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A Differential Game Modeling Approach to Dynamic Traffic Assignment and Signal Control

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Abstract

This paper addresses a theoretical issue related to combined dynamic traffic assignment and signal control under conditions of congestion through a brief review of previous research and the discussion on interaction between dynamic traffic assignment and signal control. The dynamic characteristics of the interaction are approached using a differential game modeling approach here to formulate the decision-making process for solving the problem inherent in this combination. Specifically, the combined dynamic traffic assignment and signal control problem is formulated as a leader-follower differential game, where a leader and multiple followers engage interactively to finding optimal strategies under the assumption of an open-loop information structure. Discretization in time is used to find a numerical solution for the proposed game model, and a simulated annealing algorithm is applied to obtain optimal strategies. Finally, a simulation study is conducted on a simple traffic network in which numerical results demonstrate the effectiveness of the proposed approach.

Keywords: dynamic traffic assignment, signal control, differential game theory

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