Virtual Development and Validation Environment for ADAS and RDE

Connect simulation and test

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How to run 100,000,000 (one hundred million 😊) test kilometers per week?
Integrated & Open Development Platform

Connect simulation & test

TESTBEDS

MODELS

DATA

PROCESSES

Connect existing elements within the vehicle development process...

... for early, fast and sound decisions.
Neutral and open model integration and co-simulation platform, opening the door from simulation to testbed.

Tools specific interfaces (25+ software vendors) and interface standards (FMI)
REAL-TIME: Connecting RT and non-RT Systems

ACORTA - Synchronizing off-line co-simulation with hardware components
ADAS ENGINEERING SERVICES AT A GLANCE

Functional integration & calibration services
incl. controls & function development for add-on features

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

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

For new levels of vehicle comfort, safety and efficiency
TRANSFER REAL WORLD SCENARIOS INTO SIMULATED WORD
SIMULATION CHALLENGES FOR ADAS FUNCTION DEVELOPMENT

REQUIREMENTS ON MODELS:

• Fast, accurate and extendable
• Real-time capability for control function development
• Integration with vehicle dynamics and traffic simulation
• Virtual driving quality assessment
• Execution in a distributed cluster/cloud environment
• Integration environment for HiL and testing applications
SIMULATION CHALLENGES FOR ADAS FUNCTION DEVELOPMENT

IT IS NOT SO IMPORTANT HOW WELL THE TOOLS WORK FOR THEMSELVES,

IT IS IMPORTANT HOW WELL THE TOOLS WORK TOGETHER!
USE CASE: lane keeping assistant with PlayStation2 steering wheel
VTD VIRES AUTOMATIC PARAMETRIZATION

Model.CONNECT automatic parametrization

OPEN SIMULATION INTERFACE

AVL CAMEO

OSI
USE CASE: ADAS DRIVING CASE STUDIES WITH OPTIMIZATION TOOL

Linux OS: Super Computer

Multi calculation with different calculation conditions

Windows PC
Host PC
- Model configuration (GUI)
- Calculation management
MODEL.CONNECT IN THE CLOUD + ALP.Lab

Model.CONNECT Docker Containers
Demonstrator in the Azure Cloud

Use case: ALP.Lab
ADVANCED OPEN VALIDATION ENVIRONMENT

Validation Simulation Environment

- Environment Simulation
- Model, SW, Testing Integration Platform

Tool Environment

- Online & Post-Processing
- Tool Extension Image Processing
- Model Based Validation

Development Environments

- MIL in cloud
- MIL
- HIL
- Inverter
- ADAS ECU
- (Mini-)DrivingCube
- Driving Simulator

Signals (closed loop, information)
Object lists
Streams (videos, 3D data, ...)

Data Management Measurement / Parameter
LET’S START A RIDE OF 100,000,000 KM

Simulation engine for fuel economy, emission and performance aspects of ADAS function development (ACC/PCC, acceleration, VTMS, drivability etc.)

Preferred integration platform for ADAS functions development and validation.
HOLISTIC APPROACH IN NVH ANALYSIS

**Tip-In-Back-Out:**
Clunk and shuffle noise prediction in the driveline.

**Road Bumper:**
NVH impact on the engine mounts, tires and suspension.
FRONTLOADING REAL DRIVING EMISSION TESTS FROM ROAD TO THE OFFICE
REAL DRIVING EMISSION TESTING ON THE ENGINE TESTBED

AVL-PUMA

Testbed.CONNECT RT-Workstation

Vehicle: CarMaker

Driveline: GT

Controls: Simulink

Model.CONNECT co-simulation vehicle prototype

Real Driving Emission Routes
AVL Mini-DrivingCube DEMONSTRATOR AT PDiM 2017 IN GOTHENBURG
INTEGRATED AND OPEN DEVELOPMENT PLATFORM

AVL

TESTING

SIMULATION