Outstanding tools in ANSA and μETA - Results Mapping

Introduction

When it comes to model analysis and simulation, the results of a previous simulation are often used as initial conditions for another analysis.

Aiming towards more realistic solutions, the challenge is to successfully achieve the transfer of data, such as nodal thicknesses, stresses and strains, material properties, and loads (e.g. pressures and temperatures).

The Results Mapping functionality of ANSA overcomes this burden, through its ability to map results from various solver files from one analysis to another.

Specifically, it offers a seamless way of integrating the transfer of results among standardized analysis types.

The Tool

Within the pre-processor, the engineer can setup the exchange process of results between different solvers.

The impressive number of solvers supported, combined with the significant types of results -through a simple and user friendly interface that hides the complexity of the background analysis and calculations- make Results Mapping a handy tool.
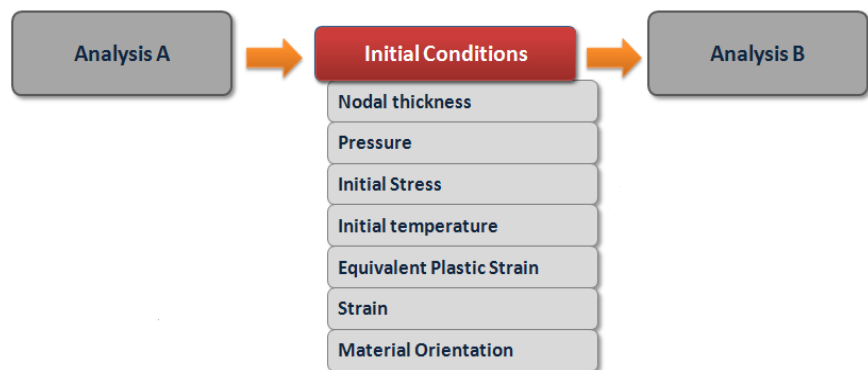

Figure 1: The concept

Indicatively, NASTRAN (*.blk and *.op2), LS-DYNA/dynain (*.d3plot), PAMCRASH, pamstamp, ABAQUS, RADIOSS, ANSYS, PERMAS, are among the supported solvers, as well as any .ascii file format through user input routines.

Combined with initial conditions, such as Nodal Thickness, Pressure, Initial Stress, Initial Temperature, Equivalent Plastic Strain, and Material Orientation, this tool leads to the mapping of results, such as pressure distribution, stress and plastic strain, nodal temperatures, composite structures, and thinning.

The concept

The function maps data, such as Nodal Thickness, Pressure, and Initial Stress from an existing file that corresponds to the mesh of the first analysis to a different mesh which will be used for a new simulation.

Thus, the results of an analysis can be used as the initial conditions for a different analysis. For example, Pressure results from a CFD analysis can be mapped to a mesh for structural applications and become the loading for a durability analysis.

Mapping is based on interpolation and the user can choose among several available interpolation methods, according to the result type.

It is also important that the source part does not necessarily need to be designed at the same location as the target part. The transformation of the source part can be automatically performed, with simultaneous transformation of tensor results, such as

Stresses and Strains. The transformation matrix can be either dictated by the user or automatically calculated, based on geometry similarities between the source and the target.
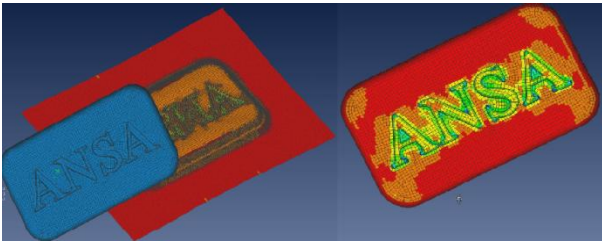

Figure 2: Mapping thickness results from Stamping analysis to Crash analysis

Managing the exchange of composites model data

Composites data can be effectively processed through ANSA and its Results Mapping functionality, assigning new attributes to the result file, such as material orientation and definition, element thickness, and orientation per layer.

FiberSIM (*.fsim2ansa and .hdf5), as well as Simulayt layup file, may communicate the ply/zone geometry and material/orientation information between ANSA and the source file. After the Results Mapping application, Laminate data are mapped and an automatic assignment of properties and orientation to elements takes place.
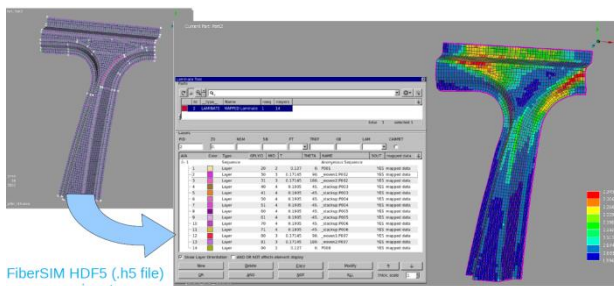
FiberSIM HDF5 (.h5 file)
input
&
ANSA RESULTS
Figure 3: FiberSIM HDF5 (.h5 file) Input and the corresponding layer mapping into ANSA

Automation

As an ANSA Entity, Results Mapper keeps all information regarding its position in space and the corresponding transformation matrices, the connectivity information, and the type of results that will be mapped. Consequently, it can be modified and re-applied at any given

time, since it also gives control and tolerances to what is considered as acceptable mismatch and/or results deviation.

This means that once the mapping process has been setup, the software can re-apply the source results on demand when a change occurs.

Results Mapping can also be performed via scripting, with the additional capability of customizing mapping in order to work with any unsupported result type and any source data format.
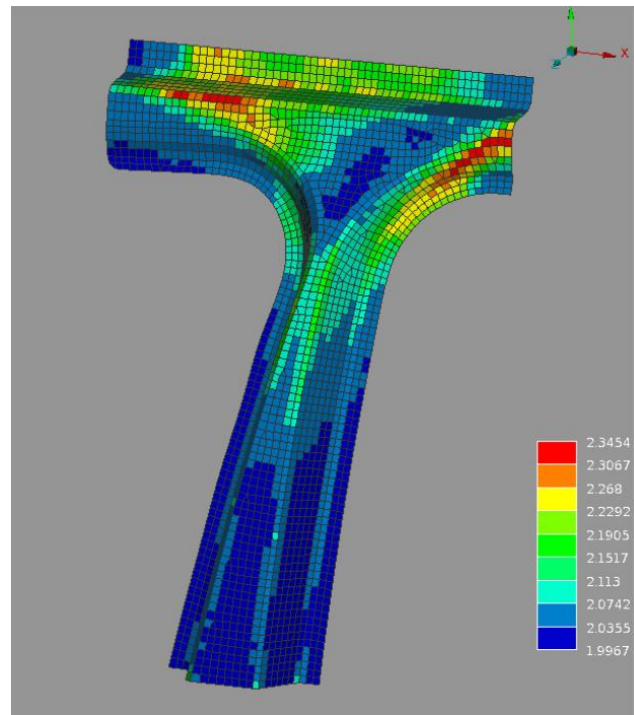

Figure 4: Visualize Element Thickness - Fringe view

The Advantages

The quick analysis setup, as well as the accuracy in the mapping process, all integrated in the pre-processor, ensure success and validity in the results.

By default, Results Mapping functionality takes into account the difference in meshes between the source data and the target model, as well as potential changes in integration rules, sections, and element orientations.

Therefore, incompatible mesh results can be mapped from a Stamp analysis to a Crash analysis or vice versa.

By exploiting this feature of ANSA, codes for metal forming, heat treatment, and crash

simulation can be used in one serial workflow with the use of one tool.

Conclusion

The Results Mapping tool's key features and advantages, such as data integrity, analysis accuracy and the numerous combinations between solvers and result types, all integrated into a familiar and user-friendly environment enables the creation of an accurate model of standardized quality.

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