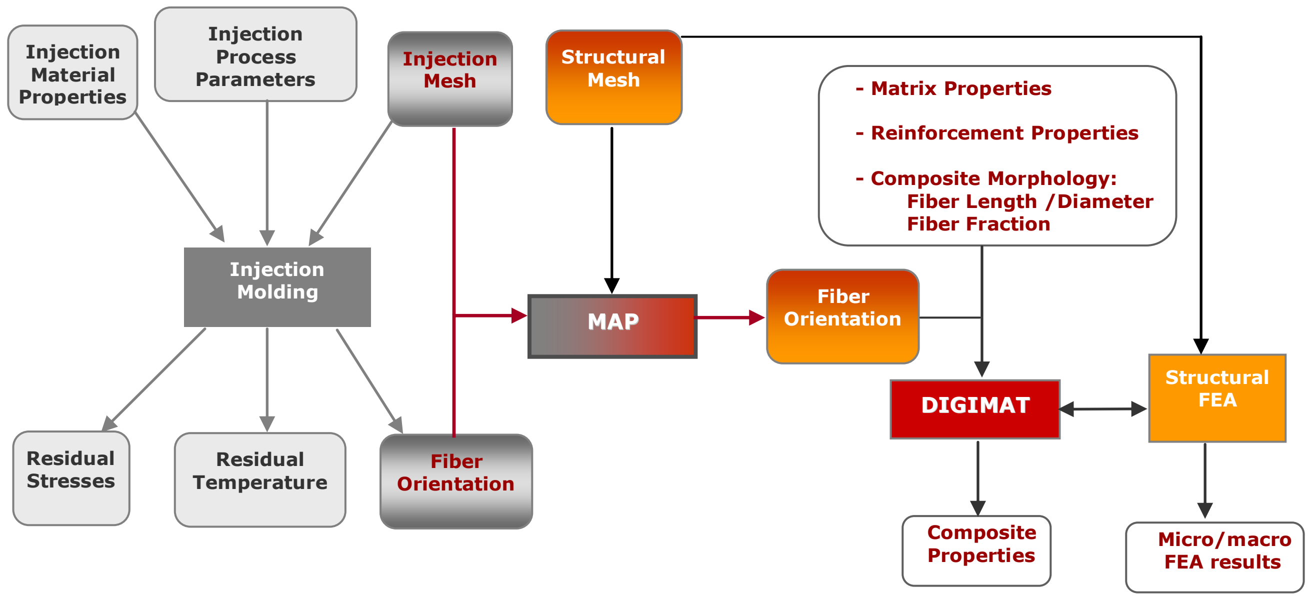
Version 1.1.1 – June 2008

Data Mapping from Injection Molding to Structural FEA Mesh

For engineering plastic suppliers and end-users, MAP™ offers the capability to transfer fiber orientation, residual stresses and temperature from the injection molding mesh to the optimal structural analysis mesh, where they can be used by DIGIMAT-MF™ to structural FEA interfaces to perform state-of-the-art nonlinear multi-scale analysis.

MAP™ is fully and seamlessly integrated within DIGIMAT multi-scale modeling process:



MAP™ bridges the gap between injection molding simulation and the advanced FEA of fiber reinforced engineering plastics via nonlinear micromechanical material modeling.

MAJOR CAPABILITIES

Donor mesh:

- Triangular shell elements and tetrahedron
- Data:
  - *Fiber orientation tensor*
  - *Residual stresses*
  - *Temperature*

Receiver model:

- Triangular or quadrangular shell elements and tetrahedron or hexahedron

Platforms:

- Windows XP X64
- Windows XP 32 Bit

File format:

- Mesh file format: Abaqus, ANSYS
- Data file format: Moldflow 3D, Moldflow MidPlane, SigmaSoft, Moldex 3D

MAJOR BENEFITS

Accuracy:

- Optimal element choice:
  - *1st and 2nd order*
  - *Quadrangles vs. triangles*
  - *Hexahedron vs. tetrahedron*

Efficiency:

- Optimal structural mesh refinement:
  - *In-plane*
  - *Across shell thickness*
- Uniform element size distribution
- Large stable time steps (explicit FEA)

Robustness:

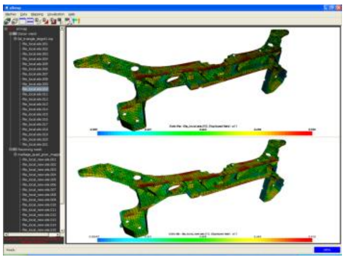
- Minimal element distortion

Flexibility:

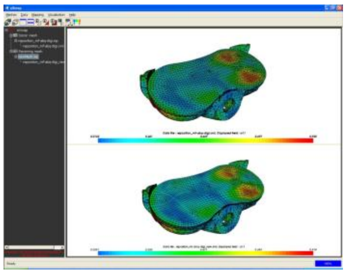
- Independent injection/structural meshes
- Multi-part, multi-material models

Shell & Continuum Mapping

- Two mapping methods are available to handle tensorial data (e.g. fiber orientation and residual stresses) and scalar data (e.g. temperature) at the nodal and integration point level.



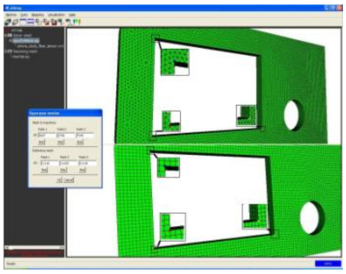
Shell Mapping…
Mapping of fiber orientation from Moldflow triangle mid-plane mesh to Abaqus/Standard second order quad mesh. In-plane and across the thickness mapping. Courtesy of Renault.



Continuum Mapping…
Mapping of fiber orientation from Moldflow 3D tet mesh to an Abaqus/Standard tetrahedron/hexahedron mesh.

Mesh/Geometric Transformation

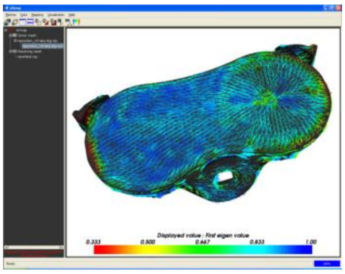
- The donor and receiver meshes are not required to overlap in space. MAP can be used to translate, rotate and scale the meshes before mapping the data.
- The *superpose meshes* function will transform the donor mesh to get it exactly superposed to the receiving mesh. Tensorial data (e.g. stresses, orientations) are also transformed to be expressed in the common axis system.



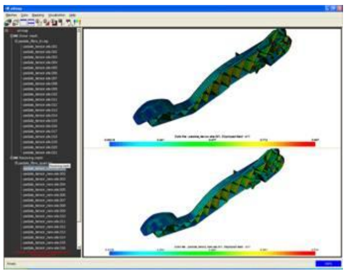
Mesh Superposition...
The donor and receiver meshes are co-positioned using the 3-point method.

Data Post-Processing

- The mapped data can be post-processed as contour or vector plots in two parallel and synchronized visualization windows.



Visualize Tensorial Data…
Vector plot of fiber orientations on a 3D mesh.



Synchronized Post-Processing…
Mapping fiber orientation from mid-plane triangular mesh to an ANSYS Mechanical quadrangular mesh. Courtesy of Rhodia /Trelleborg.

CPU & Memory Performance

- MAP is available on Windows 32 & 64 bit platforms. Mapping fiber orientation tensors from 1,000,000 to 2,000,000 3D elements can be done in less than 24 minutes CPU time (with 1 CPU) requiring less than 1,5 GB of RAM.

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