

## 【Grant-in-Aid for Scientific Research (S)】

### Integrated Disciplines (Complex Systems)



#### Title of Project : Design for Driving Automation and Legal Systems Conforming to Characteristic Features and Limitations of Cognition and/or Decision Making of Human Drivers

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Research Area : Social/Safety System Science

Keyword : Automated driving, Human factors, Authority and responsibility, Negligence liability

#### 【Purpose and Background of the Research】

Automated driving has been attracting the attention from wide variety of people expecting a bright future for the vehicle of the next generation. It should be noted, however, that automation has both positive and negative sides, as we have learnt through accidents of glass-cockpit aircraft. We need to work unflinchingly on unsolved technical as well as non-technical problems in order to realize sensible automated driving systems that can be accepted by the society.

This project aims to develop theories and methodologies for design of driving automation and legal systems reflecting characteristic features and limitations of cognition and/or decision of human drivers. More precisely, this project tries to identify mismatches between humans' understanding of and/or expectation on driving automation and humans' responsibility that are assumed by the machine. This project also tries to propose a new legal system suitable for the age of driving automation.

#### 【Research Methods】

To accomplish the above-mentioned goals, the following three Research Aspects are set up in this project: Human Factors (HF) Research Aspect, Engineering Design (ED) Research Aspect, and Authority and Responsibility (AR) Research Aspect. The HF Research Aspect's goals are: (1) to identify human factors in driving automation with solutions, (2) to formulate guidelines for design of human-machine interface, and (3) to develop training programs for enhancing driver's resilience in cases of unexpected events.

The ED Research Aspect's goals are: (1) to develop systematic methods for finding out 'missing levels of automated driving' in the list by NHTSA, SAE, or BAST, (2) to identify an optimal level of automation for performing safe and smooth transfer of control authority from the automated driving system to the human driver when the system requests, and (3) to develop safety control mechanisms for cases of

traffic conditions which the automated driving systems may not be able to cope with.

The AR Research Aspect's goals are: (1) to identify problems of the current legal system when the automated driving systems are put into the real world, (2) to develop a new legal theory for analyzing negligence liability when using driving automation, and (3) to propose a new system for driver's license in the age of driving automation.

#### 【Expected Research Achievements and Scientific Significance】

This project investigates driving automation from various viewpoints including human factors, trust in and reliance on automation, systems reliability, safety control, human-machine interface design, criminal law, and civil law. New theories and methodologies developed in this project will be used in some government-initiated programs, such as CAO's SIP program for automated driving and MLIT's ASV program.

#### 【Publications Relevant to the Project】

- T. Inagaki & T.B. Sheridan. Authority and responsibility in human-machine systems: Probability theoretic validation of machine initiated trading of authority. *Cognition Technology & Work* 14 (29-37) 2012.
- T. Inagaki & M. Itoh. Human's overtrust in and overreliance on advanced driver assistance systems: A theoretical framework. *Int'l J Vehicular Tech*, doi:10.1155/2013/951762

【Term of Project】 FY2015-2019

【Budget Allocation】 153,400 Thousand Yen

#### 【Homepage Address and Other Contact Information】

<http://www.risk.tsukuba.ac.jp/~inagaki/eng/coagency.html>