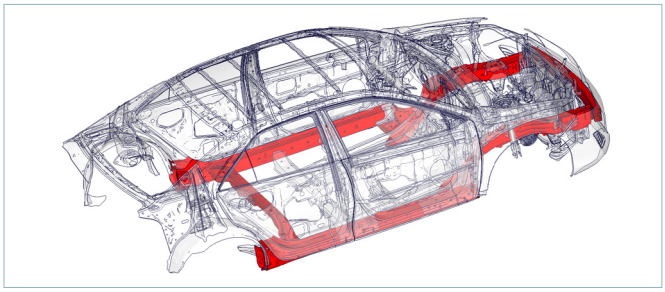
Fraunhofer SCAI

ModelCompare – FEM model comparison made fast and easy

ModelCompare is a plug-in for finite element (FE) pre-and post-processing tools. It compares two similarly discretized FE models and portrays their differences of geometry (mesh), material identifiers (ID), and thickness.

ModelCompare identifies the differences between the two models based on the geometry described by the mesh. It uses specialized mapping techniques that lead to extremely short run times.



Visualization of the thickness differences between the two chassis.

User benefits

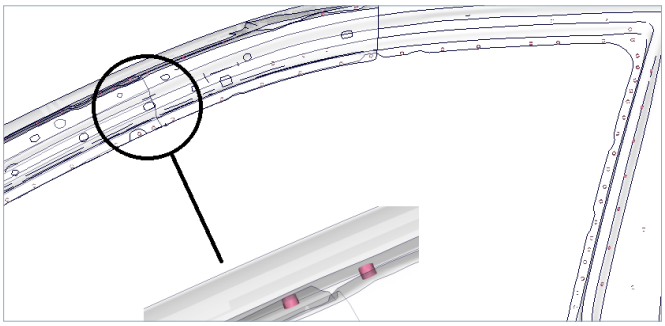
Everybody involved in computer-aided engineering (CAE) has to deal with numerous designs that vary in geometry, material, and boundary conditions. ModelCompare is a quick-look tool capable of determining the differences between two FE models, which are discretized similarly. With ModelCompare, you can quickly compare two FE models within the visualization tool used without going through the burden of manually determining the differences. A report can be generated to document the changes.

Our contribution

At Fraunhofer SCAI, we thrive at the cross-roads of mathematics and data analysis. This enables us to provide cutting-edge tools that address the everyday needs of CAE engineers. They often need to compare and identify parts from different models when they analyze different simulation results. Therefore we developed this tool as one step of an overall simulation data analysis workflow.

A seamless interface as a plug-in

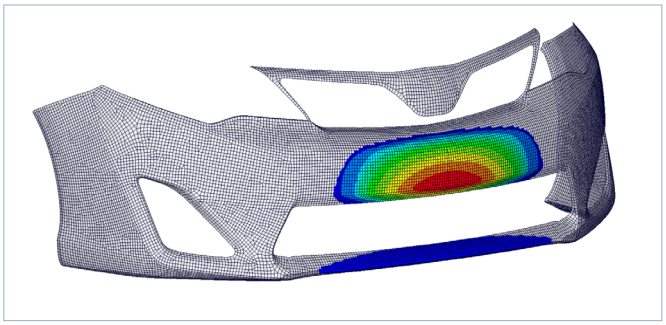
ModelCompare is available as a plug-in for GNS Animator and can also be provided as a seamless, versatile interface for the visualization tool of your choice or as a stand-alone tool.



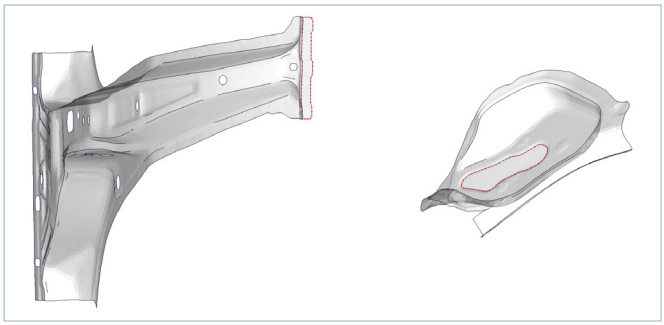
Differences in the spot welds have been detected and can be visualized together with the connecting parts.

Geometry and mesh changes
Accurate estimation and depiction of the differences in the geometry of two FE models are made based on their nodal positions. Additionally, parts with the same shape but different mesh configurations are detected and displayed.

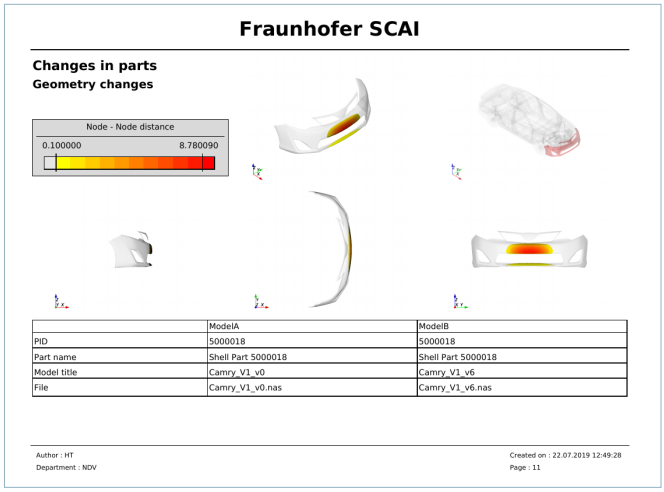
Duplicated parts in one model
Parts with the same shape and mesh, which occur several times in a model, are identified independently of their orientation.



The bumper of the car that has been morphed in the other model has been detected as changed, and the color-coding depicts the intensity of morphing involved.



Detection of an extended contour and a closed hole in the other model.



A pdf report can be generated during the comparison process. The report displays the parts that geometry changes, the user settings used for comparison, and a summary of the other changes.

All parts displayed in this information sheet are obtained from the open-source FE model of the Toyota Camry.

Multi-parts detection

ModelCompare identifies a part in the first model that is split into many parts in the second model as a set consisting of these parts.

New and missing parts / elements

New parts that have been added to or parts that have been removed from the model are detected and visualized. Elements missing in a part in one model, e.g., due to improper meshing, are also detected. The tool also detects if an element belongs to two different parts in the two models.

Material-ID, thickness, or function changes

Differences in material-ID, thickness, or user-specified function values between both models are detected. Here, thickness changes can be part-based or element-based, while function values can come from nodes or elements.

Detection of changes in spotweld, RBEs, and adhesives

Differences in the attributes of the spot welds (e.g., part identifiers, element identifiers, connected parts) along with new, missing, and moved spot welds are identified and visualized. ModelCompare can also determine the differences in the positions of the master and slave nodes of the rigid body elements (RBEs). Hexa element-based adhesives can be identified, and changes such as added, deleted, and moved adhesives can be detected.

Changes in contours and holes

Changes such as cut, extended, added, and deleted contours can be detected. Similarly, changes in planar holes, such as closed, extended, new, and shortened holes, can be detected.

ASCII comparison

Input files contain additional information not covered by the geometric comparison, for example, transformation blocks, comment blocks, etc. A smart ASCII difference analysis handles such input blocks. Currently, PAM-CRASH is supported, whereas others such as LS-DYNA will be added.

Contact

Fraunhofer Institute for
Algorithms and Scientific
Computing SCAI
Schloss Birlinghoven 1
53757 Sankt Augustin
Germany

Mandar Satyanath Pathare
Phone +49 2241 14-4007
mandar.satyanath.pathare@
scai.fraunhofer.de
www.scai.fraunhofer.de/ndv

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scapos AG
Schloss Birlinghoven 1
53757 Sankt Augustin
Germany

info@scapos.com
www.scapos.com

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