Cellular automata simulation for mixed manual and automated control traffic

羅仕京,徐嘉鴻
Transportation Technology and Logistics Management
Management
sclo@aa.nctu.edu.tw

Abstract

Complex traffic systems seem to be simulated successfully by cellular automaton (CA)
models today. Various models are developed in efforts to understand single-lane traffic,
multilane traffic, lane-changing behavior and network traffic flow. In this study, four
cellular automata (CA) rules for advanced vehicle control and safety systems (AVCSS) are
proposed and simulated. The major difference among the rules is the different settings of
the gap, which is defined to be the distance between two successive vehicles. The gap of
each rule is given depending upon the speed of vehicles. According to the results, CA rules
with AVCSS (the H0, H1, H2 and H3 models) lead to a more stable traffic flow than rules
without AVCSS. Also, the average flow and speed for CA rules with AVCSS are larger than
the average flow and speed for rules without AVCSS. However, the average speeds of the H1
and H2 models fluctuate greatly, which is considered unsafe and unreliable, in a congested
regime. The results from the H0 and H3 rules are more stable than the results from the H1
and H2 models. The H3 rule keeps a larger gap between two successive vehicles; therefore,
the H3 rule is considered the best design of the four AVCSS CA rules. If a

combinative rule
is considered, the envelope of the speed density curves of the four models might provide
an optimal design, presenting a larger speed and flow than the H3 model. Therefore, an
efficient design of AVCSS might be obtained by CA simulation.

Keyword：Traffic flow, Advanced vehicle control and safety systems, Multi-class user traffic