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Sensitivity analysis for transit network with distance effect. (Chinese. English summary)
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Summary: In order to accurately analyze the performance of transit network, the amplification effect of distance on the travelers’ perceived travel cost is considered, and a generalized travel cost function is proposed in the sensitivity analysis of transit network. Firstly, as to the influence of distance effect, a transit network model is established. Then the problem of common bus line and the passengers’ choice behaviors are coped with the hyperpath theory. Secondly, based on the equilibrium assignment of transit network, a sensitivity analysis method for transit network with distance effect is constructed in the perturbation problem of variational inequality. Finally, an example is used to analyze the changes in each arc and network performance when the transit network is affected by different factors, especially the distance. The results show that along with the demand increasing from 0 to 900 people per hour, the optimal travel strategy under the influence of distance is changed from the original single hyperpath to the multiple hyperpaths. In the identification of critical parameters, the distance factor is a sensitive parameter, which needs more accurate calibration in practice. At the same level of demand, when the distance parameter changes from 0 to 0.03, the derivatives of the total travel cost to bus service frequency noticeably declines, which can be utilized for finding the region such that the total travel time is likely to reduce.

MSC:
90B20 Traffic problems in operations research
90B10 Deterministic network models in operations research

Keywords: transit assignment; distance effect; sensitivity analysis; variational inequality

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