Driver Behavior Analysis and Inter-Vehicular Collision Simulation Approach

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Abstract : The safety test of deploying intelligent connected vehicles (ICVs) on the road network is a critical challenge. Road traffic network simulation can be used to test the functionality of ICVs, which is not only time-saving and less energy-consuming but also can create scenarios with car collisions. However, the relationship between different human driver behaviors and the car-collision occurrences has been not understood clearly; meanwhile, the procedure of car-collisions generation in the traffic numerical simulators is not fully integrated. In this paper, we propose an approach to identify specific driver profiles from real driven data; then, we replicate them in numerical traffic simulations with the purpose of generating inter-vehicular collisions. We proposed three profiles: (i) 'aggressive': short time-headway, (ii) 'inattentive': long reaction time, and (iii) 'normal' with intermediate values of reaction time and time-headway. These three driver profiles are extracted from the NGSIM dataset and simulated using the intelligent driver model (IDM), with an extension of reaction time. At last, the generation of inter-vehicular collisions is performed by varying the percentages of different profiles.

Keywords : vehicular collisions, human driving behavior, traffic modeling, car-following models, microscopic traffic simulation

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