# Technological and Legal Considerations for the Design of Interactions between Human Driver and Advanced Driver Assistance Systems

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## 1. Introduction

Among various modes of transportation, automobile has distinctive characteristics in the sense that its driver is not trained extensively so that he/she can utilize smart machines properly. Various negative side effects can happen even for fully trained operators (such as aircraft pilots). Careful considerations are necessary in the design of smart machines for automobile by taking into account possible interactions between the driver and such smart machines.

Driving a car requires a continuous process of perception, situation understanding, action selection, and action implementation. Various functions are implemented in an Advanced Driver Assistance System (ADAS) to assist a human to drive a car in a dynamic environment. Such functions include: (a) perception enhancement, (b) arousing attention to potential risks, (c) setting off a warning, and (d) automatic safety control (Inagaki 2008). The first two functions, (a) and (b), are to help the driver to understand the situation. Understanding of the current situation determines what action needs to be done (Hollnagel & Bye 2000). Once situation-diagnostic decision is made, action selection is usually straightforward, as has been suggested by recognition-primed decision making research (Klein 1993). However, the driver may sometimes feel difficulty in action selection decision. Function (c) is to help the driver in such a circumstance. ADAS that uses only the three functions, (a) – (c), is completely compatible with the human-centered automation principle (Billings 1997, Inagaki 2006) in which the human is assumed to have the ultimate authority over the automation.

Smart ADAS sometimes contains the forth function, (d). Such an ADAS may not always be fully compatible with the human-centered automation, because the system can implement an action that is not ordered by the driver explicitly. Although the automatic safety control functions are usually effective and indispensable for attaining driver safety, discussions are still going on regarding to what extent the system may be given authority to decide and act autonomously without human intervention.

Moreover, as for the function (d), the following question is frequently asked: “When the ADAS is capable of coping with the situation automatically without any intervention of a driver, is not it possible for the driver to place too much trust in the system and give up active involvement in driving?” As a matter of fact, the Ministry of Land, Infrastructure and Transport (MLIT), the Government of Japan, has been discreet in introducing highly automatic safety control functions into ADAS on concern that drivers may place overtrust in or overreliance on automation. However, discussions regarding overtrust and overreliance have not been rigorous enough up to about a year and a half ago.

A task force was set up in December 2009 in the MLIT's Advanced Safety Vehicle (ASV) project to investigate the issue of the driver’s overtrust in and overreliance on the ADAS, as well as that of authority and responsibility between the driver and the smart machines. As leader of the task force, the author would like to report our discussions on these issues.

The first issue, the driver's overtrust and overreliance on the ADAS, has been investigated based on a theoretical framework (Inagaki 2011), in which two axes, (a) dimension of trust (Lee & Moray 1992) and (b) chance of observations, are introduced for discussing overtrust in the ADAS, and two more axes, (c) benefits expected and (d) time allowance for human intervention, are distinguished for discussing overreliance on the ADAS. The framework has been successful in finding that the driver’s overtrust and overreliance on ADAS differ appreciably depending on whether the ADAS is for use in routine situations or for use in crisis situations. For instance, it is conjectured that an adaptive cruise control (ACC) system may induce the driver’s overtrust and/or overreliance more easily than an advanced emergency braking system (AEBS). The conjecture has been recently confirmed through a survey by questionnaire distributed to users of ACC and AEBS. The issue of overtrust and overreliance is currently investigated for situations in which vehicle-to-vehicle communication technology is introduced. It has been identified the imprecision of GPS data can cause overtrust in and distrust of proximity information obtained through vehicle-to-vehicle communication.

The second issue, authority and responsibility between the driver and the smart machines, has been investigated mainly for crisis situations, in which two categories of cases are distinguished. The first category is for cases in which the driver is in his/her good health conditions, in spite of possibilities of (internal or external) distractions. The second category, on the other hand, is for cases in which the driver becomes incapacitated while driving due to some sickness or disease. The discussions have been made for both categories by taking into account malfunctions of ADAS (such as, physical failures, logical faults, and limitations of ADAS, inappropriate design of human-machine interface, conflict of intentions between the driver and ADAS, and so on) as well as human errors committed by the driver. Legal aspects have been analyzed for each case to identify responsibility of drivers, designer and manufacturer of ADAS, automobile dealers, and regulatory authority.

## 2. Advanced Safety Vehicle: A Japan’s National Project

Advanced Safety Vehicle (ASV) is a car equipped with technology-based driver assistance systems to enhance safety under normal as well as time-critical situations. The ASV Project aims to promote development of new technologies for reducing traffic accidents. The project is carried out through collaboration between vehicle manufacturers, related organizations (such as user associations, insurance companies, dealer associations), academia and government agencies (such as National Police Agency, Ministry of Internal Affairs and Communications, Ministry of Economy, Trade and Industry, Ministry of Land, Infrastructure and Transport) (MLIT 2007).

The ASV Project was kicked off in 1991. In ASV-1, the first 5-year phase of the project, technological possibilities and accident reduction effects were investigated. In ASV-2 (1996-2001), ASV design principles and technology development guidelines were established. Demonstrations and exhibitions were also made with 35 ASVs. In ASV-3 (2001-2006), driver assistance concept was developed, and ASV popularization strategies were examined. Up to ASV-2, driver assistance systems of the onboard self-sensing type had been investigated. Such standalone systems can cope with hazards that are within the driver’s field of view or its equivalent. However, they may fail to detect hazards that are outside or barely within the driver’s field of view. To cope with such hidden hazards, communication-based functions were introduced to ASVs. Driver assistance systems of the communication-based type can obtain necessary information through road-to-vehicle and vehicle-to-vehicle communications. In 2005, verification tests were made with a total of 17 vehicles (9 passenger cars, 4 heavy vehicles and 4 motorcycles). In ASV-4 (2006-2011), communication-based driver assistance functions were further developed. In collaboration with the ITS promotion Council, large-scale experiments were conducted on public roads in four areas of Japan in order to evaluate and validate efficacy of communication-based and onboard sensing-based driver assistance functions.

Fig. 1 depicts the ASV design principles (MLIT 2007). Although ASV technologies provide drivers with various assistances, it is assumed that drivers should play the primary role in driving vehicles safely. In other words, the driver is responsible for safe driving. The principle coincides with the Convention on Road Traffic (1968) and *human-centered automation* principle (Woods 1989, Billings 1997) in which the human bears the ultimate responsibility for system safety and thus human locus of control is assumed: Authority and responsibility are interconnected.

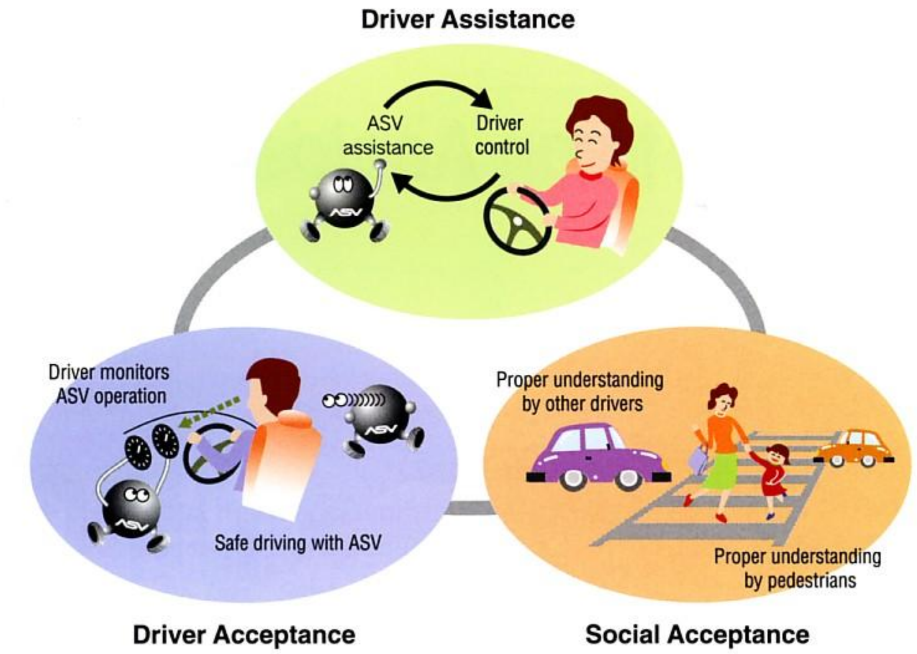


Fig. 1 ASV design principles (MLIT 2007)

Fig. 2 illustrates the ASV design guidelines, where the following points are requested to be satisfied for interactions between the driver and the assist system (MLIT 2007):

(1) The system should act in line with intent of the driver.
(2) The system should assist the driver to perform safe driving and steady operation.
(3) The driver should monitor operations of the assist system when it is in action.
(4) The system should not cause overconfidence or over-trust of the driver.
(5) The system, when it is in action, should allow the driver's intervention to override its operation.
(6) The system's control should be smoothly passed over to the driver when the situation goes beyond the range of the system.

The design principle and the guidelines above were established through investigations of negative effects of automation, such as loss of situation awareness, overtrust, distrust, automation surprises (see, e.g., Woods 1989, Wickens 1994, Endsley & Kiris 1995, Sarter & Woods 1995, Parasuraman & Riley 1997, Sarter et al 1997).

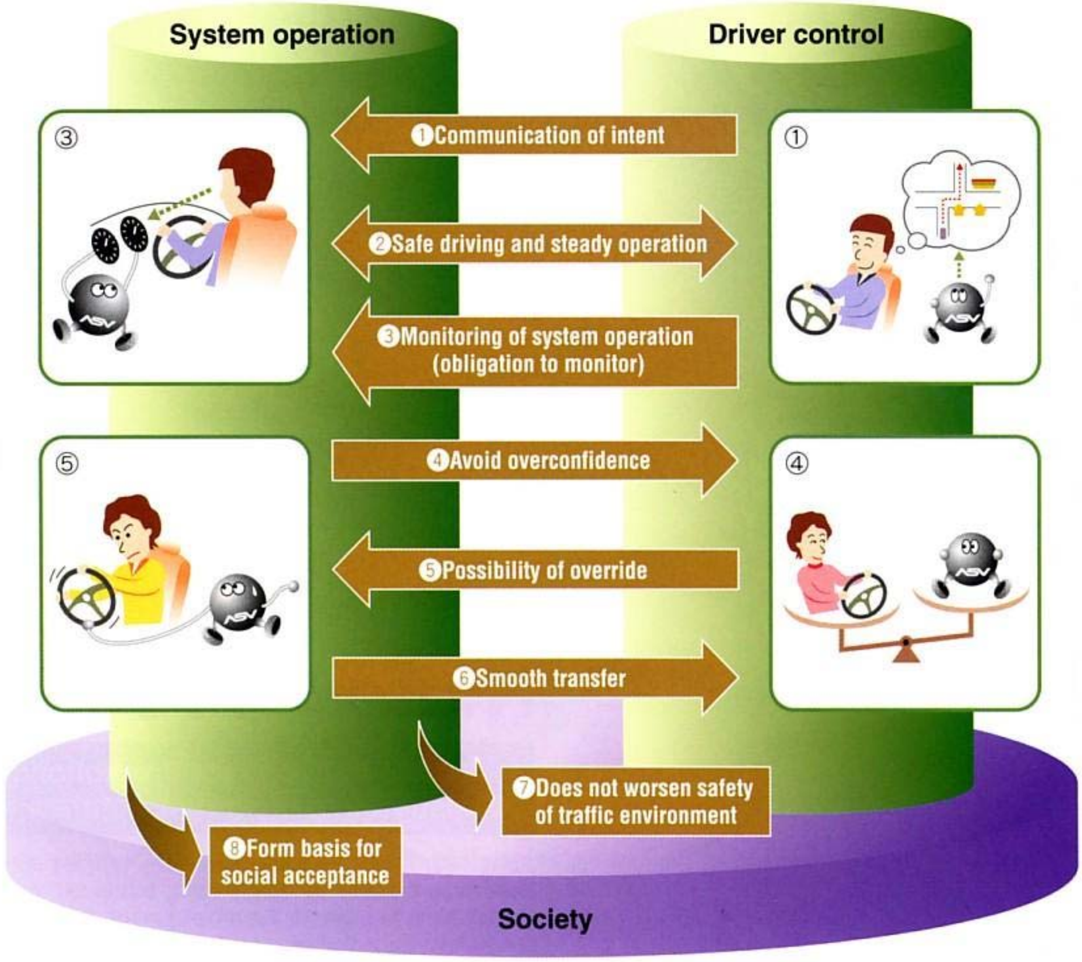


Fig. 2 ASV technology development guidelines (MLIT 2007)

The ASV project has developed various systems that provide the drivers with assistances for perception, cognition, and action selection. However, Ministry of Land, Infrastructure and Transport (MLIT) as well as National Police Agency of the Government of Japan have been taking a cautious stance on putting systems into practical use when the assistance systems are for action implementation. It is true, of course, that there are such systems. The adaptive cruise control (ACC) and the lane keeping assistance (LKA) are examples of systems for assisting driver's action implementation by *relieving* the driver's load. The electronic stability control (ESC) and the antilock brake system (ABS) are also examples of systems for assisting driver's action implementation by *amplifying* or *extending* the capabilities of the driver.

The arguments become different when it comes to the assistance systems that have capabilities to *back up* or *replace* the driver. Take, as an example, the advanced emergency braking system (AEBS). When the host vehicle is approaching relatively fast to a lead vehicle, most AEBS firstly tightens the seat belt and adds a warning to urge the driver to put on the brake. If the AEBS determined that the driver is late in braking, then it applies the brake automatically based on its decision. However, the AEBS has been implemented in Japan as a *collision damage mitigation system*, in stead of as a *collision* *avoidance system*. Behind the design decision to 'downgrade' the AEBS, there has been concern among the regulatory authorities that "If a driver assistance system would perform every safety control action automatically, the driver may become overly reliant on the assistance system, without paying attention to the traffic situations himself or herself."

Although the above 'concern' seems to be reasonable, there have been some discussions in the ASV project that more precise investigations would be necessary so as not to lose opportunities for the drivers (especially, elder drivers) to be benefited by the assistance system that may back up or replace them when appropriate. The MLIT set up a task force in December 2009 in the ASV project to investigate future directions of driver assistance in light of (1) driver's overtrust in and overreliance on the ADAS and (2) authority and responsibility between the driver and the automation.

## 3. Overtrust and overreliance

This section gives an overview of the theoretical framework that the author used at the ASV task force to discuss issues of overtrust in and overreliance on driver assistance systems (Inagaki 2011). The two terms 'overtrust' and 'overreliance' are differentiated rigorously, although they sometimes have been used as if they were synonyms.

### 3.1 Overtrust

Overtrust in a driver assistance system is an incorrect *diagnostic decision* to conclude that the assistance system is trustworthy, when it actually is not. Two axes are introduced for discussing overtrust in the assistance system. The first axis is the *dimension of trust* and the second the *chance of observations*.

#### 3.1.1 Dimension of trust

The first axis is to describe in which way the driver can overrate trust. Lee and Moray (1992) distinguished four dimensions of trust: (a) foundation, representing the fundamental assumption of natural and social order, (b) performance, resting on the expectation of consistent, stable, and desirable performance or behavior, (c) process, depending on an understanding of the underlying qualities or characteristics that govern behavior, and (d) purpose, resting on the underlying motives or intents. Three types of overtrust can be distinguished depending on which dimension among (b) through (d) is overrated; the first dimension (a) is usually met in cases of the driver assistance systems.

Overrating of (b) can be seen in a case where a driver thought, "The assistance system has been responding perfectly to all the events that I have encountered so far. Whatever events may occur, the system will take care of them nicely." Improper evaluation of (c) is seen in a case where a driver has been using an assistance system without reading the user's manual at all by thinking, "It would be quite alright even if I do not know the details of the system functions." Overestimation of (d) may be seen in a case where a driver believes that "I do not understand why my assistance system is doing such a thing. However, it must be doing what it thinks it necessary and appropriate."

#### 3.1.2 Chance of observations

The second axis is to describe how often the driver can see the assistance system functions. The chance of observations affects the ease of constructing a mental model of the assistance system. The possibility of the driver's overtrust can differ depending on whether the assistance system is for use in normal driving or is for use in emergency.

Take the ACC as an example of the assistance system to reduce the driver workload in normal driving. Based on a large number of opportunities to observe the ACC's functioning repeatedly in daily use, it would be easy for the driver to construct a mental model of the ACC. If the driver has been satisfied with 'intelligent' behaviours of the ACC, it would be natural for him/her to place trust in the assistance system. However, the trust can sometimes be overtrust. Suppose the driver encounters a new traffic condition that is seemingly similar to a previous one but is slightly different. If the driver expected that the ACC would be able to cope with the situation without any intervention of the driver, it can be an overestimation of the ACC's functionality.

Take next the AEBS as an example of the assistance system activated only in emergency to assure the driver safety. It would be rare for an ordinary driver to see the AEBS works, and he/she may not be able to construct a complete mental model of the AEBS because of lack of enough number of chances to experience the AEBS. The driver might have been told (by a car dealer, for instance) that the AEBS shall be activated automatically in emergency. However, the driver may not be fully convinced because of lack of chances to observe himself/herself that the AEBS works properly and constantly when necessary.

## 3.2 Overreliance

Overreliance on a driver assistance system is an incorrect *action selection decision* determining to rely on the assistance system by placing overtrust in it. Regarding overreliance on automated warning systems, there are relevant studies in aviation domain (see, e.g., Parasuraman et al 1993, Mosier et al 1997, Meyer 2001, Sheridan & Parasuraman 2002). Suppose that the automated warning system almost always alerts the human when an undesirable event occurs. Although it is possible for a given alert to be false, the human can be confident that there is no undesirable event as long as no alert is given (A similar situation can happen in automobile domain when the driver is provided with a communication-based alert from the road infrastructure to let the driver know of an approach or existence of cars on a crossing road behind some buildings). Meyer (2001) used the term 'reliance' to express such a response of the human. If the human assumed that the automated warning system will always give alerts when an undesirable event occurs, that may be overtrust in the warning system and the resulting reliance on the warning system is overreliance. The definition of overreliance on the driver assistance system, given at the beginning of this section, is a generalization of that of overreliance on the warning system in the previous studies in the sense that the assistance system is not only for setting off warnings but also for executing control actions.

Two axes are given for overreliance in the assistance systems. The first axis is the benefits expected and the second the time allowance for human intervention.

### 3.2.1 Benefits expected

The first axis is to describe whether the driver can produce some benefits by relying on the assistance system. Suppose the driver assigns the ACC all the tasks for longitudinal control of the vehicle. That may enable the driver to find time to relax muscles and extend legs after stressful maneuvering, or to allocate cognitive resources to finding a right way to the destination in a complicated traffic conditions. In this way, relying on the assistance system sometimes brings extra benefit to the driver, when the system is for use in normal driving.

The discussion can be quite different in case of AEBS. The AEBS is activated only in emergency, and the time duration for the AEBS to fulfil its function is short, say several seconds. It is thus not feasible for the driver to allocate the time and resources, saved by relying on the AEBS, to something else to produce extra benefit within the several seconds. A similar argument may apply to other assistance systems designed for emergency.

#### 3.2.2 Time allowance for human intervention

The second axis is to describe whether the driver can intervene into the assistance system's control when the driver determined that the system performance differs from what he or she expected. In case of ACC, it may not be hard for the driver to intervene to override the ACC when its performance was not satisfactory. However, in case of AEBS, it might be unrealistic to assume that the driver can intervene into control by the AEBS when he or she decided that the AEBS performance was not satisfactory, because the whole process of monitoring and evaluation of AEBS performance as well as decision and implementation of intervention must be done within a few seconds.

### 3.3 From Collision Damage Mitigation to Collision Avoidance

Based on the framework given in sections 3.1 and 3.2, the following argument was made in the ASV task force: "Since the AEBS is activated only in cases of emergency, it would be very rare for an ordinary driver to see how the system works (i.e., chance-of-observation axis). It is thus hard for the driver to construct a precise mental model of the AEBS, and may be hard for him/her to engender a sense of trust in the system (i.e., dimension-of-trust axis). However, it is known that people may place inappropriate trust (i.e., overtrust) without having any concrete evidence proving that the object is trustworthy. Now, let us assume that the driver places overtrust in the assistance system. We have to ask whether the driver may rely on the system excessively (i.e., overreliance). In case of AEBS, even if the driver noticed that the system's behavior was not what was expected, no time may be left for the driver to intervene and correct it (i.e., time allowance for human intervention). In spite of that, does the driver rely on the AEBS and allocate his/her resource to something else at the risk of his/her life (i.e., benefits expected)? The answer would be negative."

The ASV task force approved the above argument and decided that the AEBS may be developed as a collision avoidance system, instead of a collision damage mitigation system. The task force investigated design requirements for such collision avoidance AEBS so that it may not interfere with the driver's own actions (by letting it apply the automatic brakes at the latest time possible) but still it can avoid a collision against a forward obstacle effectively. Human factors viewpoints played major roles in determining the design requirements on the AEBS timing to initiate an automatic emergency braking and its deceleration rate. In fact, they were determined through the analyses of drivers' braking behaviors in normal and critical traffic conditions. Moreover, a couple of conventional requirements for the AEBS were abolished from human factors viewpoints (e.g., to reduce mode confusion or automation surprise).

Based on the conclusion of the ASV task force, the MLIT has been revising the design guidelines for the AEBS. The new guidelines will be announced to the public shortly.

## 4. Authority and Responsibility

It has been assumed in the ASV project that the driver is responsible for safe driving. However, humans have limited capabilities and we have technology to make machines more autonomous so that they can help humans in difficulty, which makes the issue of authority and responsibility complicated. Sudden death or onset of disease while driving is one of cases for which such autonomous machines may be in need.

### 4.1 Driver incapacitation due to sudden death or onset of disease

Sudden death and onset of disease while driving occur sometimes in Japan. For instance, around 300 cases are reported during the period of 2007-2009 for commercial vehicles, such as trucks, buses, and taxies. Although primary importance is definitely given to health management by drivers themselves and their employers, we may need to think about some technological measures for avoiding accidents. One of working groups in the ASV project investigated feasibility of such technologies. The technologies investigated include: (1) an equivalent of the train's *dead-man feature* (or, *dead man's switch*) that applies the emergency brakes when the driver ceases to hold on the controller arm, (2) an equivalent of the train's safety protective system that applies the emergency brakes when the driver does not supply any control input for a given length of time, (3) an *emergency stop button* that applies the emergency brakes when being pushed, and (4) a driver monitoring system that applies the emergency brakes when it determined that the driver may be incapacitated. The working group chose the emergency stop button as a reasonable solution for automobile at this moment in time. The working group and the MLIT asked the ASV task force to investigate the emergency stop button from the viewpoint of authority and responsibility.

The task force has been discussing (A) trading of authority as well as (B) authority and responsibility of an accident if it occurred after the emergency stop button was pushed.

(A) Trading of authority

The following four cases are distinguished by taking into account who decides the need for and implements the trading of authority.

> *Case A1: driver-initiated trading of authority*
> The driver notices a sign of ill-health himself/herself and decides it would be hard for him/her to continue to be in charge of driving. The driver then pushes the emergency stop button to let the automation take care of stopping the vehicle safely.
>
> *Case A2: passenger-initiated trading of authority*
> A passenger of the vehicle notices a sign of ill-health of the driver and decides it hard for the driver to continue driving. The passenger then pushes the emergency stop button.
>
> *Case A3: passenger-initiated trading of authority*
> A passenger of the vehicle notices a sign of ill-health of the driver and decides it hard for the driver to continue driving. The passenger seizes the authority to control the vehicle to stop it safely.
>
> *Case A4: machine-initiated trading of authority*
> The onboard computer detects a sign of ill-health of the driver and decides it would be hard for the driver to continue driving. The computer then activates the emergency stop button without any human intervention.

For each case, discussions have been made on acceptability of a ‘false alarm’ and its inconveniences. The task force also discussed whether the driver should be given authority to override the decision of the other agent (a passenger or the computer).

(B) Authority and responsibility of an accident

Suppose that the emergency stop button has been pushed, and the automation is trying to stop the vehicle safely. Various types of accidents can occur in such a phase. For each case listed below, who should be responsible for the accident?

> *Case B1:* The automation was trying to slow down the vehicle. Although the control was successful while the road was straight, the host vehicle departed from the road at the curve and overturned.
>
> *Case B2:* The automation was able to slow down and stop the vehicle safely on the lane. However, a following vehicle crashed against the host vehicle.
>
> *Case B3:* The automation was trying to slow down the vehicle. Before it came to a complete stop, it ran into a forward vehicle standing at the stop sign and then had a conflict with a pedestrian on the roadside.
>
> *Case B4:* While the automation was slowing down the vehicle, the driver came to himself. He tried to seize the control back from the automation. During the process, he got in an accident.
>
> *Case B5:* One of the passengers tried to control the bus on behalf of the incapacitated driver. However, in spite of his wish to save other passengers onboard, he lost control of the bus because of no previous experience and skill to drive a bus.

## 4.2 Should ADAS design be blamed?

Even if the driver is in his/her good health, an accident can occur in the interaction with the ADAS. The ASV task force has defined sample cases to investigate who should be responsible for an accident.

> *Case 1: malfunction of ADAS*
> A malfunction of ADAS prevented the driver from controlling the vehicle.
>
> *Case 2: combination of ADAS malfunction and driver error*
> A forward vehicle collision warning was not given to the driver because the sensor got an intermittent (or, a permanent) failure to detect the lead vehicle. The driver did not notice the lead vehicle at that time, either, due to an external distraction.
>
> *Case 3: overtrust in and/or overreliance on ADAS*
> The driver was not paying attention fully to a lead vehicle by assuming that, “my AEBS should tell me when an event occurs to which I need to respond.”
>
> *Case 4: limited functionality of ADAS*
> (a) The sensor failed to detect a lead vehicle in the thick fog.
> (b) The sensor was late in detecting a lead vehicle, because the host vehicle’s velocity relative to the lead vehicle was too high.

*Case 5: driver implemented exactly what was suggested by ADAS*
Upon receiving a forward vehicle collision warning, the driver applied the brakes precisely without any delay. However, the host vehicle was rear-ended by a following vehicle.

*Case 6: conflict of intentions between the driver and ADAS*
The driver tried to pass a lead vehicle by steering a wheel with a slight acceleration. The AEBS judged, however, that a collision was imminent to the lead vehicle, and applied emergency brakes. Because of the deceleration, instead of the driver's intended acceleration, the host vehicle was rear-ended by a following vehicle.

*Case 7: ADAS control-induced accident*
The AEBS was activated successfully to prevent a crash against a lead vehicle. However, the host vehicle was rear-ended by a following vehicle.

*Case 8: ADAS control-induced injury*
(a) The AEBS reduced the collision speed successfully. However, a passenger without wearing the seatbelt got injured at that time.
(b) The AEBS prevented a crash against a lead vehicle successfully. However, a passenger without wearing the seatbelt got injured at that time.

*Case 9: automation-induced surprises*
The driver was surprised to see the AEBS applied emergency brakes unexpectedly, which caused an abrupt and inappropriate steering by the driver. The host vehicle finally ran out of the road.

### 4.3 ASV-5: the fifth 5-year phase

The issues described in sections 4.1 and 4.2 need more extensive investigations, which will be one of major themes of the ASV-5 starting 2011 autumn. The task force is expected to give some guidelines for designing and developing ADAS so that drivers, ADAS, and people in the society may be harmonized. The task force is also supposed to investigate reasonable ways for promoting the drivers' proper understanding of the ADAS. It has been found through questionnaires distributed to ADAS users in 2010 that some drivers misinterpreted the aim of some ADAS. For instance, 23% of ACC users said that the ACC contributes well in improving safety, and 47% of AEBS users claimed that the AEBS reduces the workload appreciably.

Another major theme of the ASV-5 is further developments of communication-based ADAS. Among them, car-to-pedestrian communication systems are supposed to be studied extensively.

## 5. Concluding Remarks

Collaborations among the government, industries, and academia for better design of human-automation interface and interaction are increasing in automobile domain. For instance, the author has been involved in a National Policy Agency's committee to define specifications for car-to-infrastructure communication-based ADAS in 2009, in which the author was expected to contribute to clarify design requirements for human-machine interface as well as human-machine interactions so that human factor issues (such as, loss of situation awareness, mode confusion, automation surprise, overtrust in and distrust of automated assistance, etc) may be resolved.

The author was also a member of study committee of MLIT to discuss measures against quietness problem of Hybrid Electronic Vehicles (HEV) and Electronic Vehicles (EV) in 2009. It was claimed by some organizations, including the Japan Federation of the Blind, that “it is hard for the visually-impaired to recognize HEV/EV approaching at low speeds because these vehicles are too quiet.” The study committee discussed various points from several different disciplines, in which human factors was one of major disciplines. Some of human factors related points for discussions were:

(a) Do we need to add artificial sound to vehicles that have been made quiet?
(b) If Yes, what kind of sound is appropriate?
(c) Should the sound permanently on or switchable manually?
(d) If the sound is on permanently, is a temporary stop switch necessary?

The conclusion for each point was:

(a) We need an audible measure, because: visually-impaired pedestrians can catch the presence or approach of vehicles only audibly.

(b) The artificial sound must be one that enables people to recognize the presence and behavior (such as, starting, slowing down, direction of movement) naturally and easily even without prior knowledge on what kind of sound is emitted from HEV/EV.

(c) Basically, the sound will be kept on permanently. If the driver is requested to turn on the sound when necessary, no sound is failed to be emitted when the driver is not aware of the pedestrian. Moreover, the pedestrians may not be able to grasp the behavior of the vehicles if the sound is emitted only a short time period.

(d) A switch to stop the sound temporarily must be allowed. For instance, the drivers would want to stop the sound when they drive residential area late at night. If such a stop switch is prohibited, some drivers may accelerate the vehicle so that no artificial sound would be emitted.

The discussions and conclusions of the study group were adopted by the MLIT to establish the “Guideline for Measure against Quietness Problem of HV, etc” (2010).

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