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Integrated risk management system based automated driving

This paper describes integrated risk management based automated driving vehicles. The first objective is to propose an original probabilistic threat assessment method to completely predict and avoid all possible kinds of collision in multi-vehicle traffics. The main concerns of risk management can be divided into three requirements: 1) A traffic situation including the geometric description of the road, dynamics and static obstacle tracking; 2) a prediction of reachable set of other traffic participants under the reasonable behavior constraints such as road boundary; and 3) an assessment of collision risk that corresponds with driver sensitivity and can be applied to many complex situations. In order to follow these three requirements, the integrated risk management system for estimating the collision probability of the ego vehicle uses the basic idea of the particle filtering. The second objective is to plan and control the desired behavior of the automated driving. According to an analysis of vehicle behaviors, it can be summarized as 2 cases: Lane changing and lane keeping. From the collision risk information, motion planning algorithm determines lane change timing and direction. A safe driving envelope is defined as constraints of behaviors of other traffic participants based on the risk management. To obtain a desired steering angle and longitudinal acceleration, the vehicle controller is designed using a predictive control. The overall performance of the proposed algorithm is verified via simulation and vehicle tests. It has been shown that the proposed algorithm can manage complicated driving scenarios while guaranteeing safety.

Biography

Kyongsu Yi received his BS and MS degrees in Mechanical Engineering from Seoul National University, Korea, in 1985 and 1987, respectively, and the PhD degree in Mechanical Engineering from the University of California, Berkeley, in 1992. He is a Professor at the School of Mechanical and Aerospace Engineering at Seoul National University, Korea. He currently serves as a Member of the Editorial Boards of the *KSME*, *IJAT* and *ICROS* journals. His research interests are control systems, driver assistant systems and active safety systems of a ground vehicle.

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