OBJECTIFICATION TECHNOLOGY OF PERCEIVED SAFETY & COMFORT DURING ASSISTED DRIVING

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How does she feel?
AVL INTRODUCTION
MAIN WORKING AREAS AT ADAS ENGINEERING

System Engineering
incl. specific function & SW
development, calibration & testing

Methods & tools
for simulation, testing & validation
from lab to road, objective
assessment

New predictive functions
improving vehicle attributes
e.g. energy / fuel efficiency

For new levels of vehicle comfort, safety and efficiency
AVL INTRODUCTION
MAIN WORKING AREAS AT ADAS ENGINEERING

- How want drivers to be driven by automated features?
- How to make this knowledge applicable for development of Assisted & Automated Driving features?
EXAMPLE: DRIVERS EXPECTATIONS

Comfortable / Relaxed
- no surging & transients
- moderate accelerations
- medium reaction on traffic
- medium/long front vehicle distances
- mid lane trajectories

In-Hurry
- moderate surging & transients
- medium accelerations
- fast reaction on traffic
- short front vehicle distance
- “ideal” lane trajectories

Mandatory: Driving Quality and High Safety Feeling
ON-ROAD STUDY
IMPORTANCE OF ACC CRITERIA

Perceived safety and comfort feeling are most important criteria for drivers.
Selection of sensors and measurement method

Perform test drives with a multiple of experienced drivers

Correlation of human perception and sensor signals / physics

Implementation, testing and validation

AVL-DRIVE™ 4 ADAS

ADAS/AD Assessment technology is based on proven AVL-DRIVE™ tool

AVL DEVELOPMENT APPROACH

OBJECTIVE ASSESSMENT OF DRIVER FEELING
Longitudinal Control
- Follow at constant speed, follow deceleration, approaching slower lead vehicle in front, ...
- e.g. speed assist

Lateral Control
- Lane keeping, lane usage, distance to lane boarders, ...
- e.g. lane assist

Lane Change Maneuvers
- Lateral acceleration level, duration of lane change, uniformity, ...
- e.g. lane change assist

Objective ratings of comfort & safety criteria continuously during assisted driving
ASSESSMENT OF DRIVERS FEELING

Fully automated event triggering, assessment, logging & report generation without user interaction
ACC ASSESSMENT EXAMPLE
ACC SAFETY & COMFORT CRITERIA
APPROACHING NEW OBJECTS

A typical situation on highways
approaching low speed vehicles
SAFETY & COMFORT ASPECTS
APPROACHING NEW OBJECTS

Criterion 1: First reaction

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120 kph

EGO vehicle speed

EGO Distance to Lead

target distance to lead

deceleration EGO

[Table: Criteria]

First Reaction

7.2

-
SAFETY & COMFORT ASPECTS
APPROACHING NEW OBJECTS

Criterion 2: 50% energy absorbed

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Criterion 4: minimum time to collision

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Criterion 5: minimum distance

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Total event rating: 7.5
Dynamically weighted assessment of every sub-criteria provide representative overall ratings
APPLICATION EXAMPLES
ASSESSMENT OF DRIVER FEELING IN-VEHICLE AND SIMULATED ENVIRONMENTS

Fully automated assessment plus powerful simulation as enabler for virtual validation & verification of simulation on road
SAFE & REPRODUCIBLE ADAS TESTING ON DRIVER SIMULATOR

- Traffic scenarios e.g. critical near crash situations with passengers or heavy traffic
- Parameter/vehicle config changes e.g. speed, accelerations, payload, distances, sensor & vehicle configurations
- HMI, human & machine take over maneuver

SAFE AND REPRODUCIBLE TESTING OF CRITICAL NEAR-CRASH SITUATIONS IN THE LAB

MOVIE

6 DOF TESTING ON HEXAPOD
FURTHER DEVELOPMENT APPLICATIONS WITH OBJECTIVE ASSESSMENT TECHNOLOGY

Targets Setting

- Competitors comparison
- Calibration targets

Objective deep dive comparison of ADAS in competitor vehicles
FURTHER DEVELOPMENT APPLICATIONS WITH OBJECTIVE ASSESSMENT TECHNOLOGY

Quality fulfilment & development efficiency through consistency from target setting to validation of safety & comfort feeling
SUMMARY

- Perceived safety & comfort are most important criteria during assisted / automated driving
- Complex human feeling can be reproducible measured & described by parameter and criteria
- Fully automated operation enables virtual validation & high performance testing
- AVL technology allows therefore much faster fulfillment of end user relevant comfort & safety

Enabler technology for best in class assisted driving quality

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AVL BOOTH WITH VIRTUAL TEST RIDE

Experience this technology in Virtual Reality BOOTH (#3)