Carpooling Application Using Blockchain

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ABSTRACT:

This paper proposes a carpooling application based on blockchain technology that provides a decentralized, transparent, and secure platform for ride-sharing services. It uses a smart contract that would connect the rider and driver directly without any third-party intervention. Currently most of the carpooling systems are in the control of one agency. Proposed ride sharing system will be deployed on blockchain and will be decentralized in a true sense. This application allows drivers to provide ride-sharing services without relying on a third party. Additionally, the use of blockchain technology ensures trust and privacy, enhancing the user experience and increasing the adoption rate of the application. This paper focuses on developing a peer-to-peer hassle free, less error prone ride-sharing application powered by blockchain technology.

Keywords – Decentralized Blockchain; Peer-to-Peer

1. INTRODUCTION

The basic idea behind these applications is to leverage the decentralized and secure nature of blockchain to create a platform for carpooling that is more efficient and transparent than traditional systems. Ride-sharing services have gained in popularity as a viable means of transportation in recent years. Services that enable consumers to make better use of their personal vehicles. A ride-sharing driver shares his ride with other passengers. Individuals can benefit from ride sharing in a variety of ways as well as the community as a whole, including increased occupancy rates, splitting trip expenses, extending social circles, and lowering both fuel usage and pollution. Many companies are providing online ridesharing services all over the world. Cab service aggregators carry out their day-to-day activities using a centralized technology. Furthermore, the payment process for cab bookings is handled by mediators or third-party businesses. With more parties engaged, this becomes a problem since a lack of transparency emerges. In a blockchain-based carpooling application, users would be able to register their details and preferences, including their location, destination, and desired travel time. The blockchain would then match compatible users and automatically create a carpooling group, where users can coordinate their travel plans and share the cost of the trip. The blockchain can also be used to create a secure and transparent payment system, where users can pay for their share of the trip using cryptocurrency or other digital tokens. The use of blockchain technology can ensure that transactions are secure, transparent, and tamper-proof.

2. LITERATURE REVIEW

Wang et al. (2019) provided a comprehensive survey of carpooling services based on blockchain technology. The study identified the challenges in carpooling, including security, privacy, reliability, and fairness, and discussed how blockchain technology can address these challenges. The authors proposed a blockchain-based carpooling architecture that includes a decentralized ride matching mechanism, a smart contract-based payment system, and a reputation system to incentivize good behaviour.

Xu et al. (2020) proposed a carpooling platform based on blockchain and smart contract technology. The platform uses a smart contract to automate the ride-sharing process, including ride matching, payment, and dispute resolution. The authors also proposed a reputation system to promote good behaviour and enhance the security and reliability of the system.

Chauhan and Saini (2019) proposed a carpooling system using blockchain technology. The system uses a blockchain-based platform to provide secure and transparent ride-sharing services. The authors also proposed a reputation system to incentivize good behaviour and a smart contract-based payment system to automate the payment process.

Zeng et al. (2021) proposed a decentralized carpooling system based on blockchain and smart contract technology. The system uses a decentralized ride matching mechanism to match riders and drivers, and a smart contract-based payment system to automate the payment process. The authors also proposed a reputation system to incentivize good behaviour and enhance the security and reliability of the system.

Tan et al. (2019) proposed a blockchain-based carpooling system with privacy preservation. The system uses a blockchain-based platform to provide secure and transparent ride-sharing services while preserving the privacy of users. The authors also proposed a privacy-preserving matching mechanism to match riders and drivers without revealing their identities.

Lee et al. (2018) proposed a blockchain-based secure carpooling system. The system uses a blockchain-based platform to provide secure and transparent ride-sharing services. The authors also proposed a smart contract-based payment system to automate the payment process and a reputation system to incentivize good behaviour.

Miah et al. (2020) proposed a blockchain-based secure and trusted carpooling platform. The platform uses a blockchain-based platform to provide secure and transparent ride-sharing services. The authors also proposed a smart contract-based payment system to automate the payment process and a reputation system to incentivize good behaviour.

Zhang and Yang (2019) proposed a blockchain-based carpooling platform with decentralized privacy-preserving matching. The system uses a decentralized ride matching mechanism to match riders and drivers while preserving their privacy. The authors also proposed a smart contract-based payment system to automate the payment process.

Shao et al. (2019) proposed a blockchain-based secure carpooling system with smart contracts. The system uses a blockchain-based platform to provide secure and transparent ride-sharing services. The authors also proposed a smart contract-based payment system to automate the payment process and a reputation system to incentivize good behaviour.

Zhou et al. (2020) proposed a blockchain-based secure carpooling system with differential privacy. The system uses a blockchain-based platform to provide secure and transparent ride-sharing services while preserving the privacy of users. The authors also proposed a differential privacy-based matching mechanism to match riders and drivers without revealing their identities.

3. METHODOLOGY

To create a carpooling application using blockchain technology, we will begin by conducting a feasibility study to determine if this technology is the best solution for the issues associated with traditional carpooling. Then, we will design the system architecture, develop smart contracts for payment and verification, design the user interface, test the application, and launch it to the public. Here we are using the blockchain technology which is ensures trust and privacy, enhancing the user experience and increasing the adoption rate of the application. To evaluate the impact of the application, we will use data analytics and gather user feedback to make improvements. Finally, we will summarize the results of the project and discuss the potential for future work to improve the carpooling application using blockchain technology.

Existing system:

Carpooling is a popular transportation model where people share a vehicle to reach their destination, helping to reduce traffic congestion and carbon emissions. There are several existing systems for carpooling, such as carpooling websites, employer-sponsored programs, and public transportation options like buses and trains. Carpooling websites connect drivers and passengers going in the same direction, while employer-sponsored programs provide incentives for employees to share rides to work. Public transportation options like HOV lanes and bus/train routes encourage people to carpool to their final destination. Overall, carpooling is an effective way to save money, reduce traffic, and lower carbon emissions, and there are several systems in place to help people find carpool partners easily.

Disadvantages:

1. Limited availability: The availability of carpooling options can be limited, especially in areas with low population density or where public transportation options are limited.

2. Inconvenient scheduling: Coordinating schedules among carpooling participants can be challenging, especially if they have different work schedules or travel routes.

3. Lack of trust and safety concerns: Carpooling with strangers can raise safety concerns, especially for women or those who are vulnerable. Additionally, there may be a lack of trust among participants, which can result in issues with payment, punctuality, and reliability.

4. Unequal cost sharing: Participants may have different travel distances, leading to unequal cost-sharing arrangements that can be unfair and difficult to manage.

5. Difficulty in organizing and managing: Organizing and managing a carpooling group can be time-consuming and difficult, especially if there are frequent changes in the participants or routes

Proposed system and Advantages

The proposed system for a carpooling application that utilizes blockchain technology would provide several advantages over traditional carpooling systems. Here are some of the proposed advantages:

1. Decentralized and Transparent: The use of blockchain technology would create a decentralized platform for coordinating and sharing rides among participants. The platform would be transparent, enabling users to view the details of other users' profiles and transaction histories, promoting trust and accountability.

2. Secure and Private: The blockchain technology would provide a secure and private platform for users to share their personal and payment information. The data would be encrypted and stored on the blockchain, protecting it from unauthorized access or tampering.

3. Efficient and Cost-Effective: The matching algorithm would use the data on the blockchain to efficiently match compatible users based on their travel preferences, location, and payment information. This would result in a more efficient and cost-effective system for carpooling, reducing transportation costs for individuals and organizations.

4. Environmental Benefits: Carpooling reduces traffic congestion and greenhouse gas emissions, promoting a cleaner and more sustainable environment. The proposed system would make carpooling more accessible and convenient, leading to a wider adoption of this environmentally friendly transportation method.

5. Easy Management and Coordination: The blockchain platform would provide an easy-to-use interface for managing and coordinating carpooling activities, reducing the administrative burden of organizing carpooling groups.

MODULES:

We created the following modules for this project.

1. Shows two dashboards. One for driver and another for customer.

2. Each dashboard shows the locations of others respectively.

3. The user can call, Rent the car, Pay the amount.

4. Developed a Blockchain smart contract for renting a car for three days.

5. These are done for showcasing the functionalities of each feature.

6. when the user clicks on a particular person around his location. His location opens in the google maps and shows the user details like latitude, longitude and name information below the map.

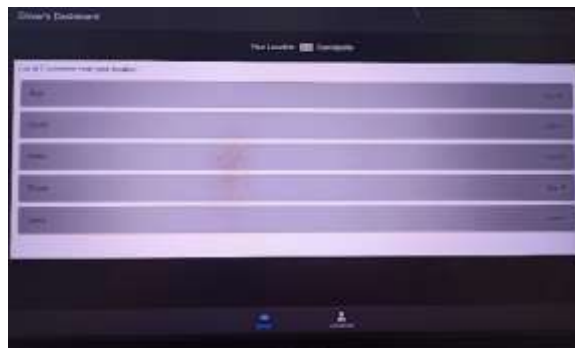## 4. EXPERIMENTAL RESULTS

Fig.1: Homepage of the Application

The above figure shows the Drivers Dashboard and the near-by customers in his location.

Fig.2: Each customer in the Driver dashboard open this page, with the location of the particular Customer
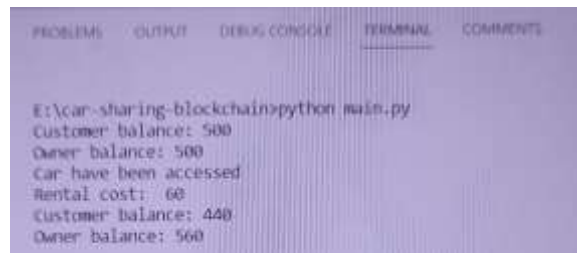

Fig.3: shows the Customer Dashboard

Fig.4: Each Driver in the Customers dashboard open this page, with the location of the particular Driver

Fig.11: Block Chain smart contract output

The above figures show the output of the amount the customer need to pay for renting the car for three days.

Using smart contract in block chain using python.

5. CONCLUSION

The use of blockchain technology in carpooling applications has the potential to revolutionize the way people share rides. By creating a decentralized digital ledger that securely and transparently records carpooling transactions, blockchain technology can help match riders with drivers, track payments, and ensure the safety of all parties involved. This technology can also increase efficiency, reduce costs, and improve the overall user experience of carpooling applications. However, there are still some challenges to overcome, such as adoption rates, scalability, and regulatory issues. Nevertheless, the development of blockchain-based carpooling applications represents an exciting area of innovation in the transportation industry, with the potential to significantly reduce traffic congestion and carbon emissions. Further research and development in this area are needed to fully realize the potential of blockchain technology in carpooling applications.

6. FUTURE SCOPE

The carpooling application using blockchain technology is a project with a lot of potential for the future. It has the capability to revolutionize the way people commute by leveraging the security and transparency of blockchain. In the future, the application can incorporate smart contracts to automate ride sharing, become a decentralized platform to enhance security, tokenize its platform to incentivize users and pay for rides, integrate with other blockchain applications to increase security, expand to include other transportation modes, and integrate with smart city infrastructure to reduce congestion and decrease carbon emissions. With these developments, the carpooling application can create a comprehensive transportation network that is more efficient and sustainable, contributing to a more sustainable future.

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