Stochastic user equilibrium with a bounded choice model

Stochastic User Equilibrium (SUE) models allow the representation of the perceptual and preferential differences that exist when drivers compare alternative routes through a transportation network. However, as an effect of the used choice models, conventional applications of SUE are based on the assumption that all available routes have a positive probability of being chosen, however unattractive. In this paper, a novel choice model, the Bounded Choice Model (BCM), is presented along with network conditions for a corresponding Bounded SUE. The model integrates an exogenously-defined bound on the random utility of the set of paths that are used at equilibrium, within a Random Utility Theory (RUT) framework. The model predicts which routes are used and unused (the choice sets are equilibrated), while still ensuring that the distribution of flows on used routes accords to a Discrete Choice Model. Importantly, conditions to guarantee existence and uniqueness of the Bounded SUE are shown. Also, a corresponding solution algorithm is proposed and numerical results are reported by applying this to the Sioux Falls network.

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