

Macroscopic Lane-Changing Model of Traffic Flow on Multi-Lane Freeway

Benchawan Wiwatanapataphee¹, Nathnarong Khajohnsaksumeth^{2*},
Yong Hong Wu³

¹School of Electrical Engineering, Computing and Mathematical Science, Curtin University, Perth 6102, Australia

b.wiwatanapataphee@curtin.edu.au

²Department of Mathematics, Faculty of Science, Mahidol University, Bangkok 10400, Thailand;
Centre of Excellence in Mathematics, Bangkok 10400, Thailand

nathnarong.kha@mahidol.ac.th

³School of Electrical Engineering, Computing and Mathematical Science, Curtin University, Perth 6102, Australia

Y.Wu@curtin.edu.au

Abstract

Aggressive lane-changing drivers have greatly affected traffic congestion which leads to reduced traffic capacity and safety. To improve traffic capacity, accurate lane-changing traffic flow model is required. This paper presents an unsteady macroscopic lane-changing model with external/internal boundary conditions to describe freeway traffic flow condition. Three main factors including lane-changing spacing intervals, ramp metering and variable speed limit affecting the flow condition are considered in this study. Numerical solutions based on the generalized Lax-Hopf formula are carried out. The model results are validated by the data sets obtained from microscopic car-following experiments.

Keywords: macroscopic traffic flow model, lane-changing model, Lax-Hopf formula

*Corresponding author.