SUMO Simulation Based Carbon Credit System to Incentivize Green Mobility

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Abstract: *The transportation sector is a significant contributor to global emissions, with road transport as a major contributor. Traditional emission control strategies such as carbon taxes, cap-and-trade systems and policy regulations often lack an effective mechanism for tracking individual vehicle emissions in real time. This paper proposes a SUMO Simulation based Carbon Credit Allocation System that collects real time data from simulation to monitor and quantify emissions per trip. The system creates a virtual representation of vehicles that allows precise emission tracking. It is facilitated with a credit-based incentive mechanism that rewards eco-friendly driving behaviors. The project ensures accuracy in emission estimation, while the credit allocation encourages sustainable transportation choices. Additionally, the system enhances transparency by providing data-driven insights for both policymakers and individuals via dashboard. Testing on two major factors demonstrated that high-speed driving results in 44% more CO_2 emissions compared to low-speed driving, whereas rough driving styles generate significantly higher emissions than normal driving. By leveraging real-time processing and adaptive learning models, the proposed system operates with high efficiency. It ensures scalable and accurate emission assessments, making it a capable solution for sustainable green mobility.*

Keywords: SUMO Simulation, Carbon Credits, Emission Estimation, Green Mobility, Incentives