Journal of Cellular Automata

Volume 8, Issue 3-4, 2013, Pages 261-282

A traffic model based on fuzzy cellular automata

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Abstract

Cellular automata (CA) play an important role in the development of computationally efficient microscopic traffic models and recently have gained considerable importance as a mean of optimising traffic control strategies. However, real-time application of the available CA models in traffic control systems is a difficult task due to their discrete and stochastic nature. This paper introduces a novel method for simulation of signalised traffic streams, which combines CA and fuzzy numbers. The introduced traffic simulation algorithm eliminates main drawbacks of the CA approach, i.e. necessity of multiple Monte Carlo simulations and calibration issues. Computational cost of traffic simulation for the proposed algorithm is considerably lower than the cost of simulation based on stochastic CA. Thus, the simulation results can be obtained in a much shorter time. Experiments confirmed that the simulation results for the introduced algorithm are consistent with that observed for stochastic CA. The proposed simulation algorithm is suitable for real-time applications in traffic control systems. © 2013 Old City Publishing, Inc.

Author keywords

Cellular automata; Fuzzy numbers; Real-time computing; Road traffic simulation; Saturation flow; Traffic dynamics; Traffic signal control

Indexed keywords

Fuzzy numbers; Real time computing; Road traffic simulation; Saturation flow; Traffic dynamics; Traffic signal control

Engineering controlled terms: Algorithms; Automata theory; Cellular automata; Control systems; Fuzzy rules; Monte Carlo methods; Stochastic models; Stochastic systems; Traffic signals

Engineering main heading: Street traffic control

ISSN: 15575969 **Source Type:** Journal **Original language:** English
Document Type: Article

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