based and traffic-sensing approach and incorporates automated taxi booking, dispatching, and monitoring application. ToD solution effectively addresses current taxi sector needs, and could be potentially expanded to emerging car-pooling/sharing models, allowing integration between modes of transport in urban/densely populated environments. [4].

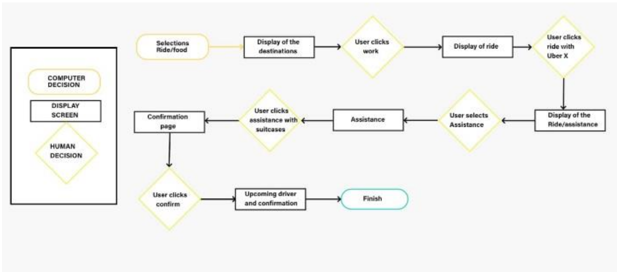
III. EXSISTING SYSTEM

BlaBlaCar is a long-distance carpooling platform where users, both drivers and passengers, can connect for shared rides. Drivers list their upcoming trips, specifying departure points, destinations, and available seats, while passengers search for suitable rides based on their preferences. The platform facilitates cost-sharing, with passengers paying a share of the expenses to the driver. Safety measures include user verification, a secure messaging system, and a rating/review system after each trip. BlaBlaCar encourages a sense of community by allowing users to share their preferences on chattiness during the journey. The mobile application enhances accessibility, making it easy for users to arrange rides while on the move.

IV. PROPOSED SYSTEM

The Pick-Me application offers additional amenities, such as the option to travel with pets to any destination, subject to limited extra charges. Furthermore, we provide a premium feature that ensures an ad-free experience and uninterrupted usage of the app. One of the standout features in the Pick-Me pooling app is the ability to book luxury cars for travel. Alternatively, if you own a luxury car, you have the option to rent it through our app.

V. METHODOLOGY



A. Hardware and Software Requirements:

This application requires a minimum specification of:

Version	Android 5.1 or later.
Processor	Quad-core 1.5 GH z or higher
RAM	2GB or more.
Hard disk	16GB or more.
Operating System	Windows 10
Front End	Figma , Flutter
Back End	Django
Database	PostgreSQL

B. **WORKING:** Algorithm:

1. User Authentication.
2. User Profile Creation.
3. Search and Functionality.
4. Ride scheduling.
5. Cost Sharing and Payment Integration.
6. Real time Collaboration and Communication
7. Route Optimization.
8. Rating and Feedback system
9. Safety Measures

C. Software

Flutter, developed by Google, stands as a cutting- edge open-source UI toolkit for building natively compiled applications for mobile, web, and desktop from a single codebase. With a strong emphasis on expressive and flexible user interfaces, Flutter allows developers to create visually appealing applications that run seamlessly on various platforms. At its core, Flutter employs the Dart programming language, offering a rich set of pre-designed widgets, extensive libraries, and a reactive framework that enables the creation of visually stunning and performant applications. Flutter enables developers to write code once and deploy it ondifferent platforms such as iOS, Android, and the web, reducing development time and efforts. Flutter stands out for its ability to enable developers to write code once and deploy it across different platforms, ensuring efficiency and consistency in application development. A game-changer for developers, Flutter's Hot Reload feature allows real-time visualization of code changes, significantly speeding up the development process and encouraging iterative refinement. Flutter boasts an extensive library of customizable widgets, ranging from foundational elements to complex UI components, empowering developers to craft intricate and visually appealing user interfaces. The framework facilitates the creation of expressive user interfaces with smooth animations and transitions, providing a delightful user experience that matches or surpasses native applications. Flutter's compilation to native ARM code ensures exceptional performance, minimizing runtime overhead and delivering applications with native-like speed and responsiveness. Being open-source, Flutter benefits from a vibrant and active community of developers who contribute to its growth, share resources, and collectively address challenges, fostering an environment of continuous improvement. Dart, the language underpinning Flutter, is designed for ease of use and performance. Its features include strong typing, just-in-time compilation, and a modern syntax that enhances developer productivity. Flutter seamlessly integrates with platform- specific features and APIs, allowing developers to access native functionalities and services, ensuring a smooth and integrated user experience.

A. Advantages:

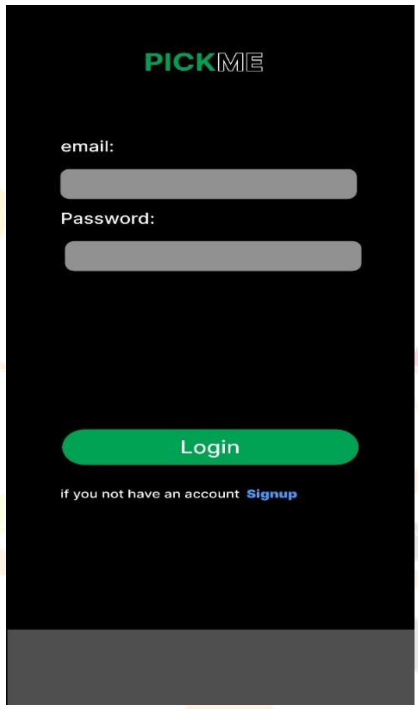
i. Reduced Traffic Congestion
ii. Environmental Benefits
iii. Cost saving and Time saving

iv. Promotes Social Interaction
v. Resource Efficiency

VI EXPERIMENTAL AND RESULT

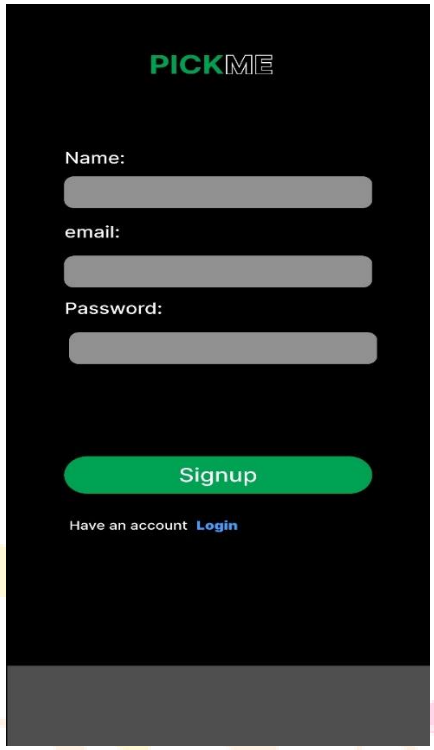
A. TEST CASE 1

The system's robust testing involved user authentication via email ID and password. Once logged in, users can effortlessly initiate rides through their PICK ME account.



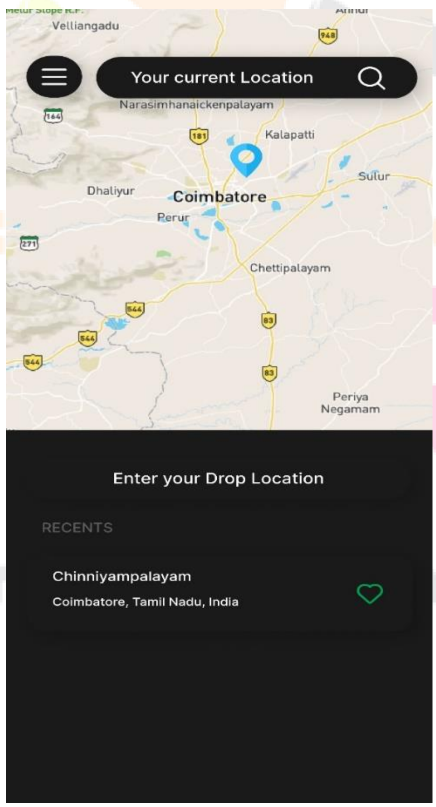
B. TEST CASE 2

If users don't have a PICK ME account, they can easily register on the dedicated page. The application prompts them to provide necessary details for a seamless registration process.



C. TEST CASE 3

Users can select their drop location on Google Maps and save rides for future use, providing convenience for repeated journeys.



VII CONCLUSION

In conclusion, a carpooling system offers a myriad of benefits that extend beyond individual convenience. By reducing traffic congestion, lowering carbon emissions, and promoting cost-effective and sustainable transportation, carpooling contributes to a more efficient and eco-friendly urban mobility landscape. The social aspects, such as enhanced community interaction during rides, further underscore the positive impact of carpooling. With the potential for significant time and cost savings, along with the promotion of responsible resource utilization, carpooling systems emerge as a viable solution for addressing contemporary transportation challenges. As cities evolve towards smarter and more sustainable living, the integration and widespread adoption of carpooling systems play a crucial role in shaping a greener and more interconnected future.

VIII FUTURE WORK

Future work for carpooling systems should explore advancements in matching algorithms for more efficient user pairings, integration with smart city infrastructure for real-time data and dynamic routing, incorporation of AI and machine learning for predictive features, multi-modal integration with other transportation modes, enhancement of safety and security measures, implementation of incentive programs to promote sustainable practices, and continuous improvement of user interfaces for a seamless and user-friendly experience. These developments can contribute to the evolution of carpooling systems, making them more responsive, personalized, and integral components of smart and sustainable urban mobility solutions.

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