Informal Document **ACSF-02-06**

OICA/CLEPA Homework Part I

HMI, Driver in/out of the Loop

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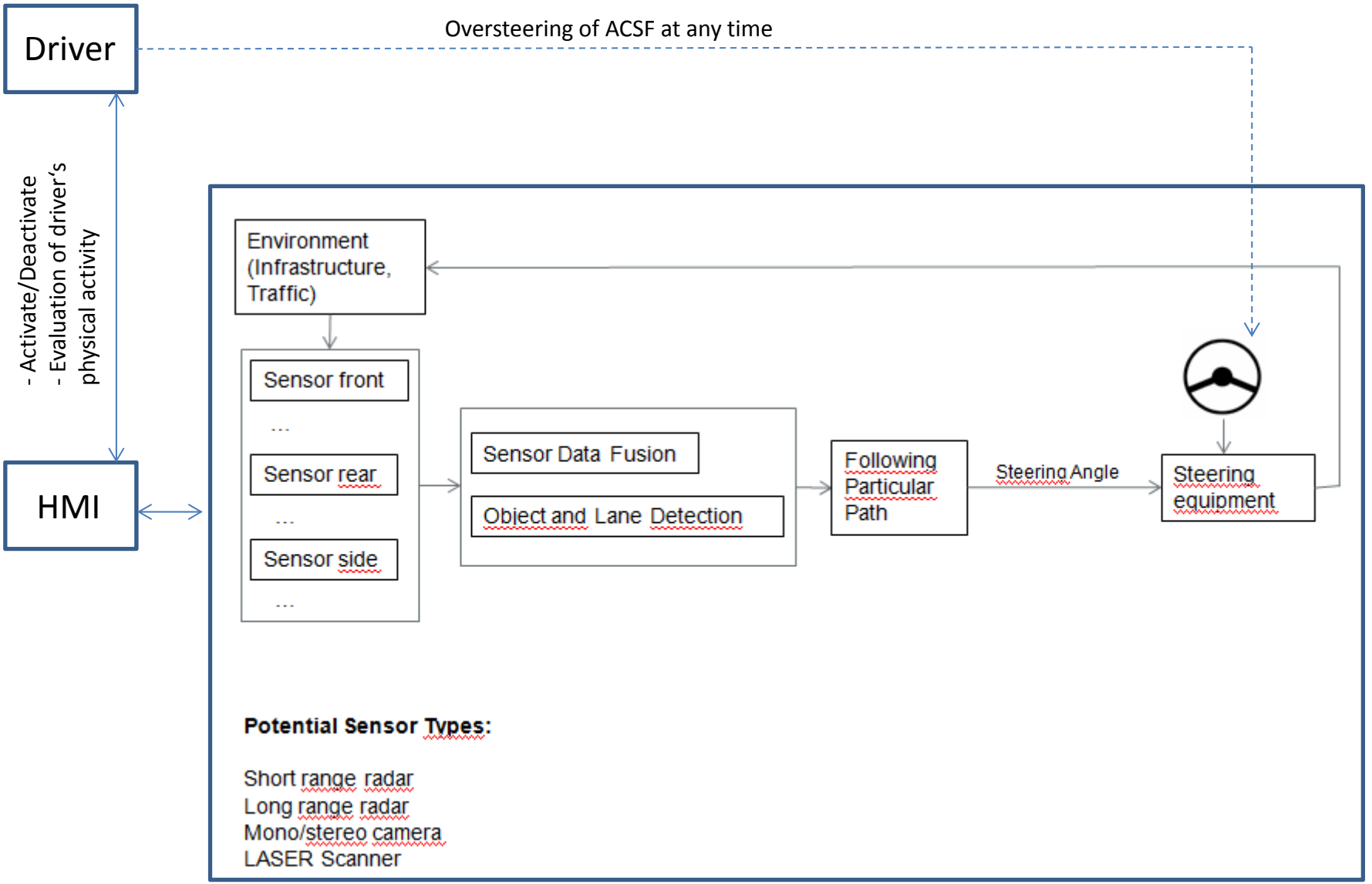
Examples For ACSF Use Case Analysis

Maneuver Step	Description	LK	LK & LC	LK & LC automated
1	ACSF manually activated by the driver	X	X	X
2	Continuous detection of the environment front/side/rear	x/-/-	x/x/x	x/x/x
3	ACSF System Activation (displayed to the driver)	X	X	X
4	Lane Keeping Functionality active	X	X	X
5	Manual Activation of LC (e.g. turn indicator)		X	
6	Lane Change Readiness		X	X
7	Start and performing Lane Change (change of steering angle)		X	X
8	Arrived in new lane	X	X	X
9	Lane Keeping	X	X	X
10	ACSF issues takeover request to the driver	X	X	X
11	Driver takes over the driving task ACSF is deactivated			

ACSF Control Loop



HMI - Communication between ACSF and the Driver

The HMI is part of the "ACSF control loop“. In order to better structure the HMI discussion, 3 sub-categories are proposed (with focus on technology neutral solutions and design freedom):

- Information and warning about ACSF status
  - Information to the driver on ACSF operational status
  - Warning on termination/sudden termination of ACSF control

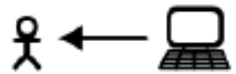
- Evaluation of the driver’s activity (suggested in the Proposal by D)
  - Means to detect the presence and activity of the driver (in combination with a warning strategy)

- Transition to/from manual control
  - Provide means to activate/deactivate the ACSF operation
  - Detect manual control/takeover by the driver
  - Ensure safe transition to/from manual control

HMI – Information and Warning

Communication between ACSF and the Driver

- The design options of communicating with the driver are manifold, as investigated by the HAVEit* Research Project
- The communication modalities can be designed by visual, acoustic and haptic means and by any combination (open for new technologies)
- Each modality can be further classified, as indicated in the table below

Modality	visual			acoustic			haptic		
Coding	spatial	colour	textual	spatial	tonal	verbal	continous	vibrabtions	discrete
									
									

time

*Source: HAVEit (Highly Automated Vehicles for Intelligent Transport)
Preliminary concept on optimum task repartition for HAVEit systems

Transition to/from Manual Control

Detect safely when driver

- has ceded lateral control to the system and inform the driver
- has taken back manual control

Different transition scenarios

- Time-critical emergency transition (e.g. sensor failure)
- Driver initiated transition

Sensing of steering and/or pedal activity

Evaluation of Driver‘s Activity

- Detect presence of the driver

- When ACSF is active, the driver’s role is to remain attentive and to be aware of the system’s/vehicle’s status. The status of the system shall be displayed in the direct view of the driver. The driver shall remain in a position to be able to resume the dynamic driving task whenever required. The system has to provide pre-requisites for the evaluation of the driver’s physical activities.

Scenarios for Active/Attentive Driving

	Driver is active	Driver is inactive
Driver is attentive	Normal driving **1**	Happens for short period of time on a straight road during normal driving or Voluntary misuse, e.g. driver is assessing the driving assistance systems. **2**
Driver is inattentive	The driver is keeping the path but is distracted / day-dreaming. This happens for short periods of time during normal driving; **3**	May happen for short period of time during normal driving or The driver is fully occupied with something else, voluntarily or not. **4**

Driver in/out of the Loop (DIL/DOL)

	ADAS Principle: R.E.3 Annex5-Appendix 3 (Extract)
Driver in the Loop	The notion of driver-in-the-loop means that a driver is involved in driving task and is aware of the vehicle status and road traffic situation. Being in-the-loop means that the driver plays an active role in the driver-vehicle system. They actively monitor information, detect emerging situations, make decisions and respond as needed.

The R.E.3 Definition of DIL suggests that a driver has to perform the following tasks:

i. Perform the longitudinal and lateral dynamics
ii. Monitor the driving environment
iii. Be aware of the vehicle status and thus also acknowledge warnings issued by sub-systems

- Increasing vehicle automation transfers some of the tasks i. – iii. from the driver to the system
- Automated driving systems that perform the tasks i.-iii. entirely in a given use-case and hence do not require the presence of a driver are considered as DOL-systems

The prospective automated driving systems require that the driver retains at least one of the three aforementioned tasks during the entire use-case. Hence, these automated driving systems remain in the scope of the UN-R 79 regarding steering (ACSF) and are covered by the Vienna Convention of Road Traffic.