博士學位論文紹介

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(Design of driver's workload prediction model through virtual AHS simulator development)
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The AHS(Automated Highway Systems) is regarded as the highest and the top level of ITS(Intelligent Transport Systems) technology as the solution of land transportation problem through steering and speed control automation. Human factors considerations are the crucial issues for AHS design because human driver should be involved in AHS use, even if there is no need to control the steering and speed during automated driving. Because all roads will not be automated economically and technically, so the drivers should drive the vehicle manually before and after automated driving instructing the entrance/exit location, changing the driving authority, and taking control in some emergency situations. And, the newly developed in-vehicle information systems will be equipped in a vehicle that are the additional visual, mental, and cognitive workloads sources to the driver. Then, human factors investigation and prediction of AHS driver's workloads will play an important role in designing the AHS configuration and driver-vehicle interface to minimize negative impacts and to maximize the system usability that are deeply related to the AHS safety by considering the driver's capabilities and limitations for the successful implementation of the AHS.

The objective of this thesis has two-folds. On one hand, this thesis predicted and modeled the demanded workloads of AHS driver among pre- and post-AHS manual driving lane, AL(Automated Lane), and two TLs(Transition Lane) using reaction time(secondary task), GSR(Galvanic Skin Response), EOG(Electrooculography), steering entropy, and RNASA-TLX(Revision of National Aeronautics and Space Administration-Task Load Index). Vehicle speed data also compared to investigate the carry-over effect at 120kph, 140kph, and 160kph automated driving speeds. Experiments results indicated that there required the higher driver's workloads in TLs and post-AHS driving road sections than pre-AHS manual road section without significant effects of AHS speeds. It means that the human factors engineers should consider the workload reduction and performance improvement strategies when design the AHS road-driver-vehicle interface. As the result, AHS driver's workload prediction model was suggested using above dependent measures.

On the other hands, this thesis proposed the specification and driver-vehicle interface of fixed-base AHS simulator that based on the 'shared at grade concept' not only for the human factors researches, but also for the expansion of advanced network-based multi-user simulator that could helpful to investigate the interactions among drivers or vehicles in various AHS road and traffic situations.