

Analytical Solution of Traffic Cellular Automata Model

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Abstract

Complex traffic system seems to be simulated successfully by cellular automaton (CA) models. Various models are developed to understand single-lane traffic, multilane traffic, lane-changing behavior and network traffic situations. However, the result of CA simulation can only be obtained after massive microscopic computation. Although, the mean field theory (MFT) has been studied to be the approximation of CA model, the MFT can only applied to the simple CA rules or small value of parameters. In this study, we simulate traffic flow by the NaSch model under different combination of parameters, which are maximal speed, dawdling probability and density. After that, the position of critical density, the slope of free-flow and congested regime are observed and modeled due to the simulated data. Finally, the coefficients of the model will be calibrated by the simulated data and the analytical solution of traffic CA is obtained.

Keyword: traffic flow, analytical solution, cellular automata.