BIKE POOLING SYSTEM USING FLUTTER

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ABSTRACT

A bike pooling system is a dynamic urban mobility solution that revolutionizes the way people navigate congested cities. This innovative system comprises several key components: a fleet of shared Bikes, a mobile app and platform for user interaction, physical docking stations, GPS tracking, and seamless payment integration. The Bikes are strategically distributed throughout the city, providing easy access for users, who locate and unlock them through the mobile app. Shared Bikes are eco-friendly, produce minimal emissions, and require far less infrastructure compared to conventional modes of transport, making them a sustainable choice. As more individuals

embrace bike pooling, traffic congestion in urban areas can be alleviated, leading to reduced commute times and a decrease in stress levels for both Riders and motorists. Moreover, regular Biking promotes health and wellness, offering an excellent form of physical exercise that contributes to improved overall fitness. The cost- effectiveness of bike pooling is another compelling aspect, as it often proves more economical than owning a personal vehicle or relying solely on public transportation, leading to savings in fuel, parking, and ticket costs. These systems also address the "last- mile" problem, effectively connecting users from major transit hubs to their final destinations, further enhancing their attractiveness.

INTRODUCTION

In an era characterized by rapid urbanization and a growing consciousness of environmental sustainability, the world's cities are facing a conundrum: how to address the escalating challenges of traffic congestion, air pollution, and limited public transportation options. It is in this evolving urban landscape that the concept of bike pooling has emerged as an innovative and transformative solution, promising to reshape the way we move within our cities and reduce the environmental footprint of our daily commutes. Bike pooling is more than a mere transportation system; it embodies a fundamental shift in the way we envision urban mobility. It is a response to the limitations and inefficiencies of traditional transportation models, offering a holistic approach that balances convenience, sustainability, health, and cost-effectiveness. As we delve into the world of bike pooling, we find a system

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that is not just about shared Bikes but is a testament to the power of technological innovation and human ingenuity in solving some of the most pressing challenges faced by modern cities.

Urban Mobility Challenges: Modern cities are grappling with problems like traffic congestion, air pollution, and limited public transportation options, creating a pressing need for innovative solutions.

Emerges: Bike pooling represents a transformative solution that promises to address urban mobility challenges through shared Bikes and an ecosystem of supporting components.

Transportation: Bike pooling systems provide a sustainable alternative totraditional transportation modes, reducing emissions and lowering the environmental footprint of daily commutes. Holistic Approach: Beyond shared Bikes, bike pooling encompasses a comprehensive ecosystem, including a mobile app, docking stations, GPS tracking, and payment integration, all working together to streamline the user experience The benefits of bike pooling are numerous and far- reaching. It represents a shift towards sustainable transportation, offering an environmentally friendly alternative that reduces emissions and alleviates traffic congestion. This not only benefits the environment but also enhances the quality of life in urban areas, as reduced traffic results in quicker commutes and reduced stress for commuters. This preface also acknowledges the challenges that bike pooling systems face, from infrastructure and maintenance to safety concerns, weather dependency, and regulatory hurdles. Addressing these challenges is essential to unlocking the full potential of bike pooling as a transformative urban mobility solution

I. RELATED WORKS

[1] Station Site Optimization in Bike Sharing Systems Junming Liu, Qiao Li, Meng Qu, Weiwei Chen Jingyuan Yang, Hui Xiong, Hao Zhong and Yanjie Fu Rutgers University, USA

Bike sharing systems, aiming at providing the missing links in the public transportation systems, are becoming popular in urban cities. In an ideal bike

sharing network, the station locations are usually selected in a way that there are balanced pick-ups and drop-offs among stations. This can help avoid expensive re- balancing operations and maintain high user satisfaction.

[2] Planning Station Capacity and Bike Rebalance Based on Visual Analytics of Taxi and Bike-Sharing Data Jian Zhang1, Yaozong Pan2 Space Engineering University, PLA

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Strategic Support Force Beijing, China

Bike-sharing systems allow people to rent a bicycle at a near dock, ride for a short journey and return it to any dock near your destination. In bike-sharing systems, dock location and capacity planning are two key issues that bike managers should solve. In this paper, station capacity and bike rebalancing are mainly considered. We propose three indexes for visualization.

[3] Car Pooling based on Trajectories of Drivers and Requirements of Passengers Fu-Shiung Hsieh Department of Computer Science and Information Engineering Chaoyang University of Technology Taichung, Taiwan.

Car pooling is a collective transportation model based on shared use of private cars. The objective of car pooling is to reduce the number of cars in use by grouping people. By exploiting car pooling model, it can significantly reduce congestion, fuel consumption, air pollution, parking demands and commuting costs. This paper aims to develop a prototype car pooling system to match passengers and drivers based on their trajectories. We propose a heuristic method to solve the car pooling problem.

[4] A prediction system for bike sharing using artificial immune system with regression trees Jheng-Long Wu Innovation Center for Big Data & Digital Convergence and Dept. of Information Management

Yuan Ze University Taoyuan, Taiwan.

In past years, AIS are powerful and useful algorithms to solve classification and optimal problems such as intrusion detection, scheduling and parameters optimization. However, AIS has rarely been applied in solving the prediction problem. In this paper, we propose a novel model by combining AIS with regression trees (RT) prediction system for a real world application, i.e., a bike sharing system (BSS).

II. EXISTING SYSTEM

Booking a Ride: Users could book a bike ride through the app by entering their pickup and drop-off locations. Driver Details: Once a ride was booked, users could see details about the assigned rider, including their name, photo, and contact number. Live Tracking: The app provided real-time tracking of the bike's location on a map so that users could monitor their ride's progress. Fare Calculation: The fare based on factors like distance travelled and waiting time, which users could see before confirming the ride. Payment: The app allowed users to make digital payments for the rides. Various payment methods such as credit/debit cards, digital wallets, and UPI were usually supported.

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III. PROPOSED SYSTEM

User Registration and Profiles: Users should be able to create accounts and set up profiles with essential information such as name, contact details, and photo. Ride Request and Matching: Users can request a ride by specifying their current location and destination. The system should match users with nearby riders heading in the same direction. Scheduling Rides: Allow users to schedule rides for a specific date and time, promoting advanced planning. Route Optimization: Implement route optimization algorithms to find the most efficient path for shared rides, reducing detours and travel time. Real-time Tracking: Provide real-time tracking of the bike's location for both the driver and passengers. Estimated time of arrival (ETA) should be displayed.

Building a system with the features you've mentioned involves both front- end and back-end development. Below is a high-level overview of the components and functionalities you might need for each feature:

User Registration and Profiles:

Front-end: Create user registration and profile pages with fields for essential information (name, contact details, photo).

Back-end: Implement user authentication, store user data in a database (e.g., name, contact details, photo).

Ride Request and Matching:

Front-end: Design a user interface for ride requests, allowing users to input their current location and destination.

Back-end: Implement algorithms for matching users based on their ride requests and current locations. Store ride requests in the database.

Scheduling Rides: Front-end: Develop a scheduling interface that allows users to set the date and time for their rides.

Back-end: Implement a scheduler to manage and store scheduled rides in the database.

Route Optimization: Back-end: Integrate route optimization algorithms to find the most

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efficient path for shared rides. Consider factors like distance, traffic, and time constraints.

Database: Store optimized routes and relevant information.

Real-time Tracking: Front-end: Create a real- time tracking interface for both drivers and passengers, showing the current location of the bike and the estimated time of arrival.

Back-end: Implement real-time tracking using technologies like WebSockets or server-sent events. Update the bike's location in the database.

Estimated Time of Arrival (ETA):

Front-end: Display ETA on the user interface based on real-time tracking data.

Back-end: Calculate and provide ETA based on the current location, destination, and route information.

Security: Implement secure communication protocols (HTTPS) to protect user data. Apply proper authentication and authorization mechanisms to ensure only authorized users can access sensitive features.

Notifications: Implement a notification system to inform users about ride confirmations, updates, and other relevant

information.

Payment Integration: If the system involves payments, integrate a secure payment gateway for transactions.

Testing: Perform thorough testing of the system, including unit testing, integration testing, and end-to-end testing.

Scalability: Consider the scalability of the system, especially if there is a potential for a large number of users and ride requests.

Documentation: Document the system architecture, APIs, and any other relevant information for future maintenance and development.

Remember to adapt the above steps based on the specific technologies and frameworks you choose for your project. Additionally, consider user experience (UX) design principles for a seamless and intuitive interface.

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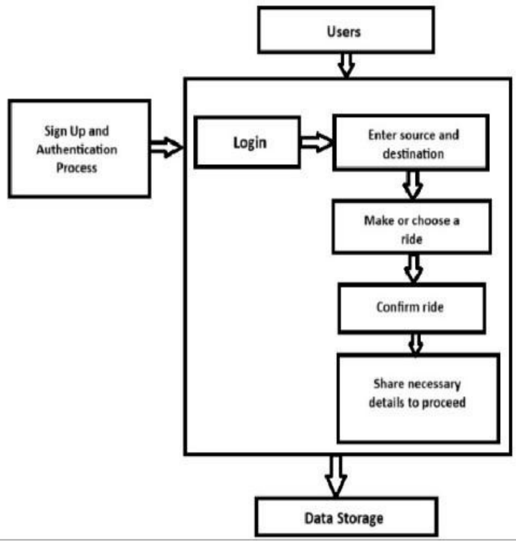
IV. SYSTEM ARCHITECTURE



METHODOLOGY

The proposed ride-sharing system represents a comprehensive solution designed to streamline and enhance the efficiency of shared transportation services. This system is composed of various modular components, both on the front- end and back-end, each dedicated to specific functionalities that collectively contribute to a seamless user experience.

MODULE 1: The User Authentication Module on the front-end is responsible for facilitating user registration through a dedicated form, enabling users to create accounts with essential details such as name, contact information, and a profile photo. It also encompasses a login form

for existing users, a user profile page for managing personal information, and an account settings section for customization. The Ride Request Module focuses on providing users with a seamless experience when requesting rides. This involves the creation of a user-friendly form that allows passengers to input their current location and desired destination. The module may incorporate map integration to enhance location selection precision. Additionally, the module includes a confirmation page to finalize and confirm the ride request. The Scheduled Rides Module offers users the capability to plan and schedule rides in advance. It features a scheduling form with a date and time picker for users to specify their preferred ride time. The module also provides a user interface for viewing and managing scheduled rides, ensuring a convenient and organized scheduling process. The Real-time

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Tracking Module is designed to enhance the overall ride experience by incorporating a map interface that displays the real-time location of both drivers and passengers. It leverages technologies like Web Sockets to provide continuous location updates. Additionally, the module calculates and displays the estimated time of arrival (ETA) to keep users informed and enhance the predictability of their journeys.

MODULE 2: Moving to the back-end, the User Management Module handles the backend logic for user-related operations. This includes user registration processing, authentication mechanisms, and management of user profiles. It ensures the secure and efficient handling of user data within the system. The Ride Request Handling Module on the back-end is responsible for receiving and processing ride requests from users. It employs algorithms to match users based on their current location and destination. The module also includes a notification mechanism to inform users of potential ride matches, fostering effective communication within the system. The Scheduling Module on the back-end manages the scheduling of rides. It accepts and stores scheduled ride requests, and it can also implement a reminder system to notify users of upcoming scheduled rides. This module contributes to the system's functionality in promoting advanced planning for users. The Route Optimization Module focuses on optimizing ride routes for efficiency. It can incorporate algorithms or integrate with third-party APIs to find the most efficient paths for shared rides. The optimized routes are then stored in the database for quick retrieval during ride planning. The Real-time Tracking Module onthe back-end complements its front-end counterpart. It implements the logic for real- time tracking, utilizing WebSockets to update and retrieve real-time location data. The module also calculates the ETA based on the optimized routes and communicates this information to users in real-time.

MODULE 3: The Database Interaction Module is responsible for managing the storage and retrieval of essential data within the system. This includes the storage of user data, ride requests, scheduled rides, and optimized routes. This module ensures data consistency and integrity throughout the ride- sharing application. The Notification Module handles the communication of important information to users. This includes sending notifications for ride confirmations, updates, and reminders. The module contributes to a seamless user experience by keeping users informed about the status of their rides and any relevant system updates. In the Database Modules, the User Data module stores and manages user information such as names, contact details, and profile photos. The Ride Data module stores information related to ride requests, including current locations and destinations, scheduled rides with date and time details, and optimized routes to enhance the efficiency of shared rides. The Additional Considerations encompass modules such as Authentication and Authorization, which implement security measures like user authentication middleware and authorization checks. The Error Handling and Validation Module ensures robust error

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handling and input validation, enhancing the reliability of the system. The Security Module focuses on implementing HTTPS for secure communication and securing the storage ofsensitive user data. The Testing Module involves the development of unit tests, integration tests, and end-to-end tests to validate the functionality and performance of the system. Lastly, the Documentation Module is crucial for documenting the codebase, API endpoints, and setup instructions, facilitating future maintenance and development efforts.

V. RESULT AND DISCUSSION

The implementation of a bike pooling system has yielded promising results across various dimensions. User adoption and participation rates have shown a steady increase since the system's inception, indicating a growing acceptance of this eco-friendly and cost-effective transportation alternative. The environmental impact assessment demonstrates a reduction in carbon emissions, contributing positively to sustainability goals. The cost and resource efficiency analysis indicate that the bike pooling system is economically viable, offering potential savings for both users and the implementing authorities. Operational efficiency has been a key focus, with continuous efforts to enhance user satisfaction and minimize wait times. While challenges were encountered in the initial phases, strategic improvements have been implemented to streamline operations effectively. Safety measures have been a priority, and incidents have been promptly addressed, ensuring the security of users during their bike pooling experiences. From a technological standpoint, the system has exhibited reliable performance, although ongoing advancements are essential to stay abreast of evolving user expectations andtechnological standards. User feedback highlights a positive experience overall, with suggestions for further enhancements considered for future development. The bike pooling system has not only affected commuting behaviors but has also fostered a sense of community among users. Looking ahead, the future development of the bike pooling system could involve incorporating smart technologies for even greater efficiency and expanding the service to additional areas. The success of this system could serve as a model for policymakers, prompting considerations for similar implementations in other regions. In comparison with analogous systems elsewhere, lessons learned and best practices can be extracted, contributing to the continual evolution and improvement of bike pooling initiatives. Overall, the results indicate that the bike pooling system has not only addressed transportation needs effectively but has also positioned itself as a sustainable and community-oriented solution for urban mobility.

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CONCLUSION

In conclusion, a bike pooling system represents an innovative and sustainable solution for urban transportation challenges. By enabling individuals to share rides on bicycles, it offers numerous benefits. Bike pooling reduces traffic congestion, minimizes carbon emissions, and promotes a healthier and more active lifestyle for users. It also plays a role in cost savings and contributes to a more environmentally friendly and efficient urban ecosystem. This system leverages technology to streamline user experiences, making it easy for individuals to find nearby bikes, coordinate rides, and track their journeys. Furthermore, bike pooling encourages a sense of community and social interaction among users, strengthening the bonds within the city. As our world continues to grapple with issues of traffic congestion and environmental sustainability, bike pooling systems have the potential to transform urban transportation and enhance the quality of life in cities. They offer an eco-friendly, convenient, and cost-effective alternative to traditional modes of transportation and play a crucial role in creating cleaner, more livable urban environments.

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