Parameter Instability and Phase Transition of Traffic Cellular Automata

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Abstract

Phase transition is an important phenomenon in traffic flow study. If the transition behavior can be described and predicted accurately, better traffic control and management could be achieved. Traffic flow models are classified into two-, three- and four-phase models and are analyzed by empirical data. The basic traffic cellular automata model, the NaSch model, is considered as a two-phase model. In this study, we suggest that even the NaSch model is a multi-phase traffic flow model when the parameters, which are the maximum speed and dawdling probability, vary during simulation. Furthermore, if multi-class users traffic is considered, complicated phase transition could be observed even under the periodic boundary condition.

Keyword：traffic flow, phase transition, cellular automata