A Stochastic Programming Model for Optimal Bus Lane Reservation under Uncertainty

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Bus lane reservation is an efficient traffic management way for improving bus transit performance. Deciding an optimal location of bus exclusive lanes to achieve timeefficient bus transit service is an important issue in the lane reservation area. In practice, some factors, i.e., link travel time and bus dwell time are varying as the actual demands change, and thus, it features with uncertainty. Different from the existing studies assuming constant link travel time and bus dwell time, this paper examines a new bus lane reservation problem under uncertainty for the first time. It aims to optimally select some lanes from the bus transit network to be reserved for the bus exclusive use such that the bus transit efficiency is improved and ensured, while subjecting to varying link travel time and stochastic bus dwell time. The objective is to minimize the total negative impact caused by reserved lanes. For this problem, this study firstly develops a stochastic programming model. Then, a hybrid intelligent algorithm integrating stochastic simulation and quantum-inspired evolutionary algorithm is proposed to solve it. This approach is applied to a real-world bus lane reservation problem in Hefei, China. The results show that the proposed method is able to produce satisfactory solutions for an actual bus lane reservation problem.