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Demonstration of disturbance propagation in traffic flow for enhancement of vehicle platoon control system

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Disturbance propagation and string stability of a large vehicle platoon that consists of a part of the traffic flow is closely related to traffic shockwaves and oscillation. In this respect, the concepts of the estimation and prediction of shockwave propagation speeds and congestion should be considered in order to establish a control strategy for safe conditions without collisions even when the congestion is amplified in an unstable string of the large platoon. This means that an advanced approach for a car-following control strategy, which includes a time delay and non-linearity terms, is necessary for the enhancement of Vehicle Platoon Control (VPC) and the system robustness. In this research, we have demonstrated the effect of the disturbance propagation phenomenon on traffic flow stability. The traffic flow shockwave and oscillation are interpreted in terms of both macroscopic and microscopic approaches. We also discuss how the phenomenon affects VPC systems based on the optimal velocity model (OVM), which is an advanced car-following model. In addition, we improve the OVM, which is called the advanced OVM, by including a term for the delay time and by setting up a boundary condition of acceleration in order to enhance the VPC system and to ensure its robustness

Biography

Jinsoo Kim received the BS degree in Traffic Engineering from Hanyang University, Seoul, Korea, in 2010 and the MS degree in Traffic Engineering from Hanyang University, Seoul, Korea, in 2012. He is currently pursuing his PhD degree in Mechanical Convergence Engineering at Graduate School of Hanyang University. From 2013 onwards, he is Research Assistant with the Institute of Mechanical Technology, Hanyang University, Seoul, Korea. His research interest includes the development of intelligent vehicle and traffic systems through vehicle and traffic flow dynamics with optimal control. His awards and honors include the Global PhD Fellowship (National Research Foundation of Korea grant funded by the Korea government (MEST)), the Best Paper Award in Proceedings of the ITS Conference and the Prize of Korean Society of Transportation.

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