

Peer Review

Review of: "Can Human Drivers and Connected Autonomous Vehicles Co-exist in Lane-Free Traffic? A Microscopic Simulation Perspective"

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1. The behavioral model assumptions for human-driven vehicles (HDVs) in the paper are overly simplified. For instance, the lateral decision formula (Eq. 3) uses an exponential decay factor to simplify the benefits of distant strips, but the parameter lacks empirical validation to reflect real driver trade-offs. Such oversimplification risks significant deviation between simulation results and real-world scenarios, undermining the credibility of the conclusions.
2. The combination of vehicle density (50–400 veh/km) and ring road length (1 km) in the experimental setup may introduce boundary effects. For example, at a 400 veh/km density, 400 vehicles are simulated on a 1 km ring road, resulting in extremely short inter-vehicle gaps (an average of 2.5 m). This starkly contrasts with real-world highway or urban traffic (typical gaps >10 m), potentially over-optimizing collision avoidance mechanisms and overestimating the LFT controller's real-world performance.
3. The performance validation of the APL controller is narrow in scope. The paper tests APL strategies only on a single ring road scenario, ignoring complex networks (e.g., intersections, ramps) or dynamic events (e.g., sudden congestion, accidents).
4. The claim that "60% CAV penetration is the threshold for LFT benefits" lacks statistical rigor. The authors derive flow data from only five random seed trials without providing confidence intervals or hypothesis testing. For example, the error margins for flow differences at 20% HDV penetration in Figure 11 are unclear, potentially leading to biased threshold conclusions.
5. Although the authors introduce a "safe acceleration" mechanism (Eq. 12) to avoid collisions, its effectiveness in extreme scenarios (e.g., sudden braking) is not evaluated.

6. The safety distance parameter ($X_{CM}=40\text{m}$) in the APL controller lacks any theoretical or experimental justification.

Declarations

Potential competing interests: No potential competing interests to declare.