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Collaborative Autonomous Rideshare: A Blockchain-Based Decentralized Transportation System

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Abstract:- The increasing urbanization of cities has resulted in challenges such as traffic congestion, air pollution, high fuel consumption, and inefficient transportation systems. Collaborative Autonomous Rideshare is a blockchain-based decentralized platform designed to address these issues by promoting efficient ridesharing through autonomous vehicle coordination. This platform connects passengers traveling along similar routes, allow- ing them to share rides in an organized and cost-effective manner.

The application leverages smart contracts to enable secure, automatic, and tamper-proof ride agreements between users, eliminating intermediaries while ensuring privacy and trust. The system optimizes vehicle capacity, reduces the number of vehicles on the road, and lowers emissions, contributing to a cleaner and greener environment.

By utilizing decentralized technology, the platform en- sures transparency in transactions and user data protec- tion. Autonomous vehicles are coordinated through algo- rithms that analyze routes and passenger needs, ensuring timely and efficient services. This innovation aims to revolutionize urban mobility by creating a smarter, moreconnected, and sustainable transportation ecosystem.

Keywords:- *Blockchain, Autonomous Vehicles, Ridesharing, Smart Contracts, Decentralized Systems, Urban Mobility, Sustainability.*

I. INTRODUCTION

Urbanization and growing reliance on personal vehicles have resulted in significant transportation challenges. Traffic congestion, environmental degra- dation, and rising fuel costs have underscored the need for innovative solutions to improve urban mobility. Collaborative Autonomous Rideshare of- fers a blockchain-based decentralized platform to address these issues by combining ridesharing with autonomous vehicle technology.

Unlike traditional systems, which are centralized and dependent on intermediaries, this platform uti- lizes blockchain for secure, transparent, and efficient operations. Autonomous vehicles enhance safety, reduce human error, and streamline traffic flow. Together, these technologies create a sustainable urban transportation model that reduces costs, improves trust, and minimizes environmental impact.

II. OBJECTIVES

➢ *The Objectives of the Collaborative Autonomous Rideshare Platform Are:*

- To reduce traffic congestion through the effi- cient coordination of shared rides.
- To minimize environmental impact by lowering carbon emissions and fuel consumption.
- To improve urban mobility by integrating blockchain and autonomous vehicle technolo- gies.
- To ensure transparency, trust, and data security through decentralized technology.
- To foster cost-effective and organized rideshar- ing by eliminating intermediaries.
- To promote a sustainable transportation ecosys- tem by optimizing vehicle utilization.

III. LITERATURE SURVEY

- Aguile´ra et al. [1] discuss carpooling challenges and potential solutions for sustainability in ridesharing practices.
- Chang et al. [2] highlight the integration of blockchain and smart contracts in creating costeffective ridesharing services.
- Cheikh-Graiet et al. [3] propose optimization techniques for carpooling, essential for designing user-matching algorithms.
- Rijavec et al. [4] examine the influence of decentralized systems on carpooling, emphasizing reduced environmental impact.

➢ *Proposed System*

The Collaborative Autonomous Rideshare sys- tem, branded as EcoRide, employs blockchain and autonomous technologies to address urban trans- portation issues. Key features include:

- **Smart Contracts:** Automate transactions and ride agreements securely.
- **Dynamic Matching Algorithm:** Matches pas- sengers and drivers based on proximity, route, and schedule.
- **Impact Dashboard:** Tracks individual and col- lective environmental contributions, encourag- ing eco-friendly behavior.
- **Blockchain-Based Payments:** Eliminate inter- mediaries, ensuring secure, transparent transac- tions.
- **Autonomous Navigation:** Optimizes routes in real-time for efficient travel.

➢ *Advantages of the Proposed System*

- **Environmental Benefits:** Reduction in carbon emissions and fuel usage through shared rides.
- **Cost Savings:** Lowers expenses for passengers and compensates drivers for their services.
- **Data Security and Privacy:** Blockchain tech- nology protects user information and transac- tion integrity.
- **User Accountability:** Community rating sys- tems foster trust and transparency.
- **Scalability:** Easily adaptable for different ur- ban areas and varying traffic conditions.

IV. METHODOLOGY

➢ *System Design and Development*

- **Decentralization**: Implements blockchain technology to connect users directly without intermediaries.
- **Smart Contracts:** Written in Solidity to auto- mate and secure ride agreements.
- **Technology Stack:** Uses Web3.js for blockchain integration and Ganache for testing.

➢ *Dynamic Matching Algorithm*

- Matches users based on time, location, and preferences.
- Real-time updates ensure timely notifications and optimal arrangement

➢ *Environmental Impact Tracking*

- Dashboards visualize reductions in emissions and fuel consumption.
- Gamified elements encourage users to choose eco- friendly options.

➢ *Testing and Iteration*

- Iterative testing ensures usability and effi- ciency.
- User feedback is integrated to refine algorithms and interfaces.

V. OUTCOME

➢ *The Proposed System Offers:*

- Reduced Emissions: Supports environmental sustainability by minimizing vehicle usage.
- Efficient Transportation: Dynamic matching and real-time routing reduce congestion.
- Enhanced Trust: Blockchain-based operations ensure transparency and security.

VI. CONCLUSION

Collaborative Autonomous Rideshare leverages blockchain and autonomous vehicle technologies to revolutionize urban mobility. It promotes sus- tainability, improves transportation efficiency, and fosters trust within communities. This innovative system addresses critical urban challenges, paving the way for a smarter and greener future.

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