Qeios

Peer Review

Review of: "Selfish Routing on Transportation Networks With Supply and Demand Constraints"

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Final Evaluation: Recommended for publication, with minor revisions to include more empirical insights.

Contributions:

This paper presents a novel approach to non-atomic selfish routing games, incorporating supply and demand constraints inspired by Daganzo's Cellular Transmission Model (CTM). Unlike traditional models, which mainly focus on flow-dependent link costs, this study integrates density constraints to better capture congestion effects in road networks.

Three main contributions are made:

- A novel selfish routing model that treats network links as cells with capacity-dependent travel times.
- Characterization of Wardrop Equilibria (WE) and Social Optima (SO) for the proposed game.
- Discovery of "Partial Transfer Wardrop Equilibria", where some exogenous flows fail to traverse the network due to congestion effects, revealing inefficiency beyond the traditional Price of Anarchy (PoA).

Remarks:

- Empirical Validation Needed: The study is purely theoretical. While the model is well-constructed, it would benefit from real-world traffic data validation.
- Limited Scope in Network Topology: The paper focuses mainly on parallel networks, which simplifies analysis but may not fully capture the complexity of real transportation systems.

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- Comparison with Alternative Traffic Models: While the authors compare their approach to prior works (e.g., density-based models, Stackelberg routing games), a more thorough quantitative comparison with competing models (e.g., dynamic traffic assignment models) would improve clarity.
- Policy Implications Not Fully Explored: The study uncovers inefficiencies in selfish routing but does not propose intervention strategies.

Declarations

Potential competing interests: No potential competing interests to declare.