

Study of Velocity Control Algorithm of Vehicle Platoon

Y. SUGIMOTO¹, T. TAMAKI², Y. WAKITA³, E. KITA⁴

¹ Nagoya University, 464-8601 Nagoya, JAPAN.

² Okinawa National College of Technology, 905-2171 Nago, JAPAN.

³ Nagoya University, 464-8601 Nagoya, JAPAN.

⁴ Nagoya University, 464-8601 Nagoya, JAPAN.

E-mail address: kita@is.nagoya-u.ac.jp

Grouping vehicles into platoons is a method of increasing the capacity of roads. Platoons decrease the distances between vehicles using electronic, and possibly mechanical, coupling. The automated highway system is a proposal for one such system, where cars organize themselves into platoons.

The key-point of the vehicle platoon is to adequately control the vehicle velocity. The velocity control model is defined as the ordinary differential equation of the information from the nearest leader vehicle (the distance or the velocity). In this study, the platoon of five vehicles is considered as the example. Each follower vehicle has one, two, three or four leader vehicles. The velocity control model of the follower vehicle is defined so that the velocity depends on the velocity of the all leader vehicles[1, 2]. It is considered as the steady state that all vehicles move at identical velocity. Model stability analysis around the steady state gives the stable condition of the sensitivities from a vehicle to its leader vehicles. In this study, maximization of the sensitivities reveals that the vehicle velocity depends only on the nearest leader and the lead vehicles of the platoon. Finally, traffic simulations of the vehicles platoon are shown in order to discuss the validity of the model.

References

- [1] R. E. Chandler, R. Herman, and E. W. Montroll. Traffic dynamics studies in car-following. *Operations Research*, Vol. 6, No. 2, pp. 165–184, 1958.

- [2] S. Bexelius. An extended model for car-following. *Transportation Research*, Vol. 2, No. 1, pp. 13–21, 1968.