Outline of Definition of Automated Driving Technology

Background and Purpose

- Background
  - Many of the existing definitions of automated driving include levels from manual driving through fully-automated driving; however, there is no uniform definition that is harmonised internationally.
  - A common definition that can clearly distinguish systems is needed in developing the regulation relating to automated driving at WP.29.
  - For example, while SAE's definition is "descriptive" and "technical", WP.29 needs to have a common definition that is "normative" and "legal".
- Purpose
  - To specify a definition of classification, as WP.29's definition of automated driving technology, that would facilitate the development of vehicle regulations.
- Tasks
  - In order for automated driving technology to develop properly and smoothly, it is necessary to clarify the devices, functions, performance, etc. of vehicles that use such technology.
  - It is also necessary to clearly distinguish between those functions that can be realised with the vehicle alone and those that can be achieved with support from the road side or infrastructure.

How to Discuss the Definition of Automated Driving Technology

1. Discussion to be based on SAE's definition

   The initial discussion will be based on SAE's definition, whose technical description is most detailed among the existing definitions presented at the first meeting of IG-ITS/AD.

2. Possible and specific systems (use cases) to be listed

   To discuss the necessary definition while visualising the regulation to be developed in the future, possible and specific systems will be identified with cooperation from the auto industry, and be compared against SAE's definition.

3. Systems to be re-categorised based on the relation with the driver

   Systems will be re-categorised from standpoints including the presence/absence of operation/monitoring by the driver, the attribution of responsibility and the relation with the Vienna Convention and the Geneva Convention. In particular, discussion will be focused on those systems corresponding to SAE's Levels 2 and 3, in view of the phased regulatory process in the future, and they will be classified into sub-categories as necessary.

4. Definition to be developed in view of the vehicle regulation

   With the system categories re-organised above, automated driving technology will be defined in view of the vehicle regulation, based on the performance, functions, etc. that are required in common by systems in each category.

（Reference）Philosophy of Automated Driving System

Issues of longitudinal direction control
- Keeping an adequate distance to the forward vehicle
- Avoiding traffic confusion by longitudinal direction control

Restrictions on current UN regulations
- Activation of braking signal when deceleration exceeds 0.7m/s²

General issues
- Shall provide a warning that the driver is no longer in primary control.
- Shall provide a warning that the system is limited or has failed.
- Shall Must ensure safety to avoid hacking.

High level assistance (System activates in ordinary driving)

Longitudinal direction control

ACC

C-ACC

Braking control

ACC

Cruise Control

AEBS

BAS

EVSC

ESC

ABS

System controls the vehicle based on the detection of forward direction

System does not monitor the surrounding area

System activates when the vehicle collides with the forward vehicle

System improves the primary driving function (System does not detect obstacles)

AEBS with steering control

Active steering system

Collision avoidance

System controls the vehicle based on the monitoring of lateral direction

Deadman systems

Automated driving system — System controls the vehicle based on the detection of all directions

Automated over-taking system

Automated driving at junctions

Stopping at the road side

System controls the vehicle based on the detection of all directions

LKAS＋ACC

Automated lane-change system

PAS

Automated parking system

A high-accuracy system that can monitor the surrounding area and judge the traffic situation is necessary

System controls the vehicle based on the detection of longitudinal and lateral directions

System controls the vehicle based on the detection of lane marking

Vehicle controls the steering function

LKAS

LKAS

E-LKAS

Parking assist system

Issues of lateral direction control
- Ensuring safe transition when control switches from automatically commanded steering to manual steering
- Avoiding traffic confusion by lateral direction control

Restrictions on current UN regulations
- Less than 10km/h in case of ACSF (R79)

Low level assistance (System does not activate in ordinary driving)

Lateral direction control

High level assistance (System activates in ordinary driving)

How to Proceed (Examples)

SAE Level	Use case	Relevant devices	Control	Environment monitoring	Responsibility	Vienna and Geneva Conventions
0			D	D	D	Compliance
1			D	D	D	Compliance
2			D	D	D	?
3			D?/S?	D?/S?	D?/S?	?
4			S	S	S	?
5			S	S	S	?

D: Driver S: System

1. Devices, functions and performance required for automated driving technology to be listed (tables similar to the above table to be created)

2. Representative use cases and issues for each item to be identified

3. Situations that cannot be dealt with by existing technology/devices to be addressed:
   - ✓ Devices that ensure safety in emergency situations (e.g., deadman's system)
   - ✓ Devices that check the device's conditions of use (e.g., driver monitoring system)
   - ✓ Devices to record the system's performance in the event of an accident (e.g., OBD, EDR)

4. With all of the above ready, the minimum requirements necessary for automated driving technology are to be proposed