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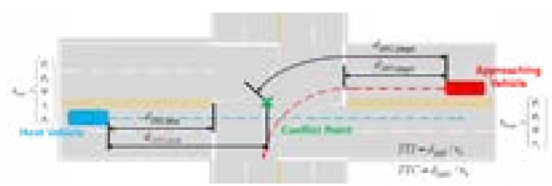
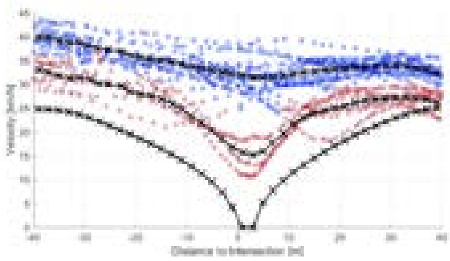
Decision and motion planning at intersection for urban automated driving

Automated vehicles are expected to be the sustainable future for safe driving, efficient traffic, and reduced energy consumption. Almost every challenge concerning modern road traffic such as traffic jam, road fatalities, carbon emissions, and parking space can be solved by smart mobility system such as automated vehicle-based car sharing. Most of major automakers have already commercialized various advanced driving assistance systems (ADAS) to enhance driving safety and to reduce driving workload, and are planning to commercialize Level 3~4 automated vehicles for personal mobility from the year of 2020. As of 2018, automated vehicle-based smart mobility systems are operated in several sites and it is expected that smart mobility services with large fleets of automated vehicles will be available in 100 cities in the year 2025. Although still there exist many technical challenges concerning full automated driving in urban environments, there has been rapid progress in the field of automated vehicles. In this talk, technical issues and recent developments for automated driving in urban environments will be presented. A hierarchical structure for decision and motion planning for autonomous driving at unsignalized intersection has been developed. Based on real road driving data analysis an intelligent driver-veicle models for cross-first or yield has been developed. Index variables for target intension inference at intersection have been defined and interacting multiple model (IMM) based intention inference scheme has been developed. A target inrention inference-based decision and motion planning has been investigated via computer simulation and successfully implemented on an automated driving vehicles.





Recent Publications

1. Donghoon Shin et al. (2018) Human-centered risk assessment of automated vehicle using vehicular wireless communication. PP(99):1-15. IEEE Transactions on Intelligent Transportation Systems. Doi:10.1109/TITS.2018.2823744.
2. Junyung Lee et al. (2015) Automated driving control in safe driving envelope based on probabilistic prediction of surrounding vehicle behaviors. SAE Int. J. Passeng. Cars – Electron. Electr. Syst. 8(1):207-218. Doi:10.4271/2015-01-0314.

3. Beomjun Kim et al. (2015) An IMM/EKF approach for enhanced multi-target state estimation for application to integrated risk management system. IEEE Transactions on Vehicular Technology. 64(3): 876-889. Doi:10.1109/TVT.2014.232947.
4. Hakgu Kim et al. (2016) Time-varying parameter adaptive vehicle speed control. IEEE Transactions on Vehicular Technology. 65(2):581-588. Doi:10.1109/TVT.2015.2402756.
5. Jongsang Suh et al. (2016) Design and evaluation of a model predictive vehicle control algorithm for automated driving using a vehicle traffic simulator. Control Engineering Practice. 51:92-107. Doi:10.1016/j.conengprac.2016.03.016.

Biography

Kongsu Yi obtained his BS and MS Degrees in Mechanical Engineering from Seoul National University (SNU) Republic of South Korea in 1985 and 1987, respectively, and PhD Degree in Mechanical Engineering from the University of California, Berkeley (USA) in 1992. He is currently a Professor at the School of Mechanical and Aerospace Engineering of SNU. He currently serves as a Member of the Editorial Boards of the *KSME, IJAT* and *ICROS* journals. His research interests are control systems, vehicle dynamics, driver assistant systems and automated driving of ground vehicles.

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