AN INTERSECTION ORIGIN-DESTINATION FLOW OPTIMIZATION PROBLEM FOR EVACUATION NETWORK DESIGN

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Abstract
In a lane-based evacuation network design problem that incorporates lane reversal and crossing elimination strategies, the network can be virtually decomposed to a number of roadway subnetworks and intersection subnetworks. Lane reversal and crossing elimination are implemented on roadway subnetworks and intersection subnetworks, respectively. While this network decomposition mechanism naturally offers an appealing algorithmic approach for network solutions by relaxing the crossing elimination constraints, one needs to consider—from the solution feasibility perspective—the mutual connectivity requirements imposed by the two capacity- and connectivity-re allocation network settings simultaneously. This paper considers an intersection origin-destination flow distribution problem arising from the evacuation network design, and outputs whether the crossing elimination constraints are satisfied or violated given a lane reversal solution. The main contribution of this work is to provide a sufficient condition of network flows for problem existence and validity and develop an efficient simplex-based method for problem solutions. Numerical examples are provided to illustrate the method’s effectiveness and efficiency.

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