

Building a Flexible CFD model

Courtesy of Metacomp Technologies

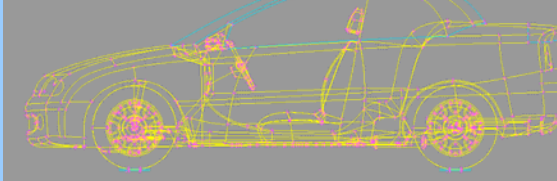
Courtesy of Advantage CFD

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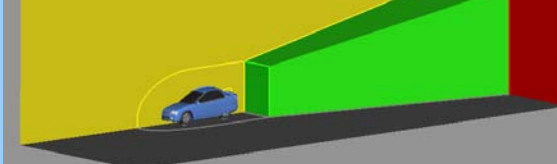
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CATIA V4 & V5 / Unigraphics NX2 / IGES / STEP / VDA-FS

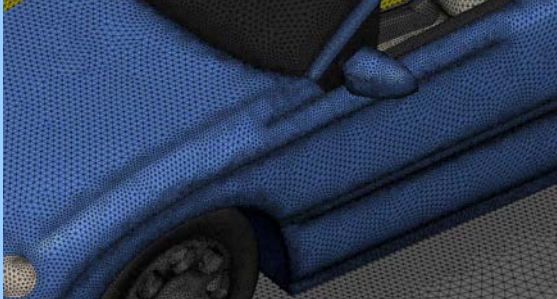
CAD REPAIR / MODIFICATION / ADDITION



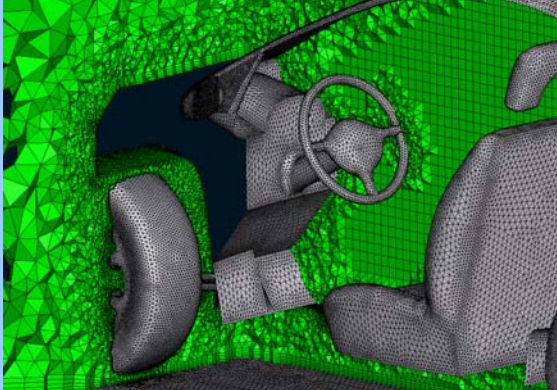
MODEL SETUP / BOUNDARY CONDITIONS



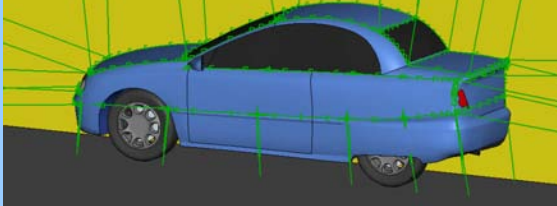
AUTOMATIC CURVATURE DEPENDANT MESHING



LAYERS & VOLUME MESH GENERATION



MORPHING



The ANSA complete process

The preparation of a mesh for CFD analysis is a complex laborious process that requires large amounts of man hours from experienced users and usually involves the combination of different software that are specialized in specific tasks. All this, in combination with the huge model sizes that are currently necessary for realistic and accurate CFD simulations, and nowadays feasible by the available hardware resources, make the process stiff and error prone. The dependence of the volume mesh to the surface mesh also makes error corrections and local model modifications hard to implement, as it is necessary to go back to the early stages of the process.

Based on the experience and feedback from the automotive industry, the new 64bit ANSA v12.0, the result of long-term development, offers a streamlined and integral process that leads to a high mesh-quality model with minimum effort.

CAD import and handling

ANSA offers translators for direct transition from industry's widely used CAD systems, Catia V4 & V5 and Unigraphics NX2. This allows a smooth and error free transfer not only of the geometrical data but also of additional part and assembly information.

For neutral CAD data, the IGES, STEP and VDA-FS formats, together with advanced tolerance controlled clean up tools again allow the user to be able to tackle even the most complicated models.

Mesh data I/O is also supported for Fluent and other CFD solvers and major structural codes such as NASTRAN, ABAQUS, ANSYS, as well as formats like STL, VRML etc.

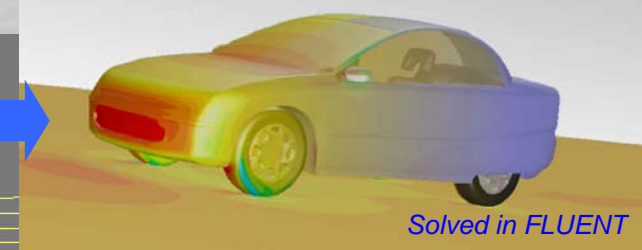
Model Build-Up

The ANSA CAD functions allow the user to modify or add any geometry in order to close openings, fix missing geometry or cut the model to create sub-volumes for volume meshing. Defeaturing at geometry level can also be performed effortlessly. ANSA can also easily combine and handle models that consist of a combination of CAD data and previously used mesh. Boundary conditions name and type can be prescribed in accordance to Fluent.

Surface Meshing

A wide range of tools for defeaturing at mesh level, tria and quad meshing, quality check and improvement are available. The latest meshing algorithm allows a highly controlled, robust and fully automatic creation of a variable element length mesh. Based on the local curvature and sharp edges, this mesh is ideal for CFD analysis.

CFD SOLVER



Volume Meshing

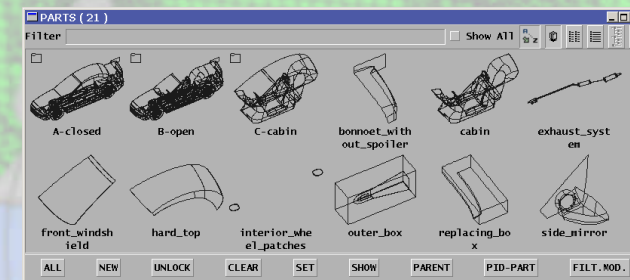
The generation of hexa & penta boundary layers is now an effortless process using the new functionality of controlled smoothing and automatic layer collapse at intersections, proximities and mesh quality problem areas of the model. This overcomes all the necessary preparation of the surface mesh for layer generation in the traditional trial & error approach.

Robust high quality volume meshing of tetra, prism, pyramid and hexa elements is only limited by available hardware resources. Meshing of zero-thickness walls and hexa-interior mesh are also available among others.

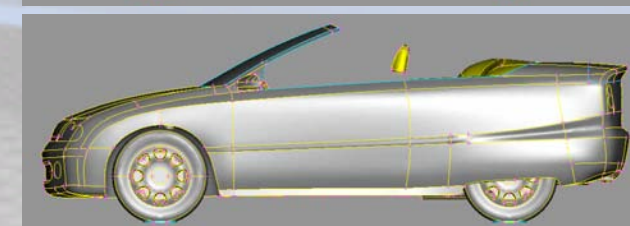
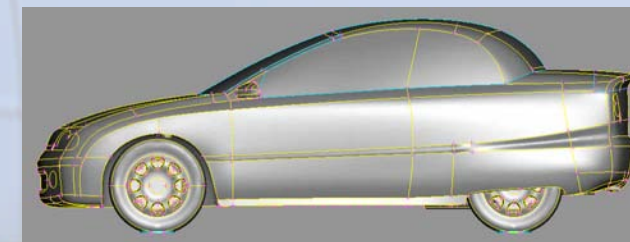
Reshaping

Having completed the baseline model it is highly advantageous to be able to modify it and use it again for comparison and optimisation studies.

A modular construction of the model, facilitated by the use of the ANSA Part Manager, allows the co-existence of more than one variant in the same database.



The ANSA Part Manager

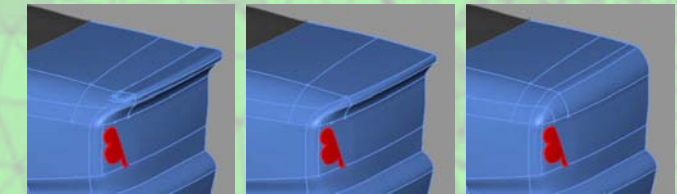


Possibility of coexistence of multiple model variants in one database

Selected Parts can be made visible or not and hence participate in the output model.

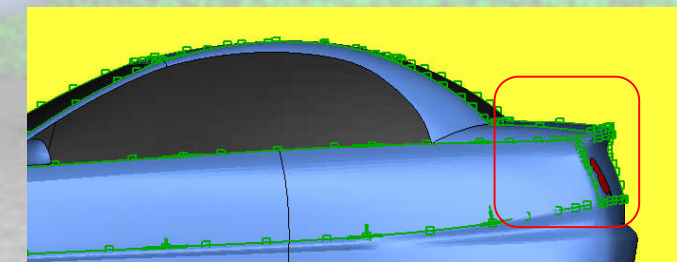
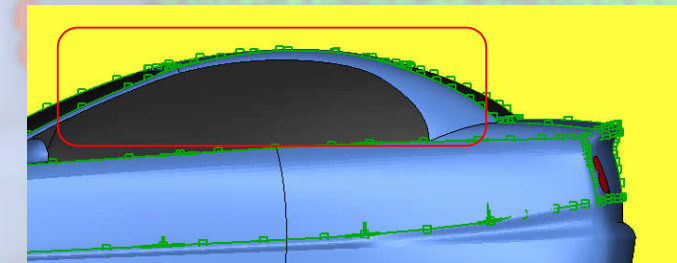
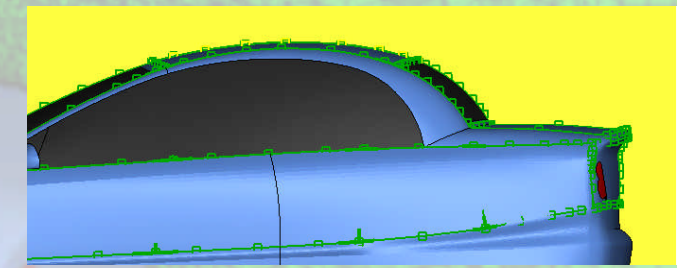
Replacing selected Parts of the completed model with new ones is another easy to perform task covered by the Part Manager. For example, the tail boot can be replaced by variations of it, with or without a rear end spoiler. In order to avoid remeshing the complete volume mesh, the area to be replaced is meshed as a separate sub-volume.

Hence the layers and volume mesh are re-created only locally in this sub-volume. The ANSA layers functionality allows the automatic reconnection and integration to the neighbouring layers.



Testing different variations using Part Replacement of rear end spoiler shape

Another option to reshape the model for optimisation studies is the use of the ANSA Morphing Tool. This can be used on a complete volume meshed model in order to precisely reshape selected features, such as front and rear windscreen inclination or tail shape, either to target new shape curves or by accurate controlled movements.



Morphing used to reshape the roof and rear boot of the complete volume meshed model

The whole ANSA pre-processing approach is an assuring solution to industry's requirements, in various engineering sectors, where reduction of time-cycle and improved cost efficiency are the driving forces.

