ALLIANCE FOR AUTOMOTIVE INNOVATION

LEVEL 2 DRIVER MONITORING PRINCIPLES

Level 2 features provide a benefit to the driver by assisting with the driving task and reducing the potential for human error that could result in a crash. However, these systems are not designed to operate independent of the human driver – the driver is ultimately responsible for the driving task. For purposes of this document, Level 2 refers to those automated driving assist features where both lane centering and Adaptive Cruise Control (ACC) are simultaneously engaged.

Confusion among some consumers regarding their role as a driver of some vehicles equipped with a Level 2 system has resulted in driver complacency, misuse or abuse of Level 2 systems that has, in some cases, resulted in a crash. To help address this concern, the automotive industry has developed vehicle driver monitoring systems that use sensor-based technologies to determine or infer when a driver is not paying sufficient attention to the driving environment. Automakers may choose, based on the specific attributes of a vehicle's Level 2 system, to use sensing methods that rely on torque or capacitive sensors or to use camera-based methods.[1]

There is extensive, ongoing research in the area of driver monitoring. While this important work continues, the Alliance for Automotive Innovation puts forward the following principles to help address important safety aspects for driver monitoring systems for vehicles with Level 2 systems.

Consumer Information

The Level 2 system name should reasonably reflect the functionality of that Level 2 system and not imply greater capability. The Level 2 system information, including promotional materials, should reasonably reflect the functionality of the system. This may include (but is not necessarily limited to): any Level 2 specific capabilities or limitations, the responsibility of the driver, the Operational Design Domain[2], and whether or not the driver's performance of one or more of the driving tasks while the Level 2 system is engaged (within its Operational Design Domain) results in the disengagement of the system. The Level 2 system should, at all times, convey information to the driver on the status of the system such that a driver can reasonably discern whether the Level 2 system is engaged or disengaged.

---

[1] These examples are included to illustrate the variety of current sensing methods and are not intended to be a comprehensive list, particularly as new methods and technologies may be introduced in the future.

[2] Operating conditions under which a given driving automation system or feature thereof is specifically designed to function, including, but not limited to, environmental, geographical, and time-of-day restrictions, and/or the requisite presence or absence of certain traffic or roadway characteristics.

Driver Monitoring as a Standard Feature

A driver monitoring system should be provided as a standard feature in any vehicle that is equipped with a Level 2 system in which both lane centering and ACC can be simultaneously engaged. The driver monitoring system should be active when the Level 2 feature is engaged. Since it is important that the driver of a Level 2 vehicle be attentive to the surrounding driving environment at all times, the driver monitoring system should be designed such that the driver monitoring system cannot be disengaged or disabled while the Level 2 feature is engaged.

Driver Warnings

If a driver monitoring system determines or infers that the driver is not engaged in the driving task, then an initial warning should be issued within a reasonable amount of time from when a system detects the driver is not engaged. For example, for a vehicle equipped with a Level 2 system that is designed to be "hands on," if the driver does not satisfy the system's "hands on" criteria, the driver monitoring system should issue an initial warning, i.e., request for the driver to re-engage in the driving task. The time elapsed between the detection of the disengaged driver to the request for that driver to re-engage should be minimized. If the driver does not respond to the initial warning from the driver monitoring system, subsequent warnings should escalate and include, at a minimum, some combination of visual and non-visual (auditory or haptic) alerts.

Re-engaging the Driver

The driver monitoring system should only terminate the warning(s) if the system detects that the driver has appropriately re-engaged based on the system design, for example by putting his or her hands back on the wheel or returning his or her eyes to the road. If the driver does not respond to the escalated warnings from the driver monitoring system, the vehicle should take a corrective action, such as disengaging the Level 2 system, increasing the ACC headway distance, or coming to a safe stop. Any such action should include a clear combination of visual and audible alerts regarding the status of the system and vehicle.

Misuse and Abuse

The potential for driver misuse or abuse of a system should be evaluated as part of the design process for driver monitoring systems.

Camera-Based Systems

An in-vehicle camera should be further considered as a component of a driver monitoring system for vehicles with Level 2 systems, particularly for more advanced Level 2 systems (such as those with hands-off capabilities) to help identify driver inattention. This consideration should be based upon, among other things, research by industry, academia, government or any combination and should take into account the uniqueness of each manufacturer's vehicle systems.