

Public summary of PhD-thesis of Dong Wang

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Advances in Urban Traffic Network Equilibrium Models and Algorithms

Urban traffic network equilibrium models and algorithms have drawn much attention in transportation research. Their applications in network planning, transport policy evaluations, and traffic management face challenges to address rich behavior realisms responding to various supplies. This thesis aims to extend the existing urban traffic network equilibrium models and develop efficient solution algorithms.

Travel time uncertainty is unavoidable due to several factors and affects travelers' route choice behavior significantly. A generalized mean-variance metric and the corresponding user equilibrium model are proposed to help travelers choose a more reliable path under travel time uncertainty. Besides, we design a column generation algorithm to solve it without path enumeration. However, the computation time is large even for small general networks. Across the spatial and temporal dimensions, four tolerance-based strategies for extending the column generation algorithm are proposed by incorporating bounded rationality and dynamics. The resultant tolerance-based algorithm is efficient in solving the boundedly rational dynamic user equilibrium model. Based on the algorithm, two extensions of the car-sharing services and activity participation are investigated within the boundedly rational dynamic user equilibrium framework. On the one hand, car-sharing services have received increasing attention in the passenger mobility sector. The supply-demand dynamics of one-way car-sharing services are formulated and compared under different first-come-first-served mechanisms. On the other hand, since travel is derived from the needs to participate in activities, we refine the tolerance-based strategies for solving the boundedly rational dynamic activity-travel assignment problem.

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