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Multi-objective transport network design with a reversible simulated annealing algorithm

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ABSTRACT

In order to rationally coordinate inconsistent objectives in transport network design, this research newly develops a multi-objective network layout optimisation model solved by an improved Simulated Annealing Algorithm (SAA). Two temperature control variables and one cost difference control variable are defined in the proposed SAA. They work in cooperation to restart the optimum search from the latest temporary optimal solution if the search is made excessively in any searching direction as well as expand the searching area for the globally optimal network layout with the minimum operation cost. The genetic algorithm is embedded into the reversible SAA to iteratively provide a network configuration with the minimum total time expense of all the transports for the minimisation of the network operation cost. It is confirmed that the new optimisation model solved by the reversible SAA integrating the genetic algorithm is able to effectively minimise both the total transport time expense and the network operation cost with searching for the best fits between these two basically inconsistent objectives from different perspectives. The proposed approach can be utilised to optimise configurations of not only urban transit lines for passenger mobility organisation but also logistics transportation routes for manufacturing production management.

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