automotive [CAE] GRAND CHALLENGE

July 05 – 06, 2022
Congress Park Hanau
Germany

// CAE-PROCESS: COMBINING TEST AND SIMULATION – SMART AND EFFICIENT USING AI AND ML

// FATIGUE: INFLUENCE OF TOLERANCES ON DURABILITY

// MATERIAL: MATERIAL AND FAILURE MODELS FOR PLASTICS

// MULTI SIMULATION: HOLISTIC (ACEMT) SIMULATION OF ELECTRICAL DRIVES - ENGINES AND BATTERIES

// NVH: COMFORT OF EVS – VIBRATIONS, CLIMATE, AND SOUND (DESIGN)

// OPTIMIZATION: USING DEEP LEARNING AND EXPERT KNOWLEDGE IN OPTIMIZATION

// QUALITY ASSURANCE: DETECTION OF, AND REASONS FOR SCATTER OF RESULTS

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Empowering Engineers

automotive CAE GRAND CHALLENGE

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Background, Concept and Implementation

In the last 30 years computer simulation has become an indispensable tool of automotive development.

Challenges in virtual vehicle development

Despite of significant progress in simulation technology and impressive results in industrial application there remains a number of challenges.

The Grand Challenge as a platform for dialog

The automotive CAE Grand Challenge stimulates the exchange between users, scientists and software developers in order to solve these challenges.

Grand Challenges 2022

The Grand Challenges 2022 have been identified through a survey among the simulation experts of the international automotive industry:

- ► **CAE-PROCESS:** Combining Test and Simulation - Smart and Efficient using AI and ML
- ► **FATIGUE:** Influence of Tolerances on Durability
- ► **MATERIAL:** Material and Failure Models for Plastics
- ► **MULTI SIMULATION:** Holistic (ACEMT) Simulation of Electrical Drives - Engines and Batteries
- ► **NVH:** Comfort of EVs – Vibrations, Climate, and Sound (Design)
- ► **OPTIMIZATION:** Using deep Learning and Expert Knowledge in Optimization
- ► **QUALITY ASSURANCE:** Detection of, and Reasons for Scatter of Results

In the conference one session is dedicated to each of the most critical challenges, the „Grand Challenges".

Industry Requirements → Science & Research → Software Development

In every session of the conference experts from industry, research and software development will explain how critical the individual challenge is for the virtual car development process and report about their efforts to overcome the challenge.

Scientific Committee

To continuously improve the concept of the conference and to ensure the up-to-dateness and industrial relevance of the topics of the yearly survey we have introduced a scientific committee in 2013.

The scientific committee is made up of renowned CAE experts from OEMs, suppliers, engineering consultants, education and research thus representing all stake holders of automotive CAE.

We are honored to introduce the members of the scientific committee:

- ▶ Richard Peter Brown - Jaguar Land Rover Ltd.
- ▶ Mark Gevers - TECOSIM Technische Simulation GmbH
- ▶ Dr. Axel Hänschke – CPS Pekka Stuckert Consulting Unternehmensberatung
- ▶ Prof. Dr. Lothar Harzheim – Opel Automobile GmbH
- ▶ Prof. Dr.-Ing. Dietmar Jennewein - Hochschule Darmstadt
- ▶ Stefan Kirschbichler – Virtual Vehicle Research GmbH
- ▶ Dr.-Ing. Boris Künkler - Opel Automobile GmbH
- ▶ Dr. Niels Pasligh – Ford-Werke GmbH
- ▶ Bart Peeters Weem – BMW AG
- ▶ Prof. Dr. Axel Schumacher – Bergische Universität Wuppertal
- ▶ Christian Stender – Volkswagen AG
- ▶ Alexander-Frederic Walser – ASC-S e.V.
- ▶ Carsten Wienk – ZF Automotive Safety Germany GmbH

PARTNER WORKSHOPS

## BETA CAE Systems Workshop

Pre- and post- processing for engineering simulations with Human Body Models

This workshop will present the latest developments in our suite, for effectively performing simulations with Human Body Models. The tools for positioning HBMs, creating different Human body model variants and the plugin that creates different bicycle configurations, will be part of the workshop's agenda. Moreover, the latest developments in post- processing for evaluating occupant injury criteria will also be demonstrated.

Virtual Testing Workshop
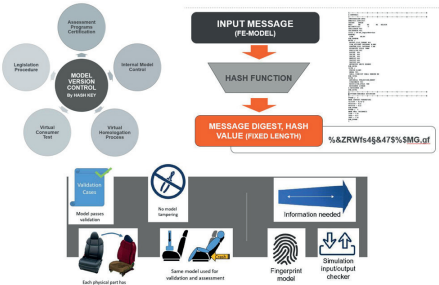
Model Version Control – Model Traceability
How to ensure process integrity by making sure that the exact same version of a CAE model is used within the whole Virtual Testing process.

In VT procedures currently applied for development within automotive regulatory or consumer assessment procedures the vehicle model

as well as CAE models of assessment tools (dummy or human body model) will not be shared outside the vehicle manufacturer.

In this kind of VT process the quality and validity of the models will be checked and finally approved by some kind of certification procedure. Somehow it has to be made sure, that the same model is used in the model certification process and eventually in the VT-based assessment procedure.

This could be done in a first approach on a basis of trust and based on OEM internal documentation systems. However, if virtual testing will be more widely used in future it might be necessary that the models get a kind of "certified" label to guaranty that the same model is used within the whole VT process.

Different options will be discussed in the workshop. Eventually, the technical feasibility of possible proposals within the different IT environments and codes of different OEMs have to be considered. It also has to be ensured that it is still possible to work with the models. After certification of the vehicle model and certification of the HBM, it is still necessary to combine all models in a VT procedure to run the assessment or homologation load case simulation.

In this workshop contributions from IIHS, BASt, JSOL, ESI, IDIADA, LMU and automotive industry will introduce this topic from different points of view highlighting the relevance, possible solutions as well as requirements from the side of the users. This will further be discussed with all workshop participants in an open discussion.

JULY 06, 2022 | 08:30 – 10:00

Gompute Workshop

Transitioning CAE workloads to the Gompute HPC Cloud

Industries worldwide are going through a Digitalization process towards industry 4.0 where cloud resources play a key role, forcing

PARTNER WORKSHOPS

a transition for CAE engineers from traditional, in-house HPC to more flexible solutions in the cloud.

On the digital maturity journey there are different dimensions to consider when transitioning a CAE team to the cloud as a permanent solution, being the needs and requirements of the different industries not always covered with a single solution, what requires an analysis of the different layers involved (IT/Network, Licensing, Security, Engineering).

In this workshop, the Gompute team will cover an overview of the different options available in the market, and how can those be deployed for CAE users based on their needs followed by a demo of the Gompute Software.

SCALE Workshop

Simulation Data Management with SCALE.sdm

The workshop gives an overview of the simulation data management solution SCALE.sdm. The framework consists of three modules:

- ▶ SCALE.project: Project administration, milestones, requirements, responsibilities, targets, approval,...
- ▶ SCALE.model: Model setup (CAD, mesh, simulation), version management, load cases, HPC-submit, documentation, collaboration,...
- ▶ SCALE.result: Evaluation of test and simulation results, assessment, reports, correlation, data analysis,...

There will be a discussion on how to benefit from SCALE solutions from the perspective of a user and from the perspective of a project manager. Examples of typical CAE workflows and processes with SCALE.sdm are introduced within live demos. A lively discussion at the end of the workshop is very welcome to investigate a potential integration of SCALE.sdm software in your environment.

PARTNER WORKSHOPS

asc-s Workshop: „simpulse day"

Fluid-Structure-Interaction for Virtual Water Management

OBJECTIVE
Virtual water management of modern vehicle bodies continuously confronts developers, simulation software providers and scientists with new tasks and problems. In this context, the interaction between water and structure must be determined quickly and accurately under a variety of use cases, even before hardware prototypes are created. The research and development of new virtual methods enables the increase of development quality and in the end ensures customer satisfaction. With our event we want to provide simulation experts with a forum for exchange around agile and collaborative research and development environments on the tool side. According to the objectives of the asc(s association, representatives from science and industry are invited to participate in a software independent discussion forum for pre-competitive exchange and initiation of research groups / projects.

TOPICS
Industry-driven requirements and use cases, scientific approaches as well as best-practices for the co-simulation on Fluid-Structure-Interaction (FSI) for automotive water management with latest methods and different software algorithms based on

► SPH - Smoothed-particle Hydrodynamics
► CFD - Computational Fluid Dynamics
► FEM - Finite Element Methods
► IGA - Isogeometric Analysis
► . . .

Further information: www.simpulse.de/134/fsi-for-water-management

TUESDAY, JULY 05, 2022

09:00   Welcome and Introduction
Dr.-Ing. Dirk Ulrich - carhs.training gmbh

Parallel Sessions 09:30 – 13:00

//MATERIAL: MATERIAL AND FAILURE MODELS FOR PLASTICS

Chair: Bart Peeters Weem - BMW AG

09:30   Some Challenges and Trends in Plastics Simulation from the Perspective of Bosch Research
Dr.-Ing. Benjamin Schneider, Dr.-Ing. Jan-Martin Kaiser - Robert Bosch GmbH

10:00   Meshfree Simulation of EPP Foams during Impact and Deformation
Dr. rer. nat. Jörg Kuhnert, Dr. Isabel Michel - Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM

10:25   Sheer Properties of Plastics
Timo Schweiger - Fraunhofer-Institut für Werkstoffmechanik IWM

10:50   High-cycle Fatigue Models for the Multiscale Simulation of Fiber Reinforced Polymers
Dr. Hannes Grimm-Strele - Fraunhofer-Institut für Techno- und Wirtschaftsmathematik ITWM et al.

11:15   Coffee Break

11:45   New VDI Guideline "Strength Assessment of Plastic Components"
Dr. Wolfgang Korte - PART Engineering GmbH

12:10   Material and Failure Models for Plastics
Ulrich Esselborn, Marian Bulla - Altair Engineering GmbH

12:35   LS-DYNA Material Models for Depiction of Unloading in Low Speed Crash Applications
Harish Kalyan Ram Pothukuchi, Benjamin Hirschmann - 4a engineering GmbH

13:00   Lunch Break

Parallel Sessions 09:30 – 13:00

//MULTI SIMULATION: HOLISTIC (ACEFMT) SIMULATION OF ELECTRICAL DRIVES - ENGINES AND BATTERIES

Chair: Mark Gevers - TECOSIM Technische Simulation GmbH

09:30	Holistic Simulation Needs of Electric Powertrains and Batteries – Why it is Necessary? Dr.-Ing. Axel Hänschke - CPS Pekka Stuckert Consulting Unternehmensberatung
10:00	Integrating lithium-ion Battey Packs in Full Vehicle Simulations of EVs Dr. Elham Sahraei Esfahani - Temple University
10:30	Thermal propagation Testing & Simulation of Battery Cell Stacks Dr. Martin Schwab, Robert Kießling - 4a engineering GmbH
11:00	Coffee Break
11:30	Specifics in Strength and Fatigue Assessment of E-Drives Axel Werkhausen, Dr. Oliver Grieshofer - Engineering Center Steyr GmbH & Co KG
12:00	How Machine Learning and AI Accelerates Automotive Design Processes - Feedback on 3 Different Application: Battery Design, Structural Optimization and System Design Laurent Chec - DATADVANCE SAS
12:30	Title tba. Dr. Bartosz Gorecki - QuickerSim
13:00	Lunch Break

TUESDAY, JULY 05, 2022

Parallel Sessions 14:00 – 17:35

//CAE PROCESS: COMBINING TEST AND SIMULATION – SMART AND EFFICIENT USING AI AND ML

Chair: Dr.-Ing. Axel Hänschke - CPS Pekka Stuckert Consulting Unternehmensberatung

14:00	**Virtual Calibration of Joints by Neural Networks** Philip Zimmermann - Volkswagen AG; Simon Thel - TU Braunschweig
14:30	**Optimization of the CAE Process with a Unified Simulation Modelling Language** Prof. Dr.-Ing. Darius Friedemann, Jörg Rademann - HTW-Berlin; Bastian Näser - BMW AG
14:45	**Solver and Simulation Discipline independent Modeling of Automotive Components** Jörg Rademann, Prof. Dr.-Ing. Darius Friedemann - HTW-Berlin; Bastian Näser - BMW AG
15:05	**Automatic Sheet Metal Surface Defect Detection - Deep Learning** GaneshRam Rajagopal - Actalent Services
15:35	**Coffee Break**
16:05	**Combining Test and 3D Simulation in Product Development and Quality Management** Dr.-Ing. Olgierd Zaleski, Dr. Sören Keuchel - Novicos GmbH
16:35	**Integral Combination of Simulations, Proving Ground Tests, and Real World Field Tests for Effective ADAS/AD Development & Validation with AI** Dr. Andreas Kuhn - Andata Entwicklungstechnologie GmbH
17:05	**Integrated Evaluation of Test and Simulation Data with Comprehensive ML-based Data Analysis** Akhil Pillai, Dr. Martin Liebscher - SCALE GmbH
17:35	**End of Day 1**

Evening Reception and Dinner 19:00 // Wirtshaus am See

Parallel Sessions 14:00 – 17:30

//NVH: COMFORT OF EVs – VIBRATIONS, CLIMATE, SOUND (DESIGN)

Chair: Prof. Dr.-Ing. Dietmar Jennewein - Darmstadt University of Applied Sciences

14:00	Aeroacoustic Comfort Simulation for (Electric) Vehicles Dr. Dirk Kehrwald - Stellantis
14:30	MBS Simulation of NVH Phenomena for Electric Vehicles Regarding E-Motor and Gearset Excitation Norman Günther, Mario Schwalbe - IAV GmbH Ingenieurgesellschaft Auto und Verkehr
15:00	High Frequency Predictions of Structure-borne and Airborne Noise Markus Brandstetter - Hexagon
15:30	Coffee Break
16:00	NVH Optimization of an eDrive Transmission using MBS and DOE Benjamin Schmelzle, Sascha Kullmann - AVL Deutschland GmbH
16:30	A FEM,BEM,PEM approach to reduce radiated EV Noise on both component and system level Willem van Hal, Kamel Amichi - ESI Group
17:00	Electric Vehicle NVH Design: Structural Requirements and Battery Pack / Body in White Integration Mark Lamping - Siemens Digital Industries Software
17:30	End of Day 1

Evening Reception and Dinner 19:00 // Wirtshaus am See

WEDNESDAY, JULY 06, 2022

## //OPTIMIZATION: USING DEEP LEARNING AND EXPERT KNOWLEDGE IN OPTIMIZATION

Chair: Prof. Dr. Lothar Harzheim - Opel Automobile GmbH

08:30	Industry Presentation: Using deep Learning and Expert Knowledge in Optimization Dr. Philip Klaus - Segula Technologies GmbH
09:00	State of the Art in Using Deep Learning Algorithms and Expert Knowledge Schemes for Supporting Mathematical Optimization Procedures Prof. Dr.-Ing. Axel Schumacher - University of Wuppertal
09:30	Optimization for Robust, Sustainable Designs to Manage Risks and Uncertainties Armin Lohwasser - Rafinex S.à r.l.
10:00	Coffee Break
10:30	Intrusion Vehicle Body Optimization Combining Frontal and Side Crash Responses Fabian Leonov Santoyo Lopez - LURI Engineering
11:00	Optimization with Simulation-based Expert Knowledge Dr. André Backes - TECOSIM Technische Simulation GmbH
11:30	A study on the effect of sampling on the quality of AI/ML/ROM models Dr. Kambiz Kayvantash - Hexagon
12:00	Lunch Break

Parallel Sessions 08:30 – 11:30

//DURABILITY: INFLUENCE OF TOLERANCES ON DURABILITY

Chair: Frank Braunroth - SEGULA Technologies GmbH

08:30   Challenge of Tolerances in Body Durability Assessments – Approaches and Examples
Dr.-Ing. Matthias Weinert, Dr. Philipp Römelt - Ford-Werke GmbH

09:00   Research Presentation Title and Speaker tba.

09:30   Predicting the effect spot weld quality tolerances on durability
Dr. Philipp Römelt - Ford-Werke GmbH

10:00   Coffee Break

10:30   Fatigue, Reliable and Robust?
Dr. rer. nat. Michael Hack - Siemens Industry Software GmbH

11:00   Incorporating Design Uncertainties in a Durability assessment – a Robust Design Approach
Dr. Marco Veltri - MSC Software

WEDNESDAY, JULY 06, 2022
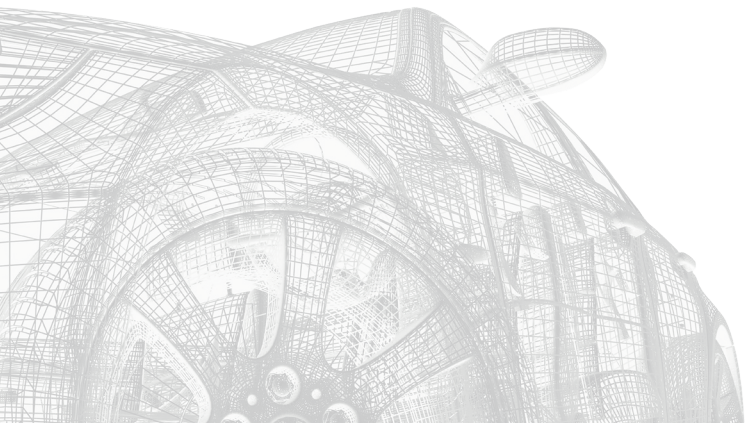
13:00 – 16:35

//QUALITY ASSURANCE: DETECTION OF, AND REASONS FOR SCATTER OF RESULTS

Chair: Dr. Niels Pasligh - Ford Forschungszentrum Aachen GmbH

13:00	AQUA - Artificial Quantification for Uncertainty Anomalies Dr. Marc Rocas Alonso - SEAT SA - Centro Tecnico
13:30	Automatic Identification of Deformation Modi in Robustness Studies Dr. Daniela Steffes-Lai - Fraunhofer-Institut für Algorithmen und Wissenschaftliches Rechnen SCAI et al.
14:00	The Stochastic Fracture Behavior of Glass and its Influence on Head Impact for Pedestrian Protection Prof. Dr.-Ing. habil. Stefan Kolling, Christopher Brokmann, Dr.-Ing. Christian Alter - TH Mittelhessen University of Applied Sciences; Marian Bulla - Altair Engineering GmbH
14:30	Coffee Break
15:00	Crash Test Barrier Rating and its Application for Repeatability, Robustness and FE Correlation Dr. Arnauld Malak - CT-Sim GmbH; Claude Ph. Medard - SAP Deutschland SE
15:30	An Enhanced Parameter Study Approach using Modal Decomposition of Key Events in Frontal Crash Dr. Masahiro Okamura - JSOL Corporation
16:00	From Scatter Detection to Scatter Analysis Clemens-August Thole, Dominik Borsotto, Vinay Krishnappa, Kirill Schreiner - SIDACT GmbH
16:30	Summary & Farewell Dr.-Ing. Dirk Ulrich - carhs.training gmbh

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automotive **CAE** **GRAND** CHALLENGE

Event Facts & Registration

Date	July 05 – 06, 2022
Location	Hanau, Germany
Fee	**ON SITE:** EUR 980 till June 07, 2022, thereafter EUR 1,180
	Includes full access to the conference live stream.
	ONLINE: EUR 780 includes access to the conference live stream.
Discounts	Universities and public research institutes receive a 40% discount on the registration fees.
Language	English

All prices are exclusive of VAT.

ON SITE

► Participation on both conference days including meals
► Evening event
► Meet & talk with the speakers, exhibitors and participants
► Access to the virtual showroom
► Digital conference proceedings (PDF)
► Lectures on demand after the event

Register for **ON SITE**

ONLINE

► Access to the live stream of both conference days
► Interactive participation via the internet
► Access to the virtual showroom
► Digital conference proceedings (PDF)
► Lectures on demand after the event

Register for **ONLINE**

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SCALE IT-Solutions for CAE

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EXHIBITORS

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