Three-Step Traffic Cellular Automata Procedure

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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. CA-based (or so-called multi-agent based) traffic simulators has been developed to simulate network traffic so as to design traffic signal, predict route choice and evaluate the performance of traffic management strategies. Therefore, a rapid and robust traffic CA procedure is necessary. Generally, traffic CA models are proposed based on the NaSch model, which is a four-step procedure. In this study, a three-step traffic CA procedure is proposed and compared with the NaSch model. According to the analysis of procedure and the numerical results, the computational efficiency of the three-step procedure is faster than the NaSch model. The simulated speed and flow of the three-step procedure are higher than the simulated speed and flow of the NaSch model. The three-step procedure also can be coupled with the high-speed、velocity-dependent randomization and slow-to-start rules. In addition, two-lane and three-lane traffic flow are simulated by the three-step procedure successfully. Therefore, the three-step procedure can be an alternative traffic CA model to predict traffic flow or develop simulator.

Keyword：traffic flow; cellular automata; slow-to-start; multi-lane