GiD 10 News

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GiD 10 news - Outline

- Geometry
- Meshing
- Visualization of results
- Advanced visualization
- Customization
- General features
- Future developments

GiD 10 news - Geometry

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Geometry construction from mesh

Several tools added inside GiD allow the geometry creation (NURBS surfaces) from mesh data (triangles or quadrilaterals).

Specially useful when:

- Input data for the simulation is discrete
  - Scanners
  - Images processing
  - Visualization (render) meshes
- Optimization loops (usually, in each iteration, the shape actualization is applied to the mesh)

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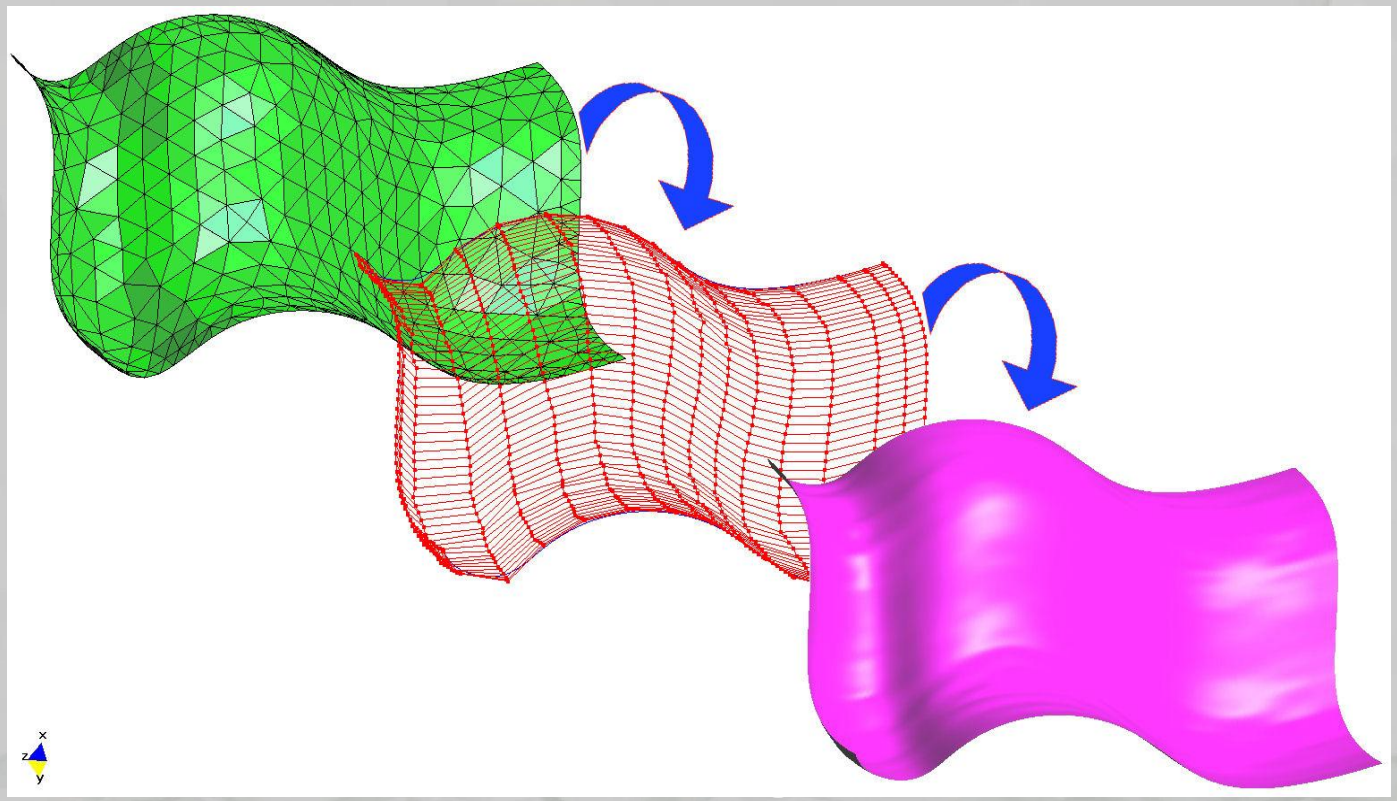
Create NURBS from Mesh

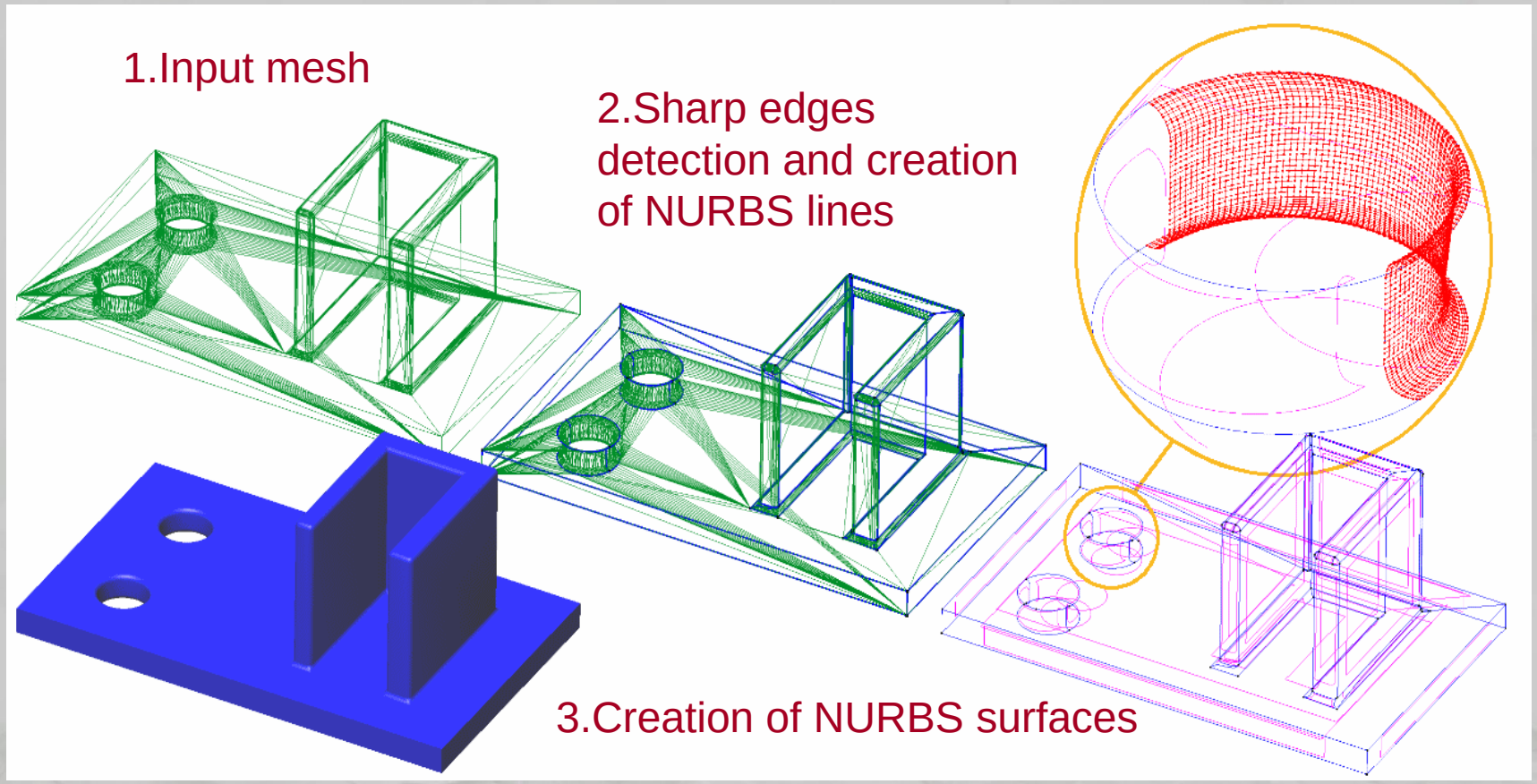
- Option to create one single NURBS surface from a mesh



(useful in cases where ‘4 sides’ can be detected in the mesh boundary).

Create NURBS patches from mesh

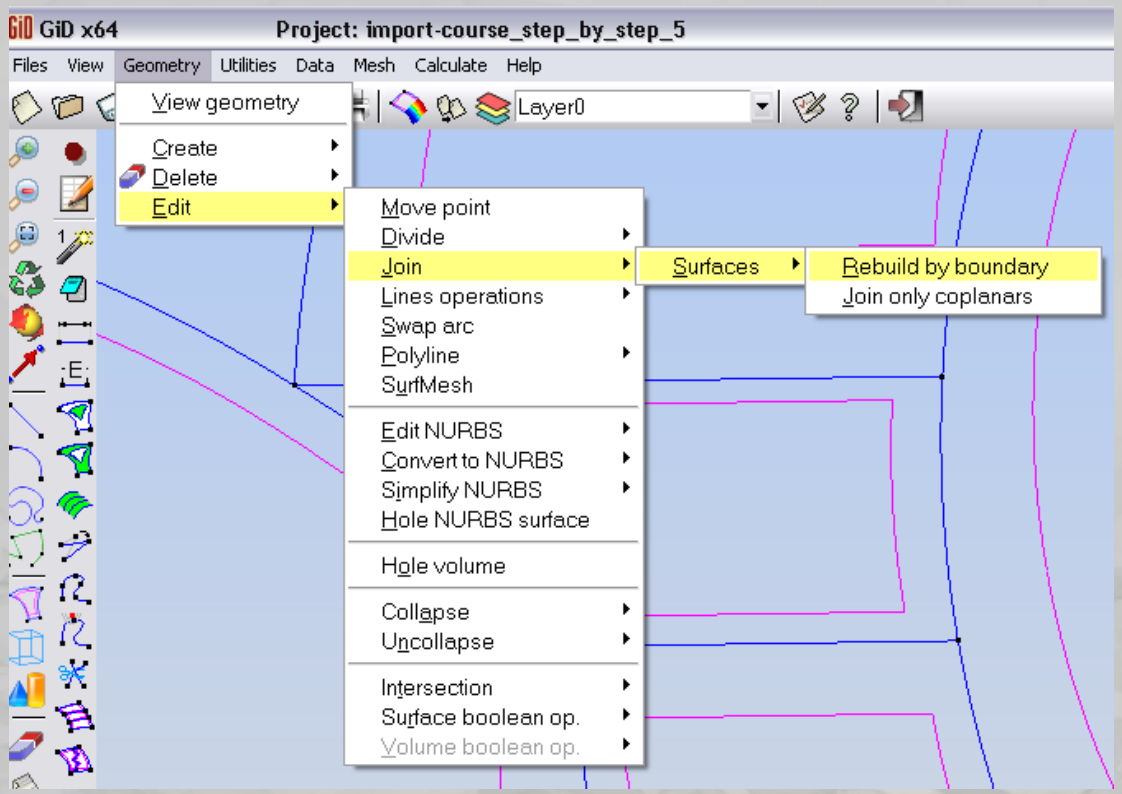
- Example of geometry generation from a mesh.



From a skin mesh, a subdivision of geometric entities (NURBS) it's automatically obtained which defines the same shape in a smooth way.

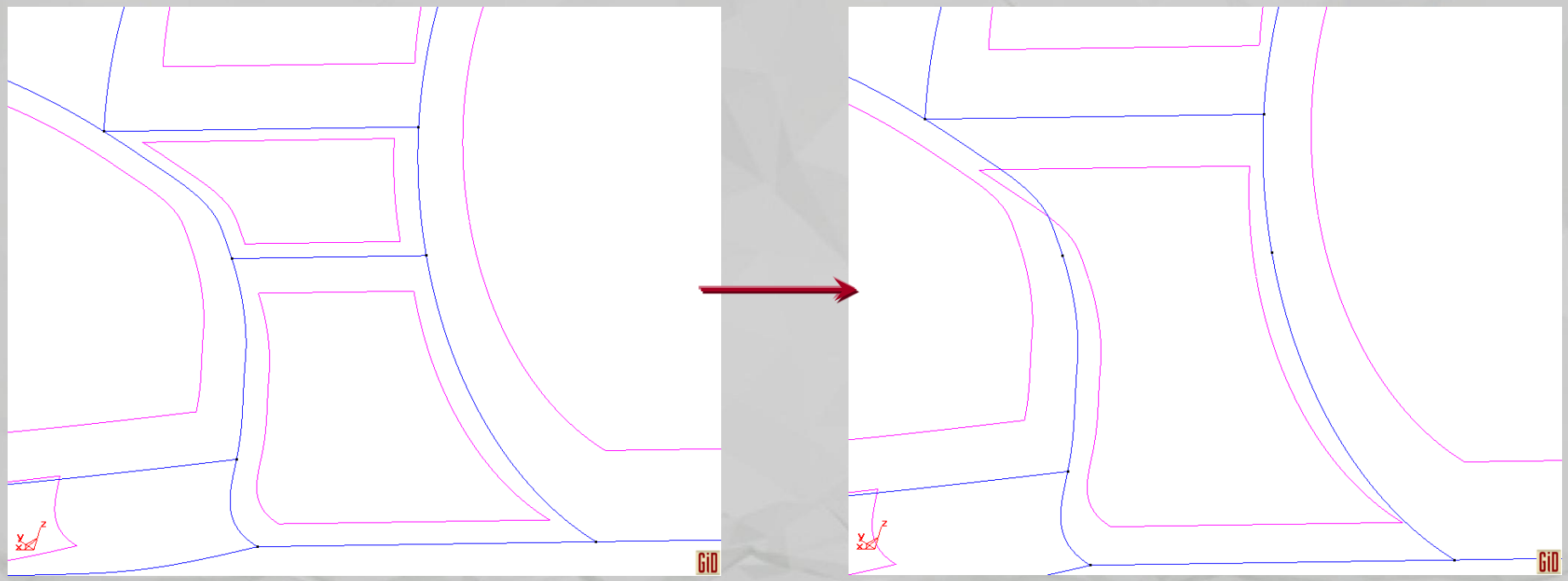
Join surfaces

Option to join NURBS surfaces: GiD reconstructs a new NURBS surface using the common boundary of the surfaces to be joined.



Join surfaces

- New surface can be created from a collection of two or more connected surfaces



Reconstruction of 1 single surface is also possible by selecting only one surface

Other news in geometry field

- **Rhinoceros 4.0 export**
- Import of x y z? ASCII files as points or nodes
- Import of ply format
- **Boolean operations** with **multiple selection**
- **Improvements** in geometric **intersection** operations.
- **Tcl wrapper** of the **HDF5** library to read/write this data format.
- **Parasolid** format import **updated** from version 16004 to 20000

GiD 10 news - Meshing

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3D Boundary Layer Meshes

User defined parameters:

Three possible stretching functions:

- Function 1: Geométric

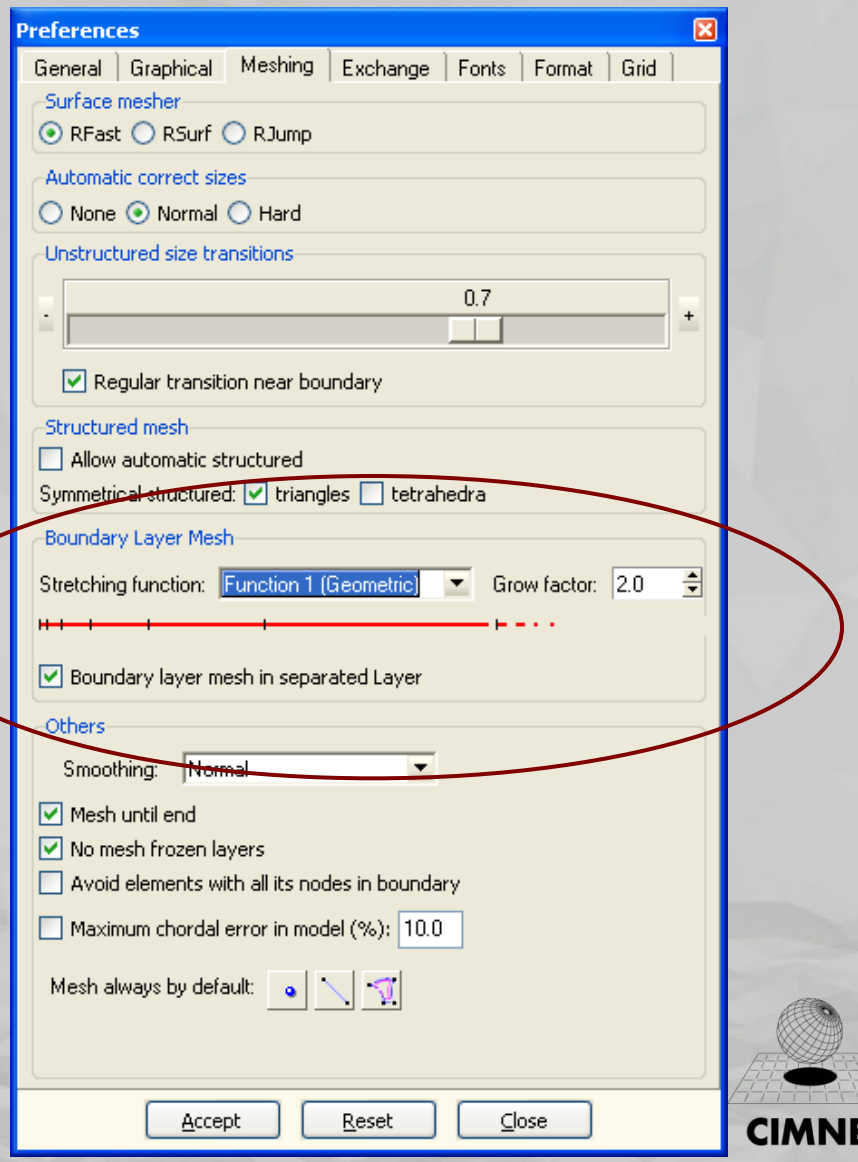
$$h_i = h_0 \cdot \left(r^0 + r^1 + r^2 + \cdots + r^{i-1}\right)$$

- Function 2: Exponential

$$h_i = e^{(r \cdot i + \ln(h_0))}$$

- Function 3:

$$h_i = h_0 \cdot \left(1 + i\left(1 + r\left(1 + r\right) \cdot i\right)\right)$$



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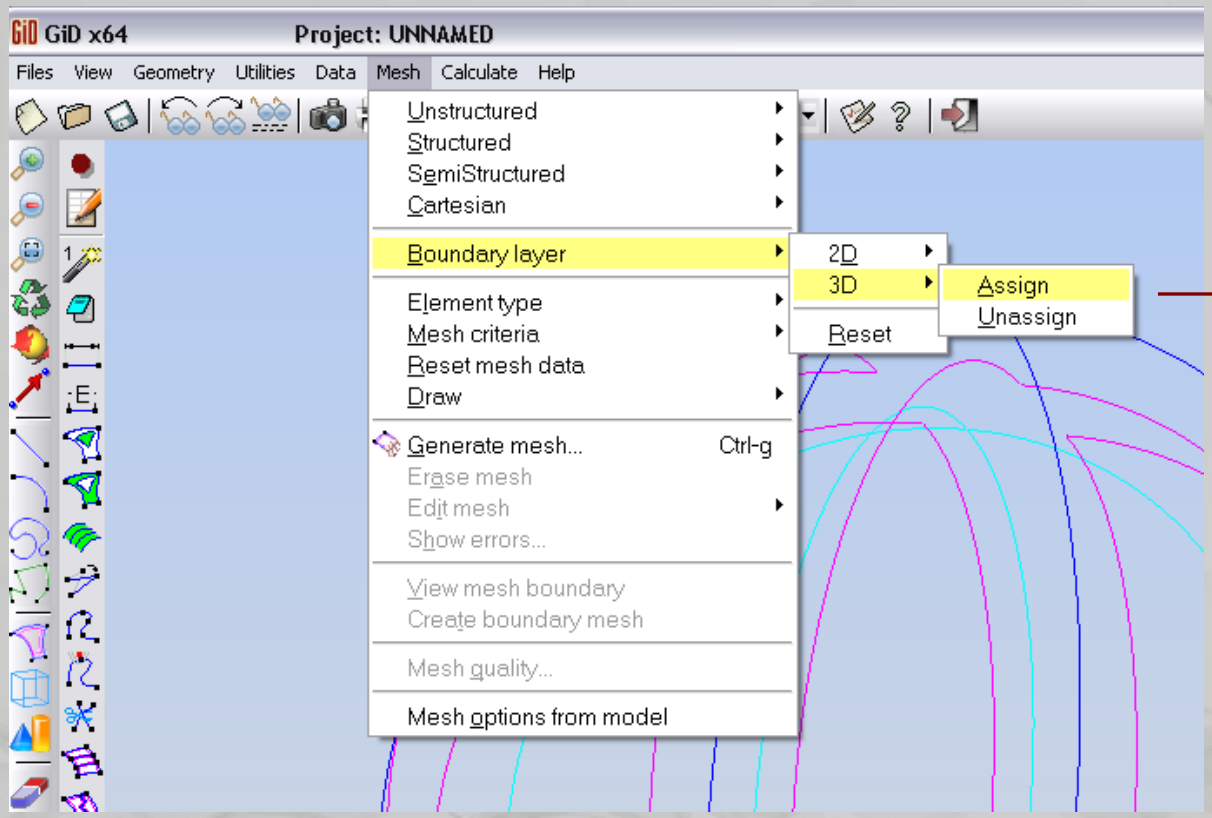
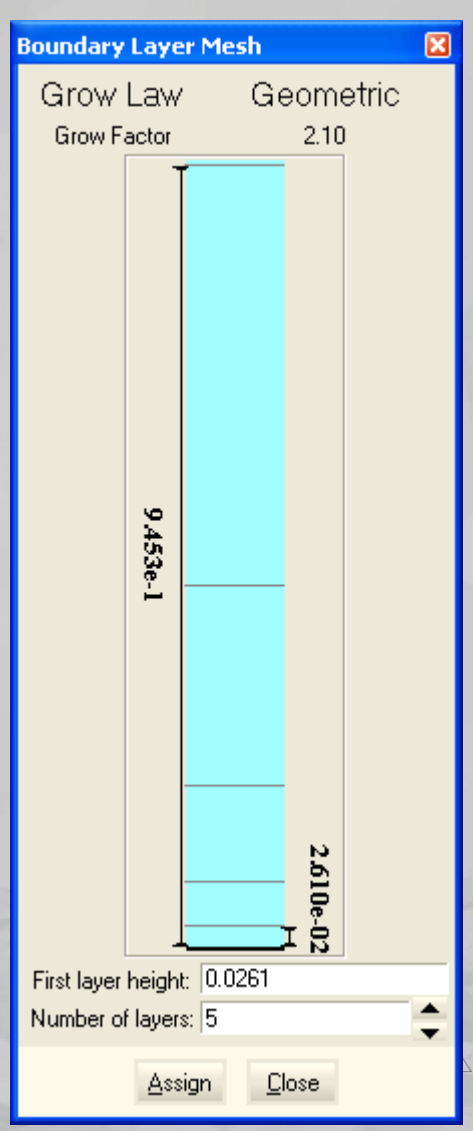
3D Boundary Layer Meshes

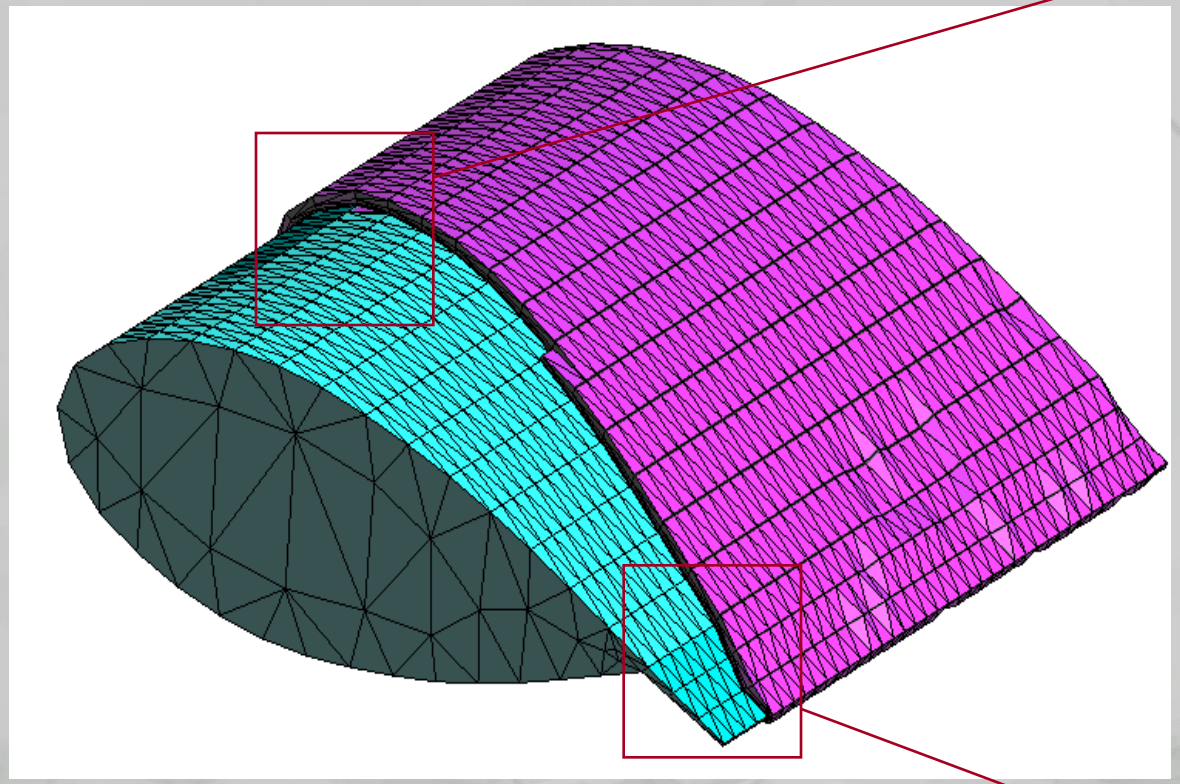
How to assign boundary layer meshes properties to entities

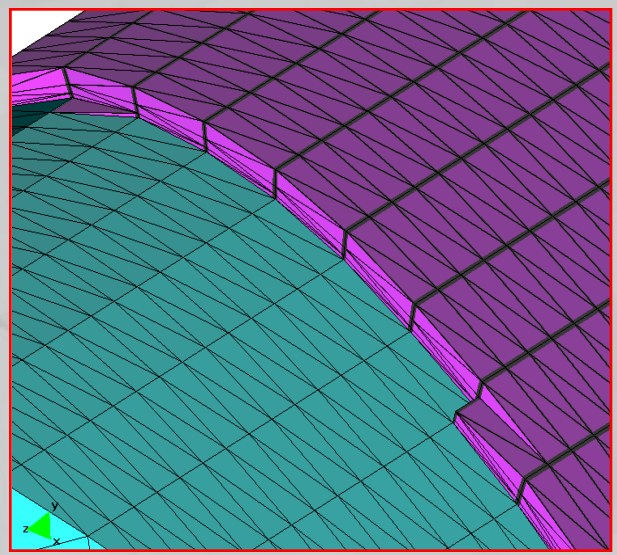


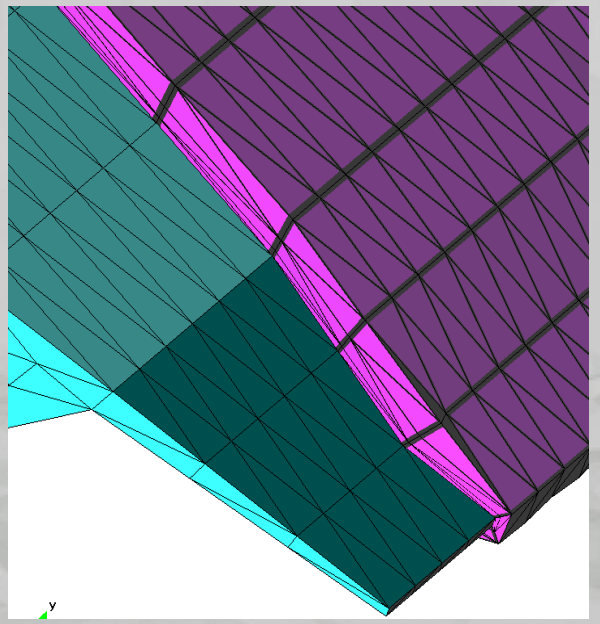


3D Boundary Layer Meshes

Example of a Boundary Layer Mesh in a wing profile

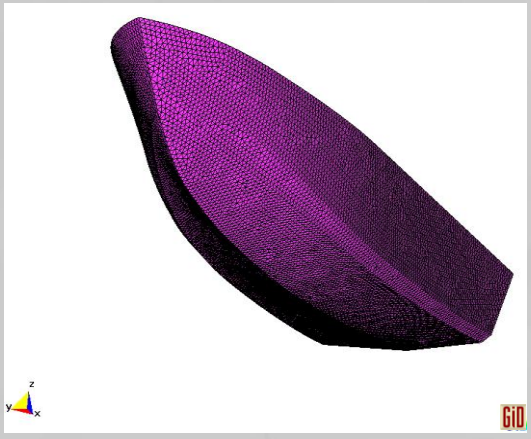


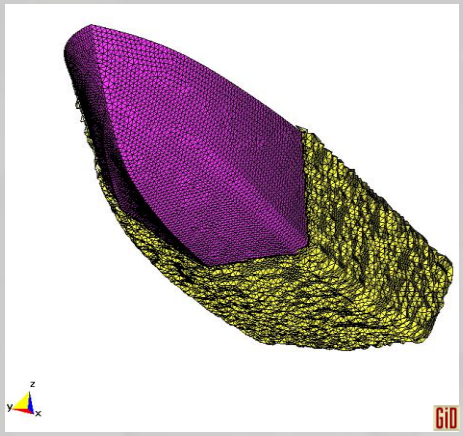


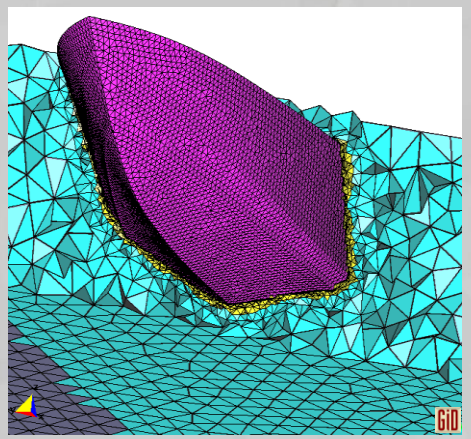


3D Boundary Layer Meshes

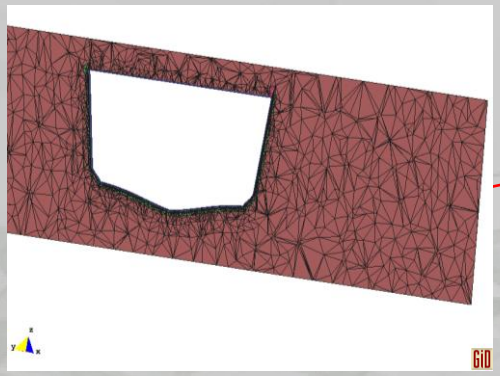
Example of a Boundary Layer Mesh in a ship hull

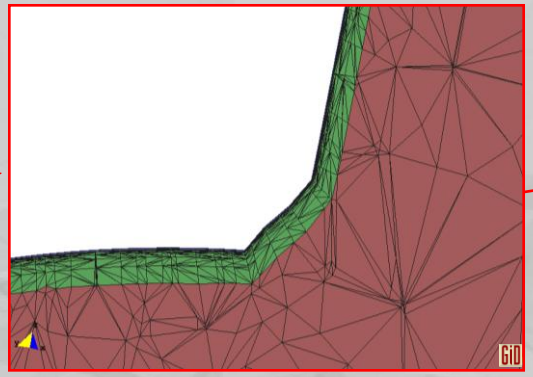


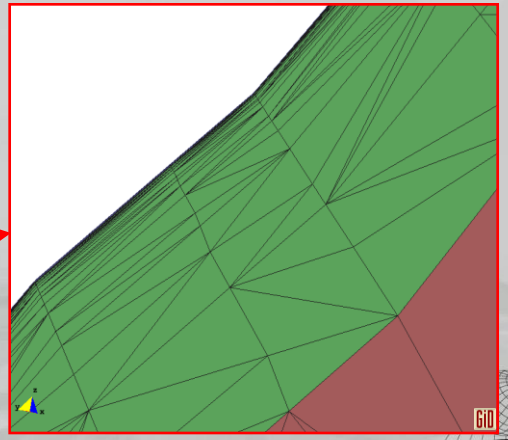




Plane cut of the mesh







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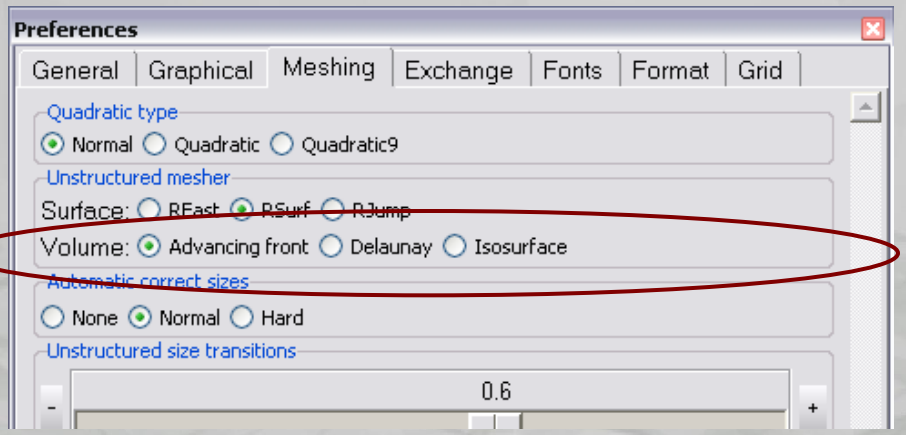
Two new Unstructured volume mesher

User can choose now between three different unstructured tetrahedral volume meshers:

- Based in Advancing front algorithm
- Based in Delaunay method
- Based in Isosurface Stuffing algorithm (F. Labelle and J. Shewchuck) – Not constrained



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Isosurface Stuffing based mesher

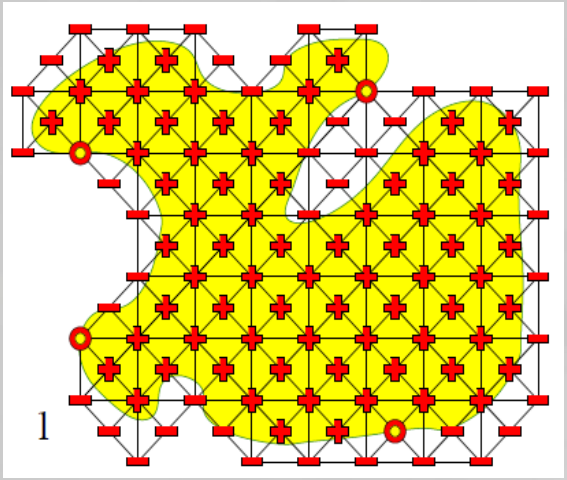
Main characteristics:

- **Fast** mesh generation
- **Robust**
- Able to generate a volume mesh **from a bad quality surface mesh**
- Able to generate volume mesh **from non conformal surface mesh** (available soon)
- Use of points lattices to **improve tetrahedra quality** (good dihedral angles)
- **Not constrained**: it don’t give conformal meshes if there are volumes sharing some surface

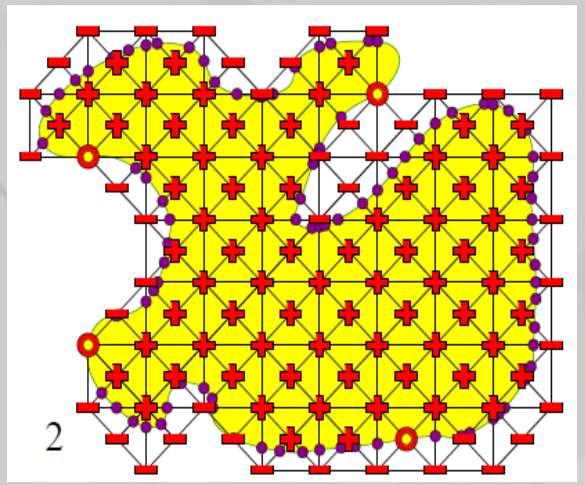
Isosurface Stuffing based mesher

Steps of the mesher:

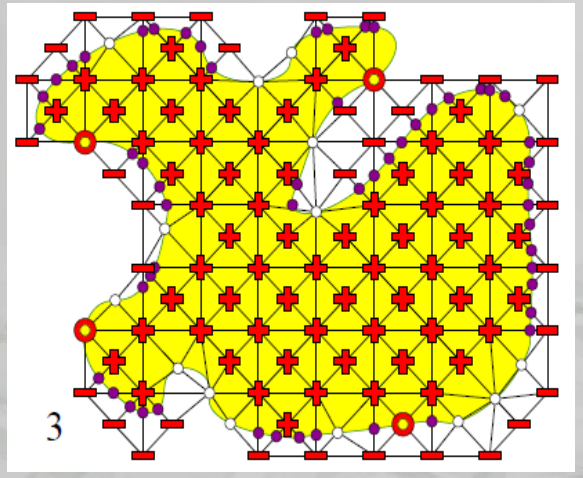
1. Generate fields of signed distance on a cartesian grid



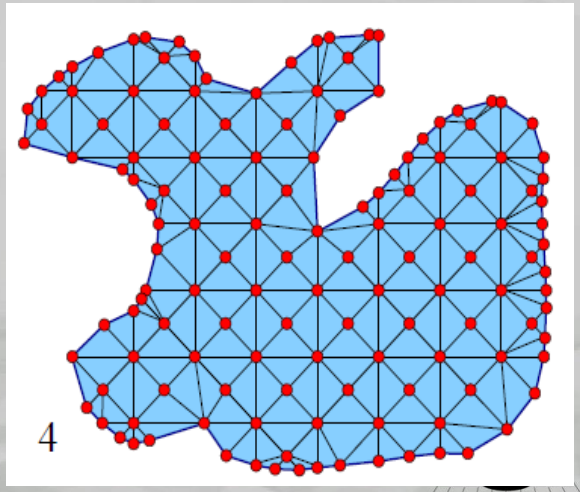
2. Generate cut points



3. Move and collapse points near boundary mesh



4. Apply tetrahedral patterns



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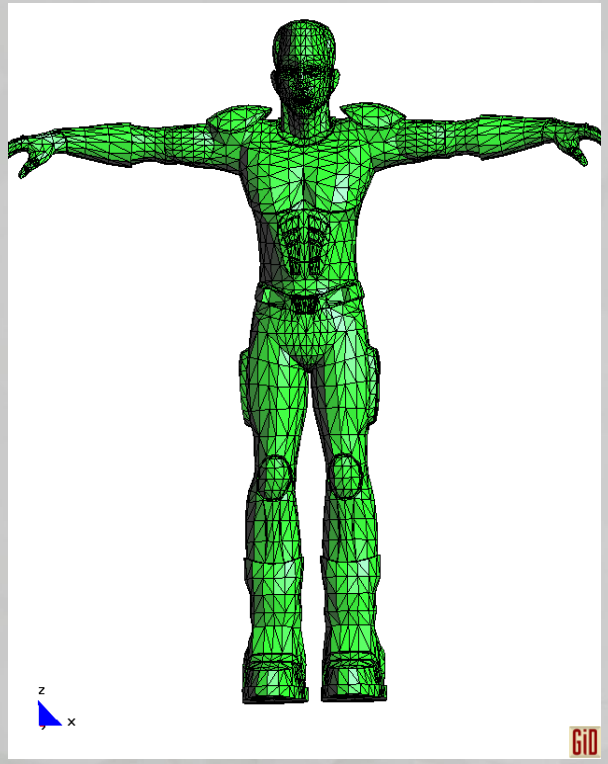
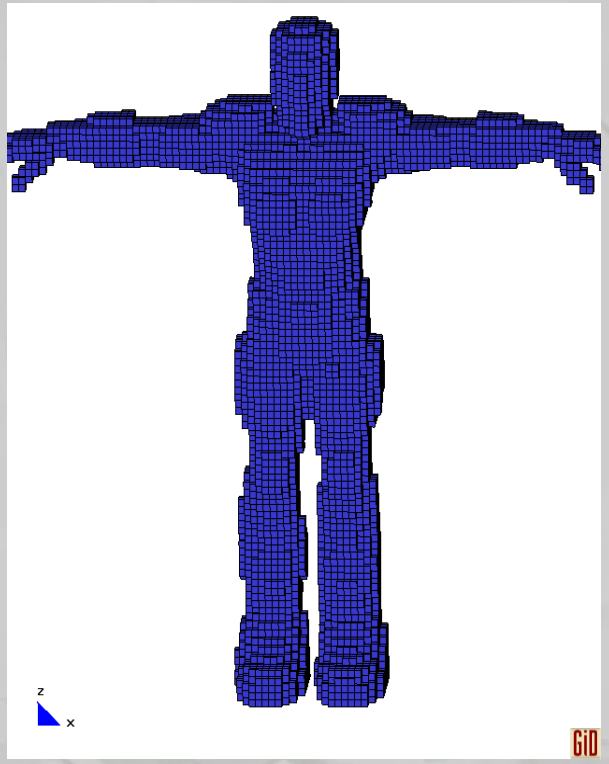
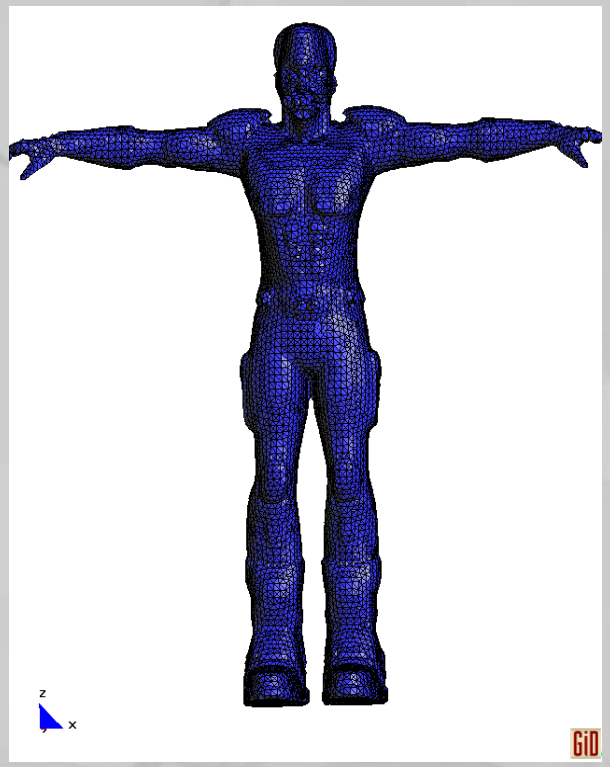
Isosurface Stuffing based mesher

Very useful when the input geometrical model is in .stl format.







.stl format → Cartesian meshing → Tetrahedral subdivision and nodes movement

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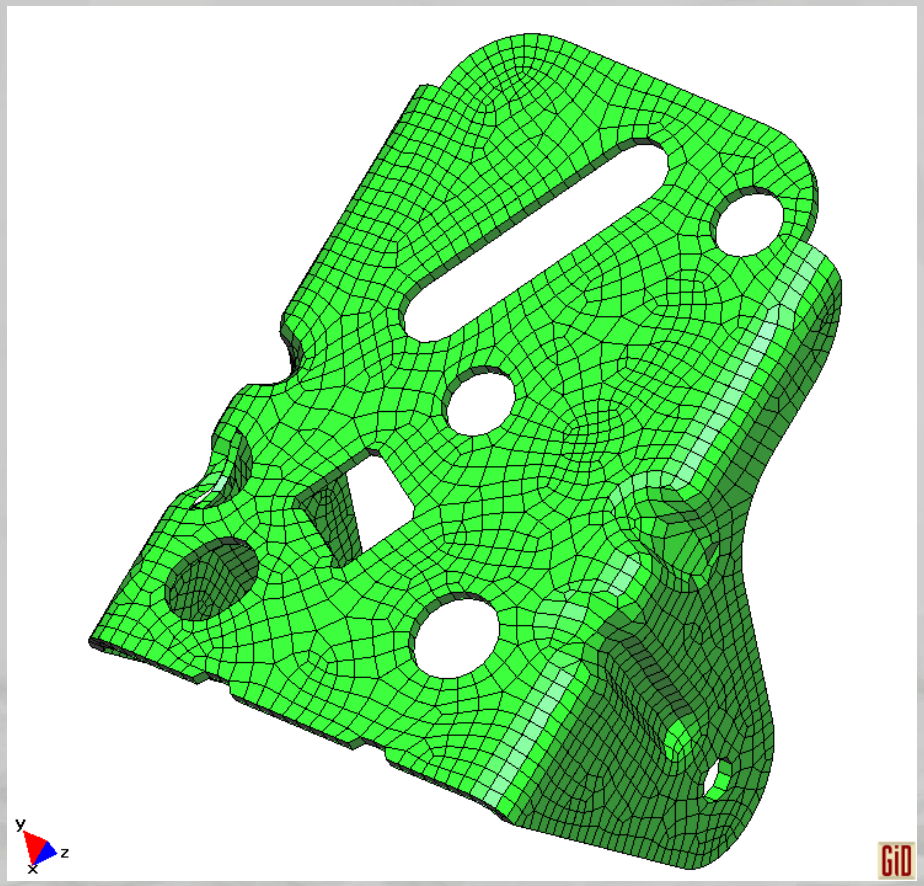
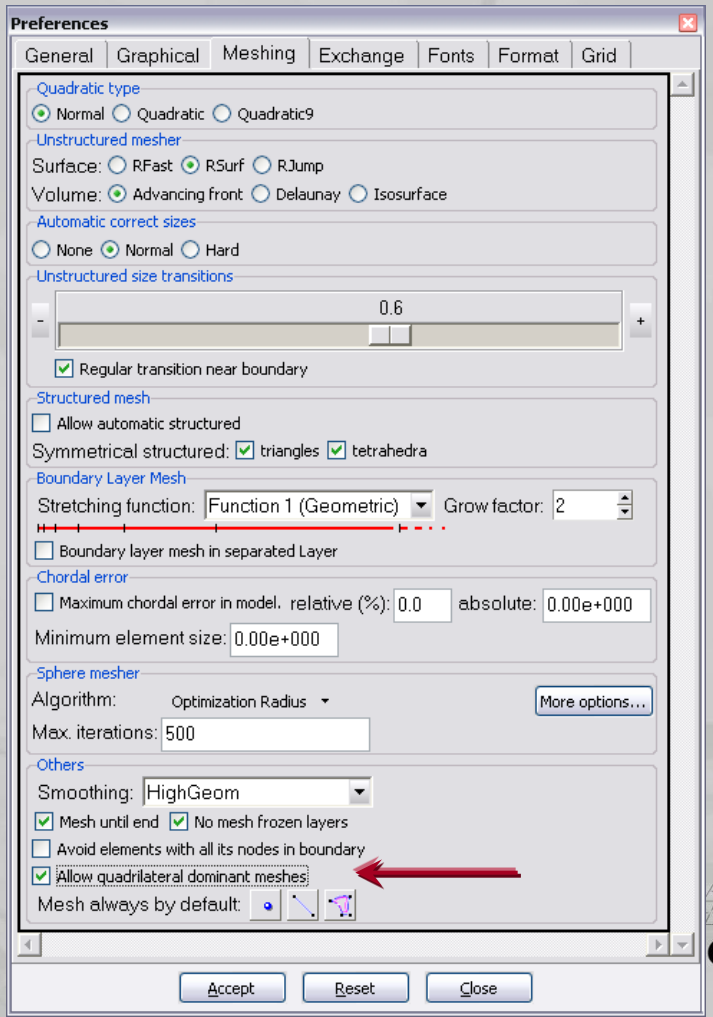
Quad-dominant meshes

Quad-dominant unstructured meshes can be generated (mixed meshes with quadrilateral and triangles).





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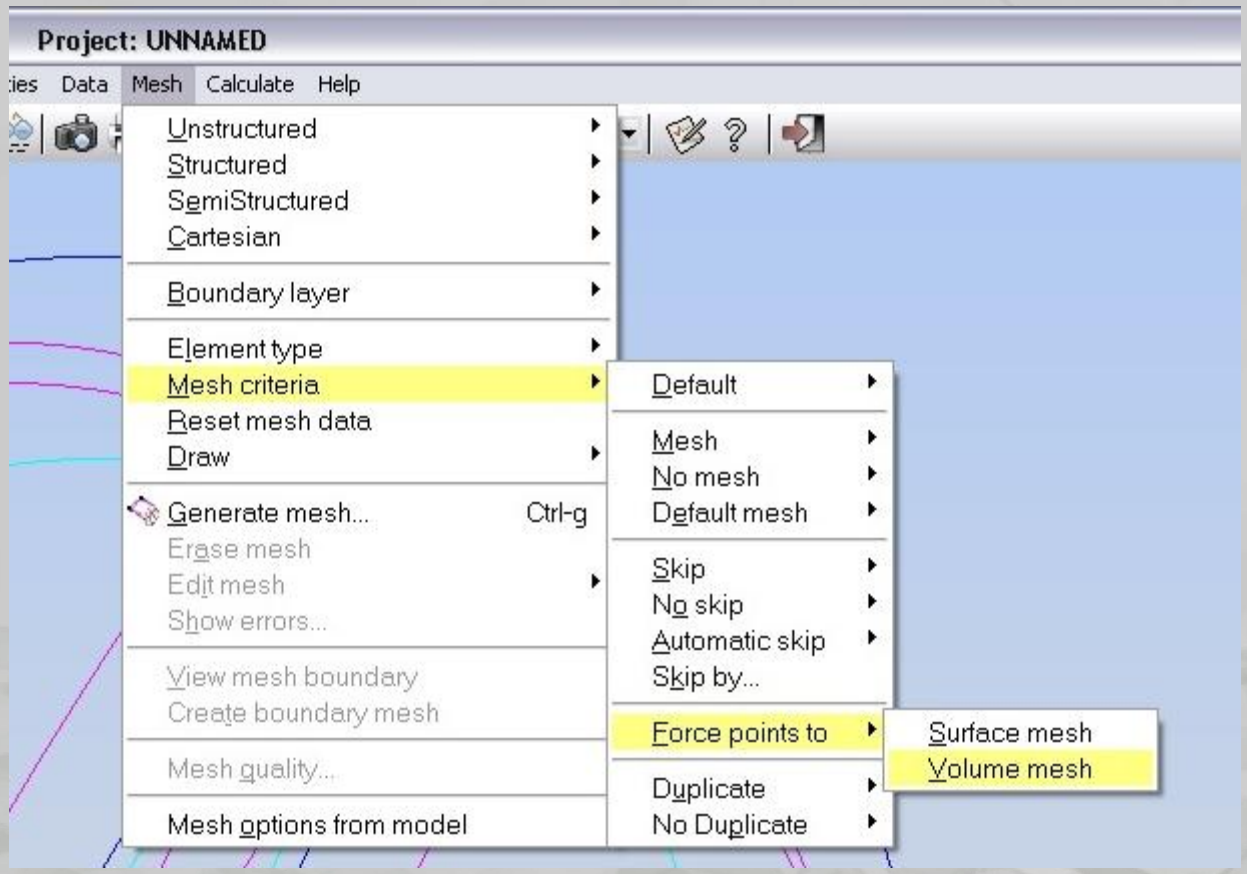
Force points to volume mesh

- Option to force volume tetrahedral meshes to own points which are not topologically inside the volume.



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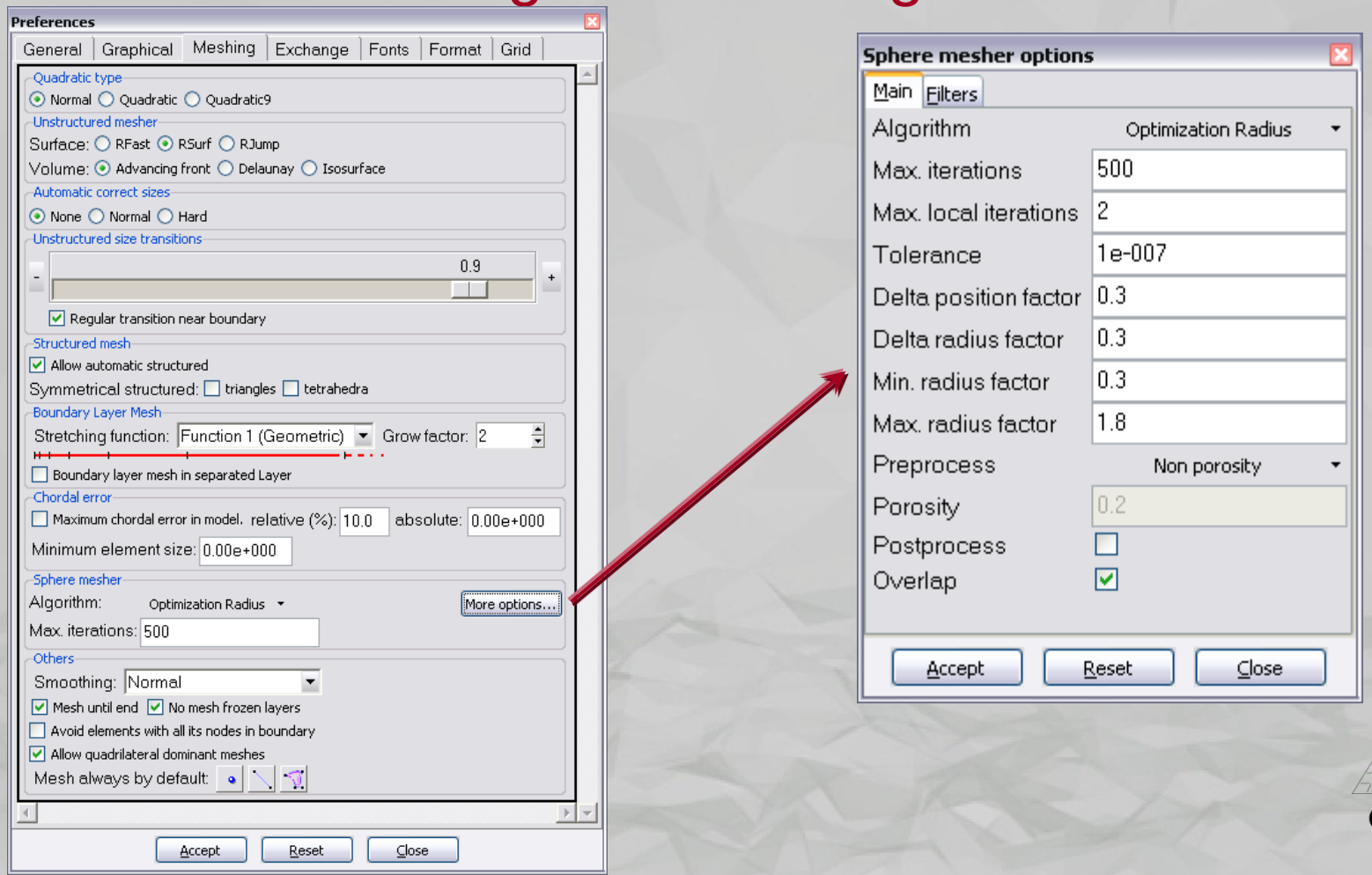
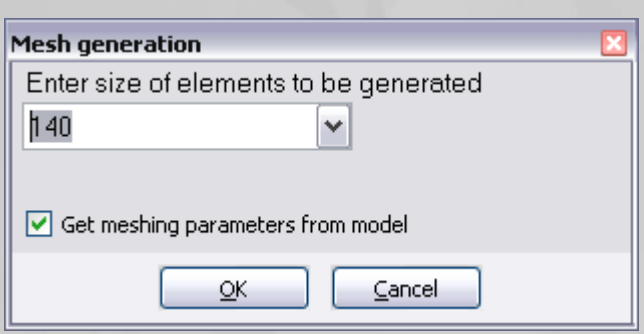
Sphere/Circle mesher options

- Sphere/Circle mesher options in preferences window and new generation algorithms.



Meshing parameters from model

- New option to choose between meshing settings of the model (saved the last time the model was meshed) or the ones in meshing preferences.



User can update the meshing preferences with the ones loaded with the model by selecting **Mesh→Mesh options from model**

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Other news in meshing field

- **Improvement of robustness and efficiency** in volume unstructured mesher based in **advancing front algorithm**.
- **Improvement in the mapping operations** onto surfaces when unstructured mesher in 3D space (RSurf) is used.
- **Improvement** in the assignment of a **chordal error** global criteria to be accomplished in surface and lines meshes (Preferences window).

Other news in meshing field

- **Quadratic option inside meshing preferences**, instead of in the Mesh menu.
- **Automatic correct sizes** only take care on entities **topologically connected**
- **Improvements in quadrilateral** unstructured mesher
- **Cartesian mesher enhancements**: boundary conditions, nodes numbered by rows to access to neighbors.

GiD 10 news – Visualization of results

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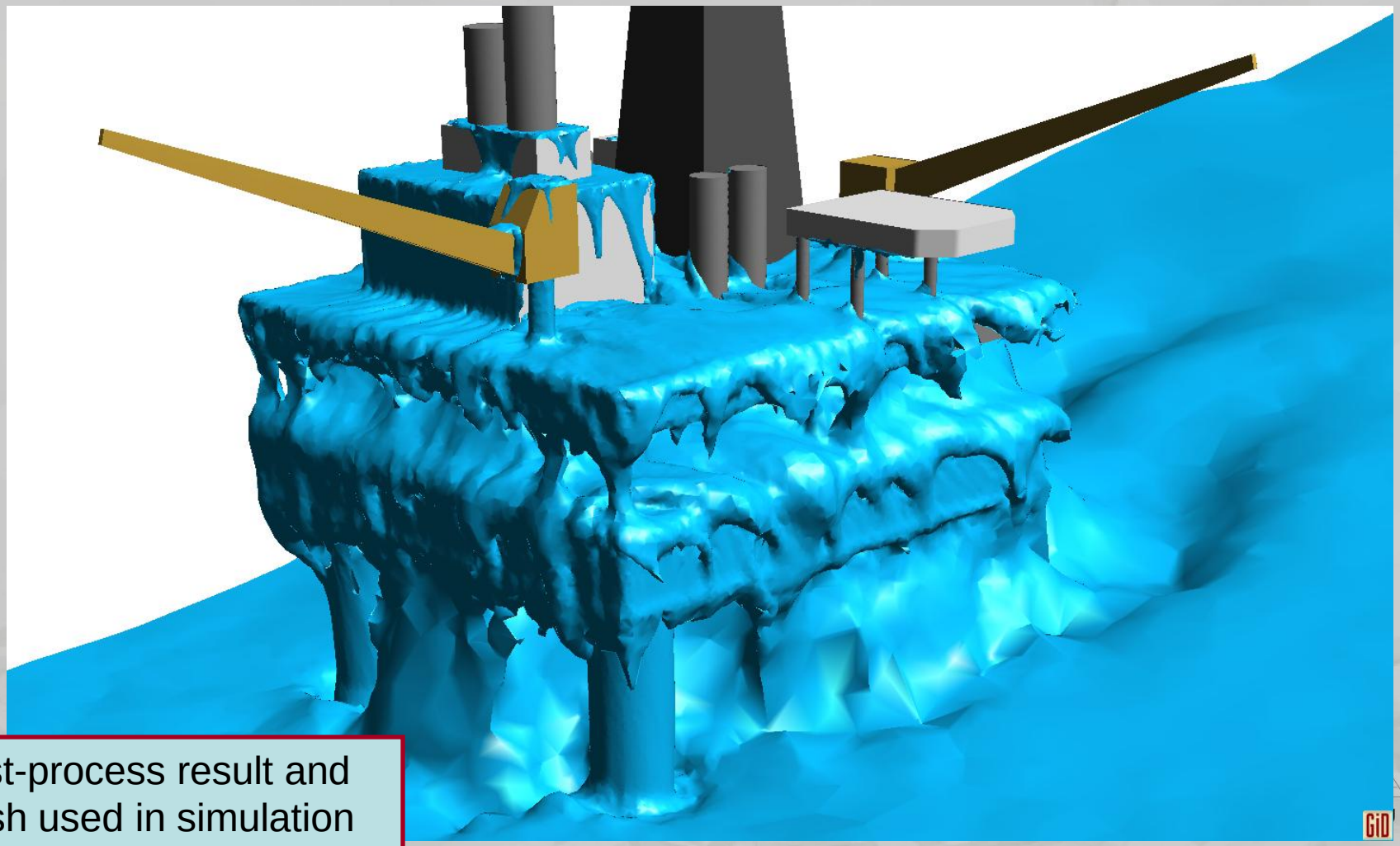
GiD 10 news – Visualization of results

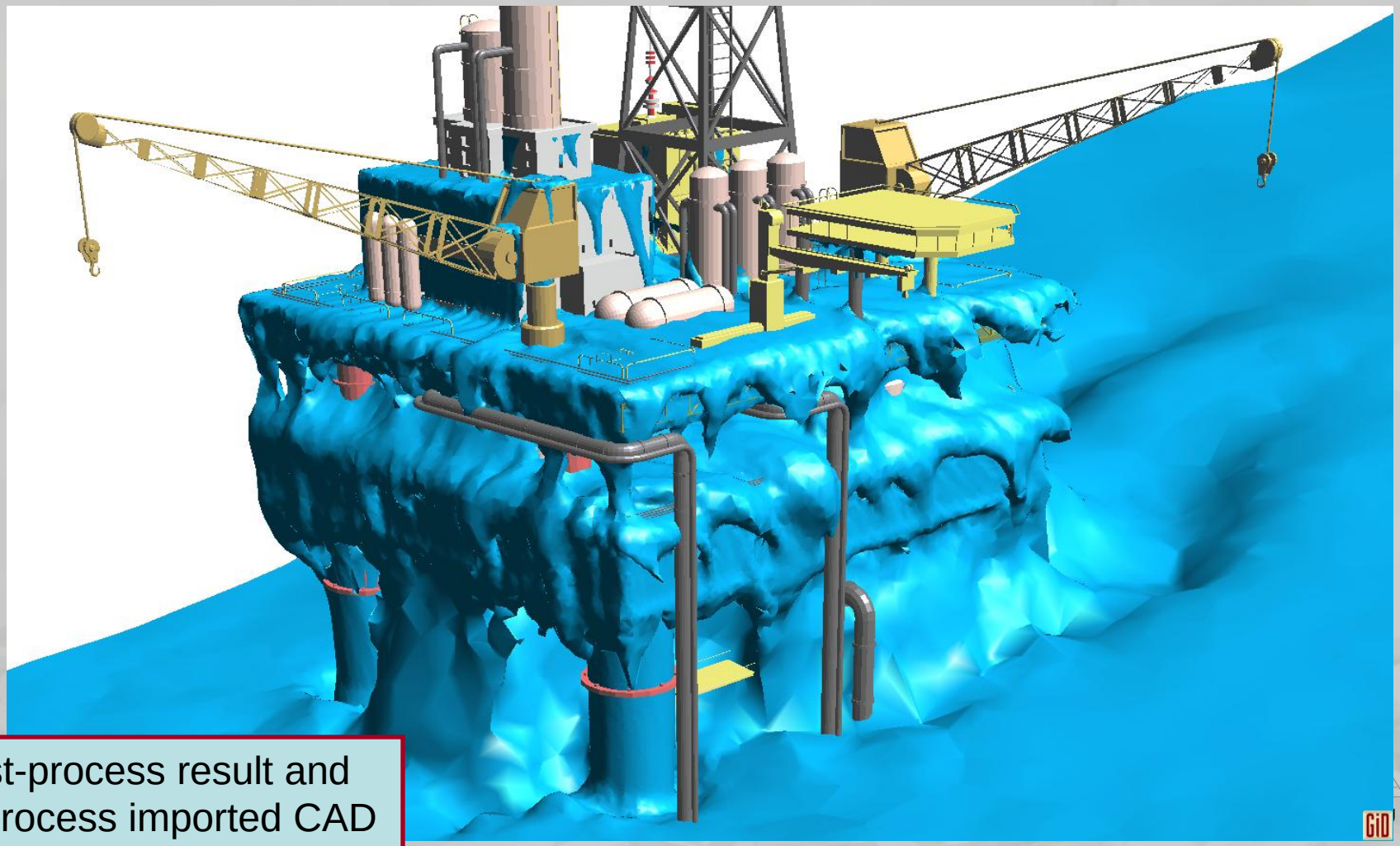
- Results and Geometric model together:



Post-process result and mesh used in simulation

GiD 10 news – Visualization of results

- Results and Geometric model together:



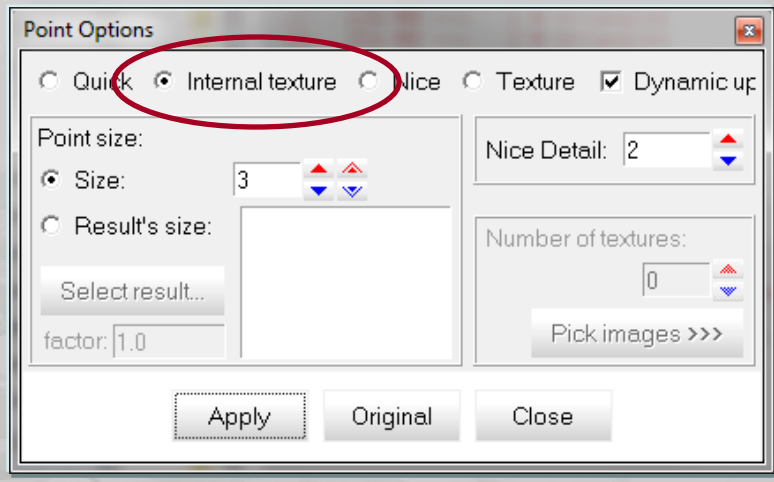
Post-process result and
pre-process imported CAD

GiD 10 news – Visualization of results

- Faster drawing using:
  - OpenGL Display Lists (OGL_useMeshObjects)

OpenGL Vendor	Maximum number of triangles
nVIDIA	2.000.000
ATI	1.000.000
Software (Mesa 3D)	500.000
Others (Intel, S3, ...)	1.000.000

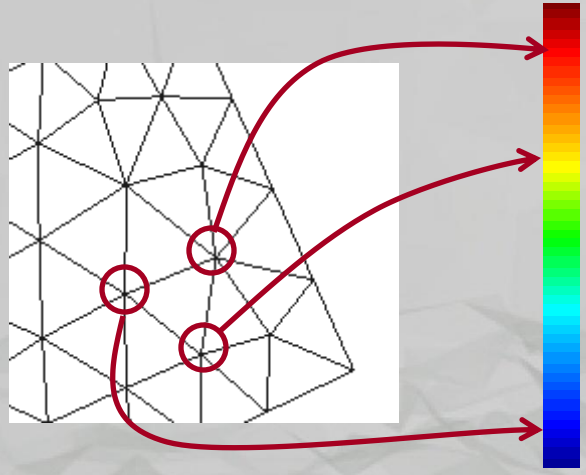
  - Textures
    - Contour Fill: 2x - 20x Speed-Up (OGL_useCFillTexture)
    - Spheres, circles, points: Internal texture drawing mode



GiD 10 news – Contour Fill

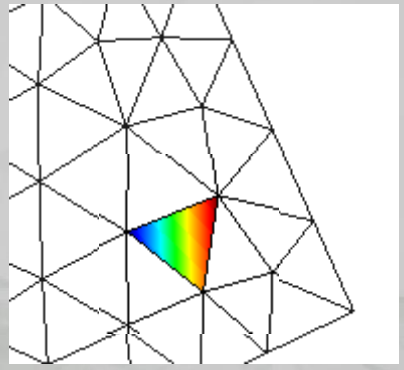
- Faster drawing using:
  - Textures:
    - Contour Fill: 2x - 20x Speed-Up (OGL_useCFillTexture)

Mapping of results to an image (texture)



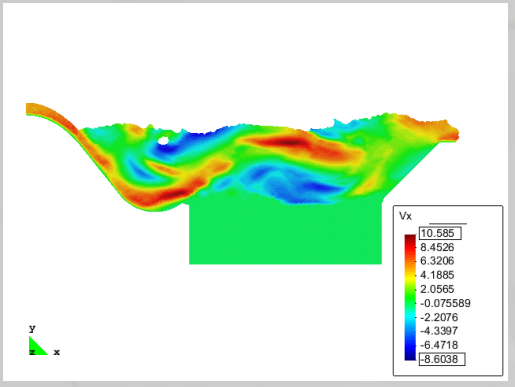
Texture with the colour scale

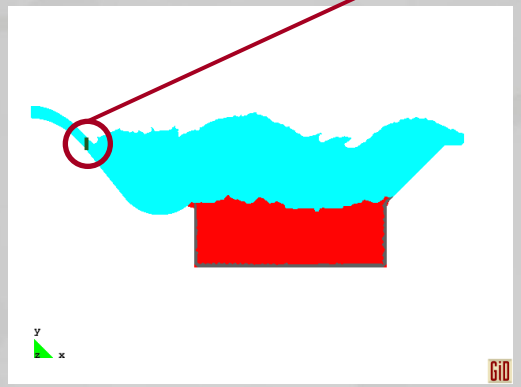
Only a single triangle is drawn



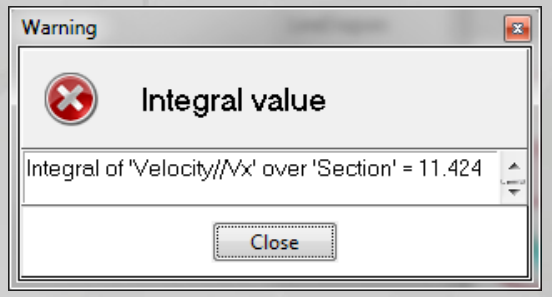
GiD 10 news – Visualization of results

- Results integration:
  - Integral in a single step of a result:

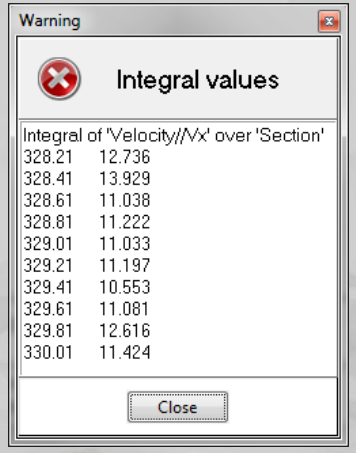




Cross section used to integrate the x-velocity



  - Integral across all steps:



  - For scalar results
  - For vector results (scalar product using element's normal)

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GiD 10 news – Visualization of results

- Loading results:
  - ‘model.lst’ → List of results to be loaded
  - Changing from pre to post:

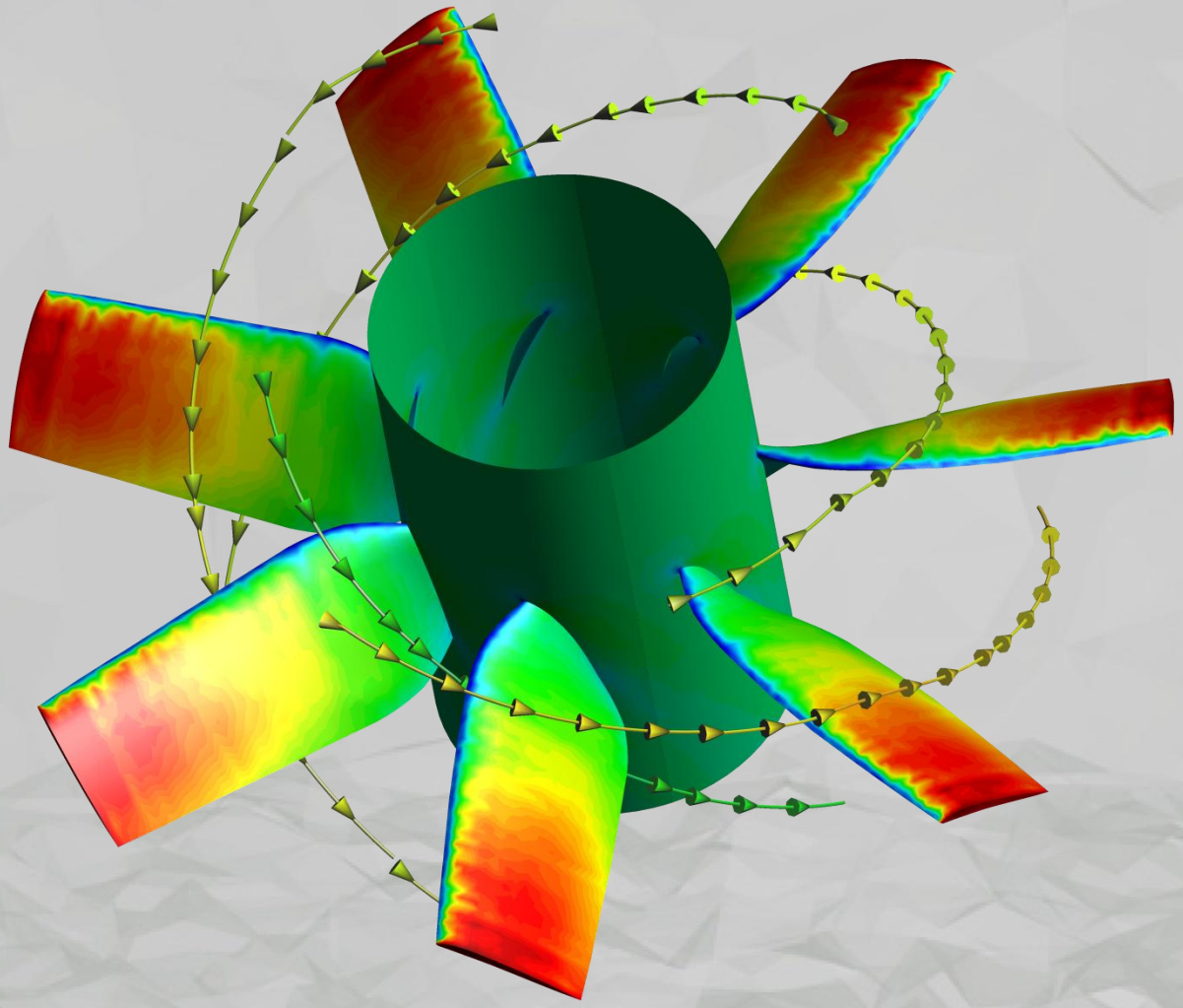
    Project.post.lst

    Project.post.grf
  - Multiple graphs in same file

```
# may be Multiple | Merge | Single
Multiple
# postprocess files
dem-fem-wave1_001.2.post.bin
dem-fem-wave1_001.3.post.bin
...
dem-fem-wave1_001.6.post.bin
dem-fem-wave1_001.7.post.bin
# graph files
dem-fem-wave1_001.FEM.fem-energy.grf
dem-fem-wave1_001.mesh-DEM.branch-vector.1.1.grf
...
dem-fem-wave1_001.mesh-DEM.branch-vector.2.2.grf
dem-fem-wave1_001.mesh-DEM.dem-bonds.grf
dem-fem-wave1_001.mesh-DEM.dem-contacts.grf
dem-fem-wave1_001.mesh-DEM.elastic-energy.grf
dem-fem-wave1_001.mesh-DEM.stress-xx.grf
...
dem-fem-wave1_001.mesh-DEM.stress-yy.grf
dem-fem-wave1_001.node-2105.displacement.1.grf
dem-fem-wave1_001.node-2105.displacement.2.grf
```

GiD 10 news – Visualization of results

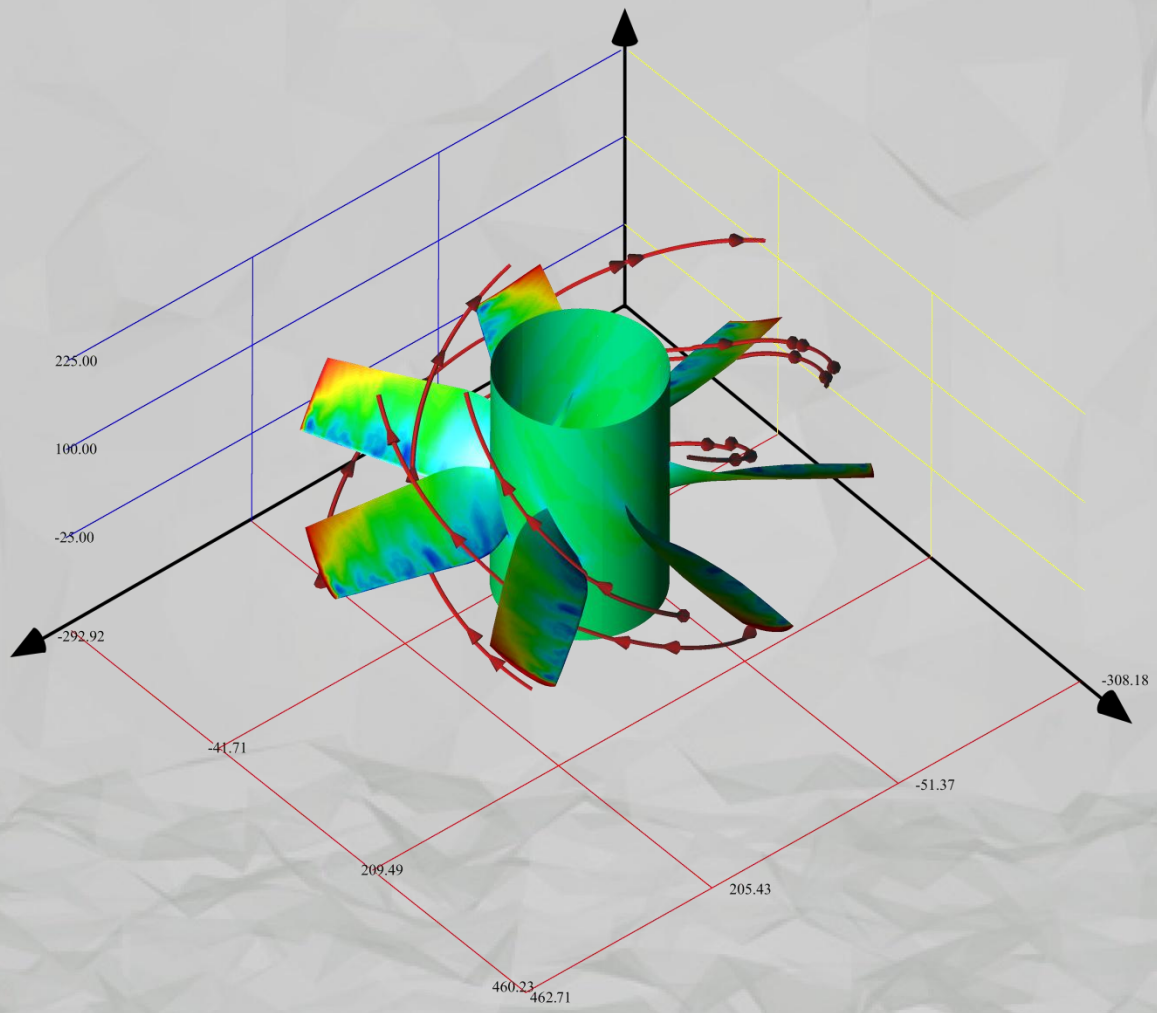
- Arrows in stream lines



Contour Fill of VELOCITIES, |VELOCITIES|.

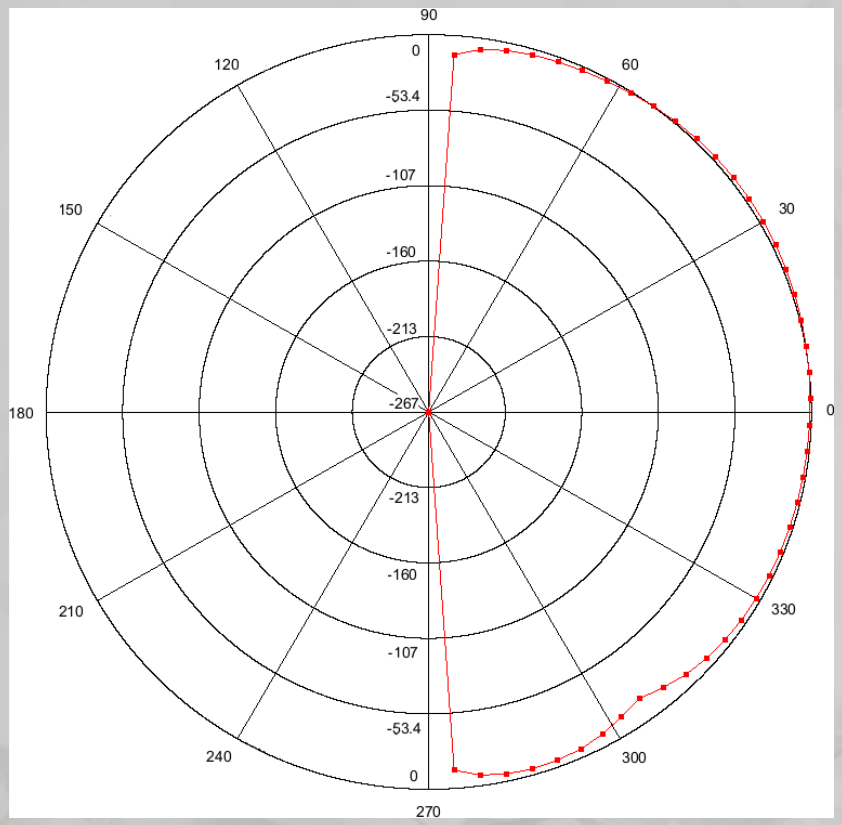
GiD 10 news – Visualization of results

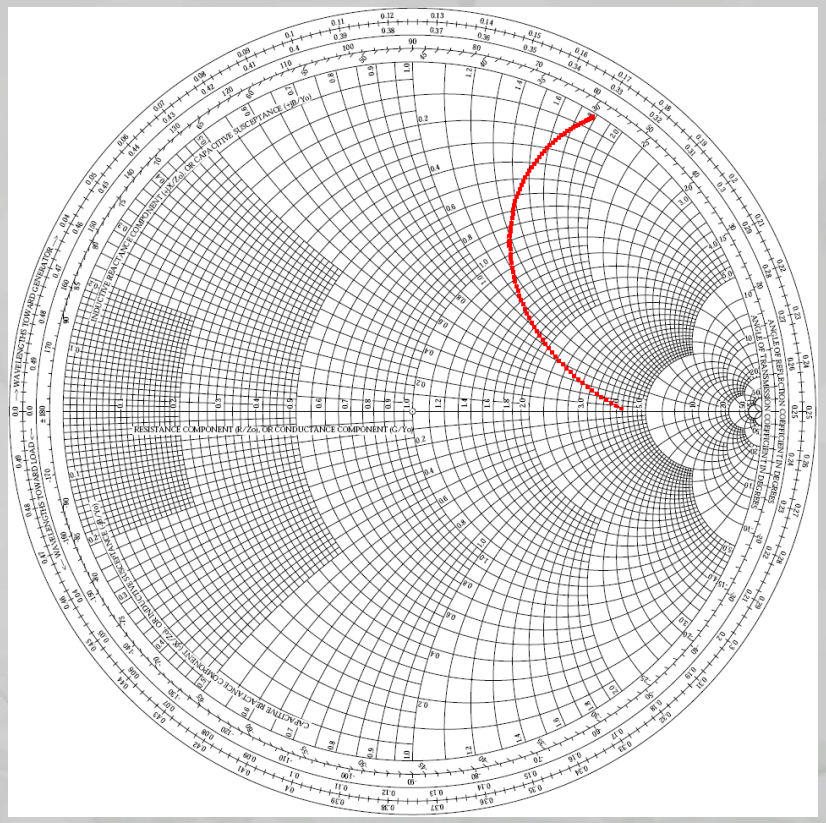
- Local axes



GiD 10 news – Visualization of results

- Polar graphs and Smith Charts





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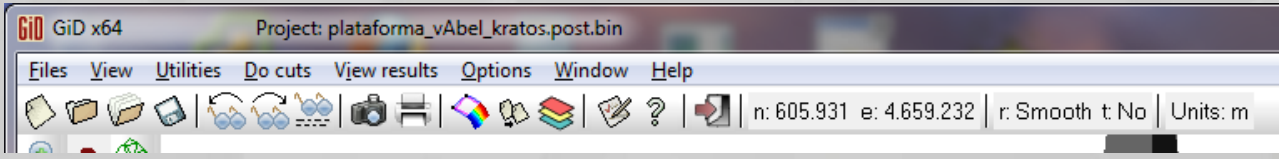
Other news in post-process

- Basic postprocess state saved:
  - Meshes and set: colours, styles and other properties
  - View
  - Result visualized except for stream lines and isosurfaces
- Status Label:
  - last node id,



  - number of elements,
  - switching render and transparency mode,
  - unit support
- Creation of Delaunay meshes from nodes: ideal for meshless data.

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Other news in post-process

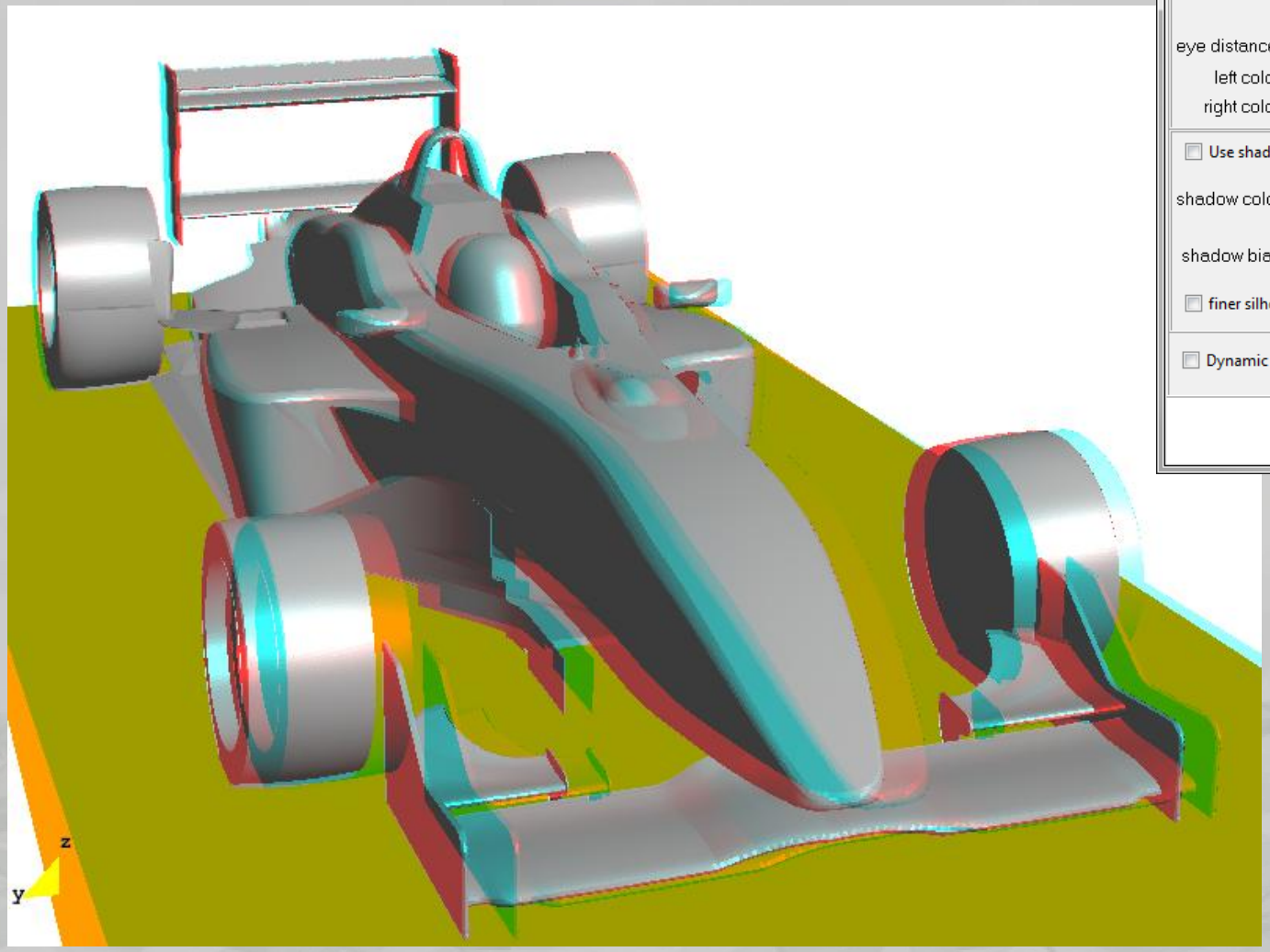
- STL export, ascii or binary, of current meshes
- Import of xyz ASCII files:
  - Compressed
  - ‘free format’: x, y [, z] in same line, but any separator or comment character can be used
- …

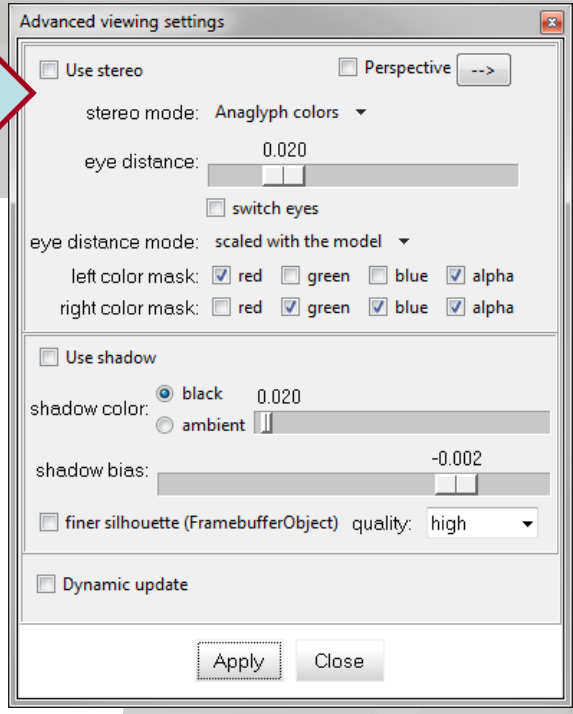
GiD 10 news – Customization

- Geometry
- Meshing
- Visualization of results
- Advanced visualization
- Customization
- General features
- Future developments

GiD 10 news – Advanced visualization

- Stereoscopic mode:





Advanced options window accessible through:
Menu Bar → View → Advanced Options

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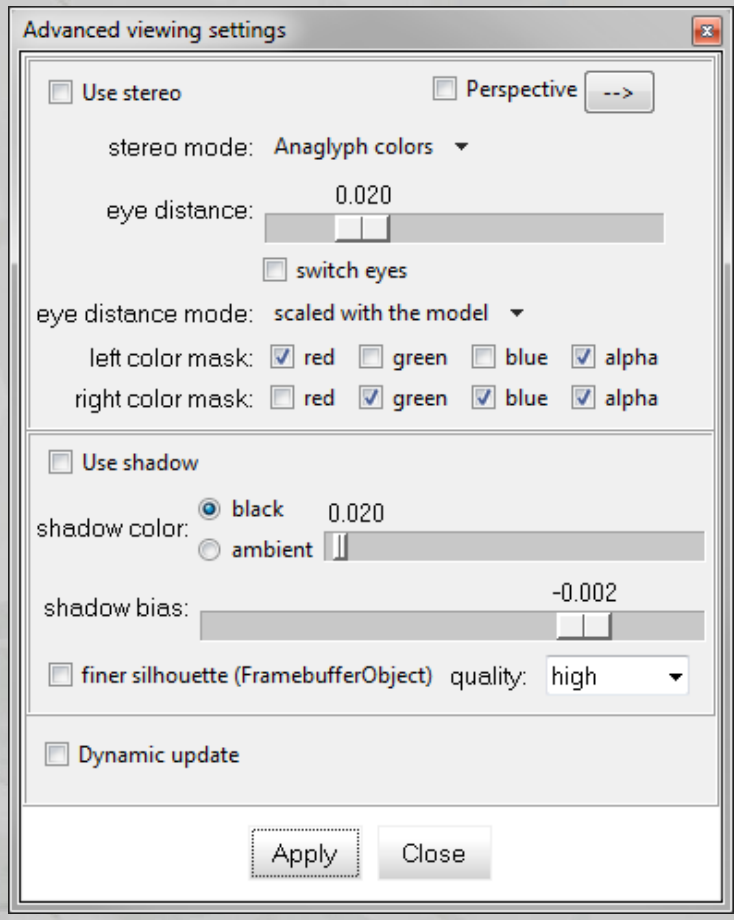
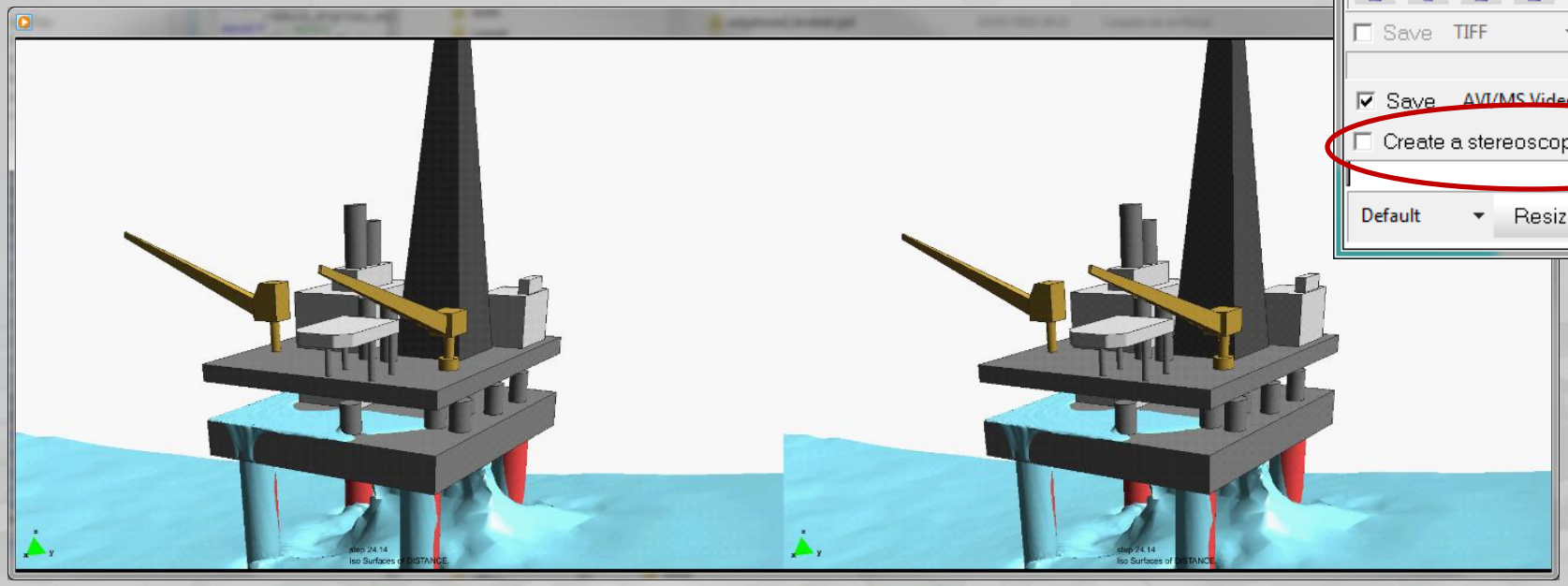
GiD 10 news – Advanced visualization

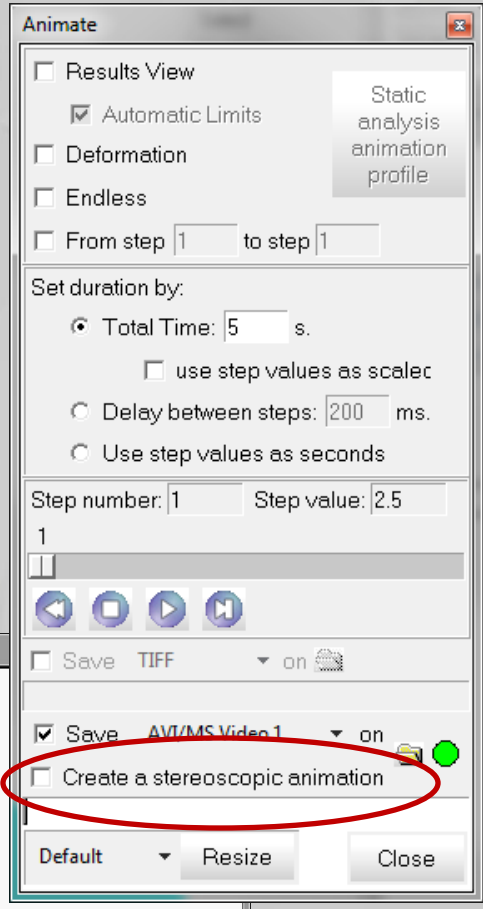
- Stereoscopic mode:
  - Both modes supported:
    - Anaglyph (Software mode): uses colours to filter left and right images
    - Quad-buffers (Hardware mode): uses hardware left and right buffers
  - Options:
    - Eye distance: l/r separation
    - E.D. Mode: scaled / absolute
    - Colour masks for anaglyph



GiD 10 news – Advanced visualization

- Stereoscopic mode:
  - Animations:
    - Anaglyphs: can be saved as usually
    - Stereoscopic mode: allows the creation of stereoscopic animations without hardware quad-buffers. Special viewer, and hardware, required to view the animation.





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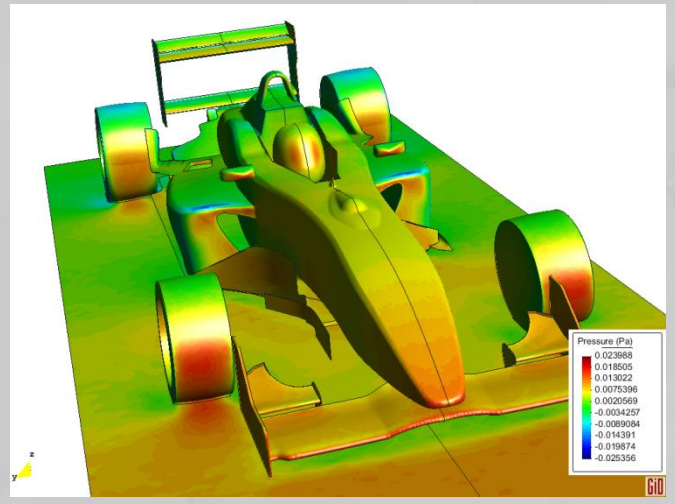
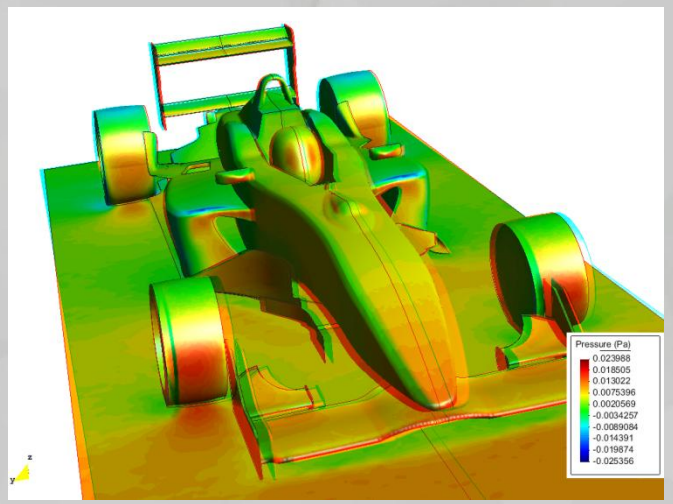
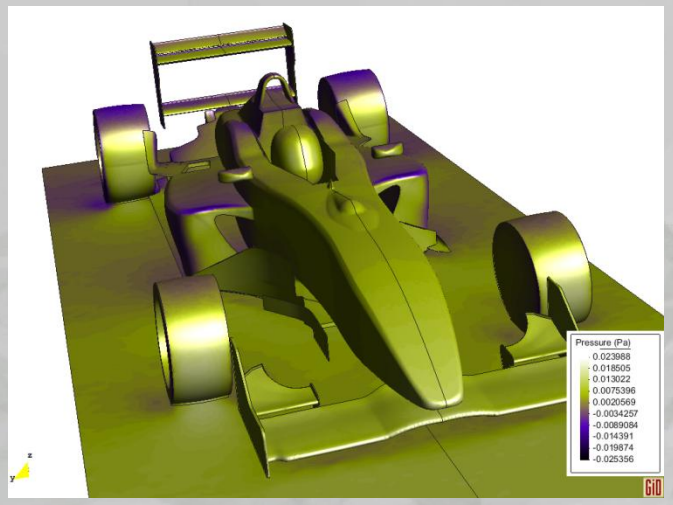
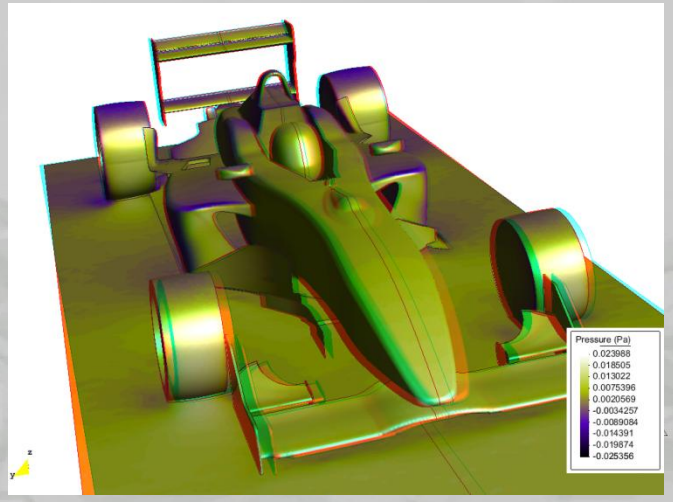
GiD 10 news – Advanced visualization

- Stereoscopic mode: Special colour scale: 3D anaglyphs



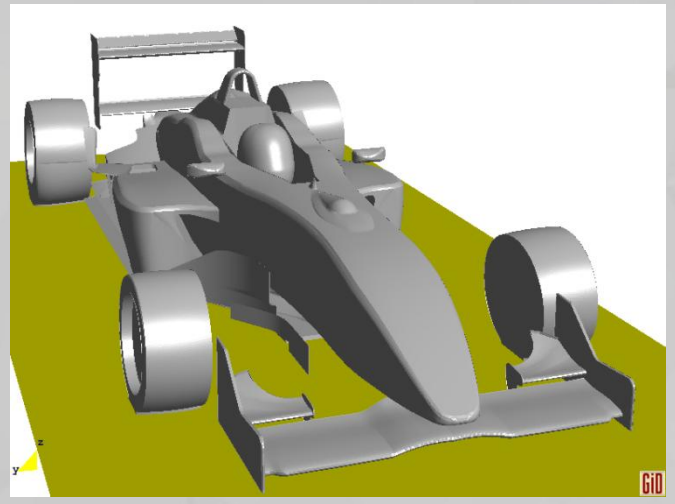


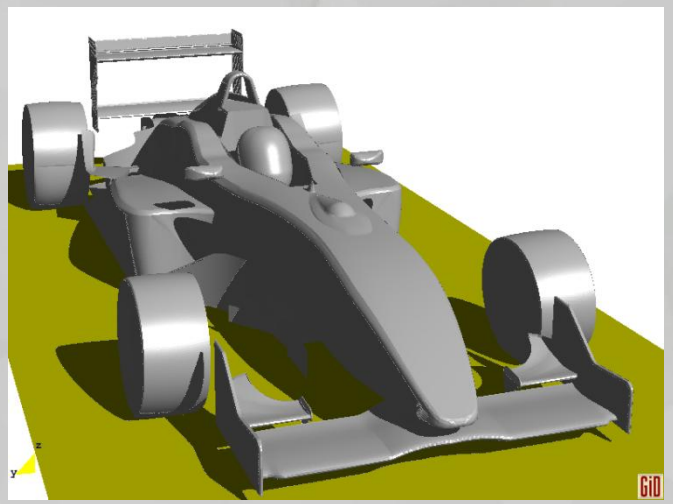


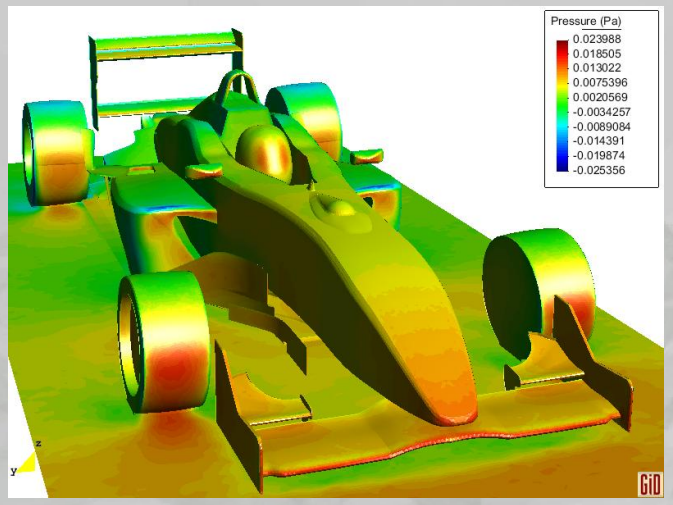


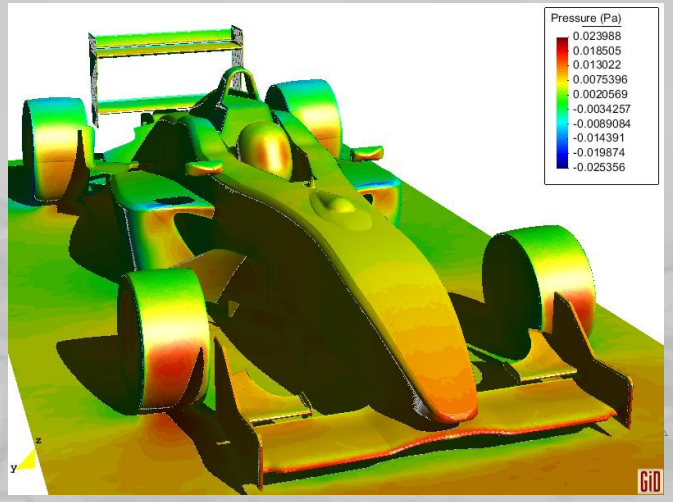
GiD 10 news – Advanced visualization

- Shadows:



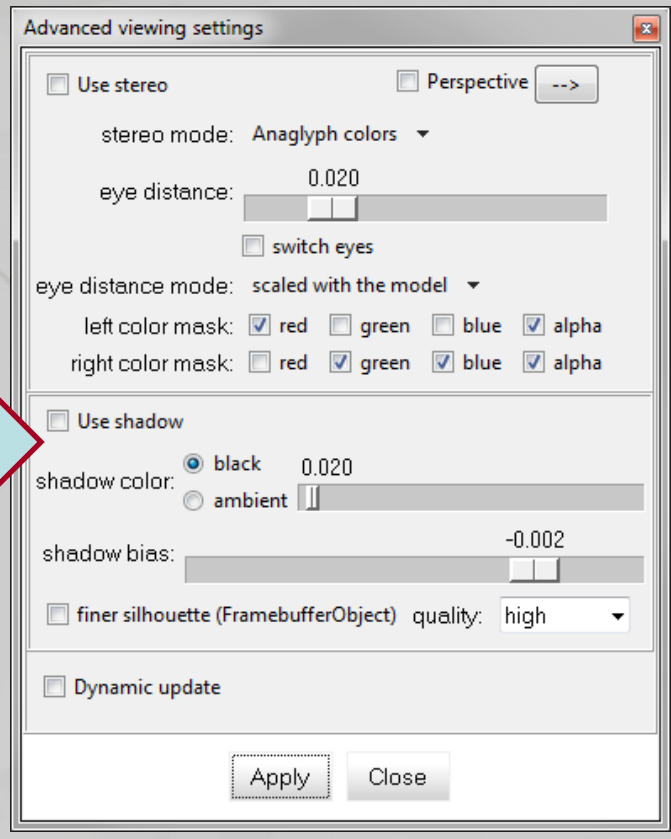






GiD 10 news – Advanced visualization

- Shadows options:
  - Shadow behaviour:
    - Black shadows
    - Dimmed ambient light
  - Shadow bias: separation between occluder and shadow
  - Silhouette: finer shadow contour (using Framebuffer Objects)



Advanced options window accessible through:
Menu Bar → View → Advanced Options

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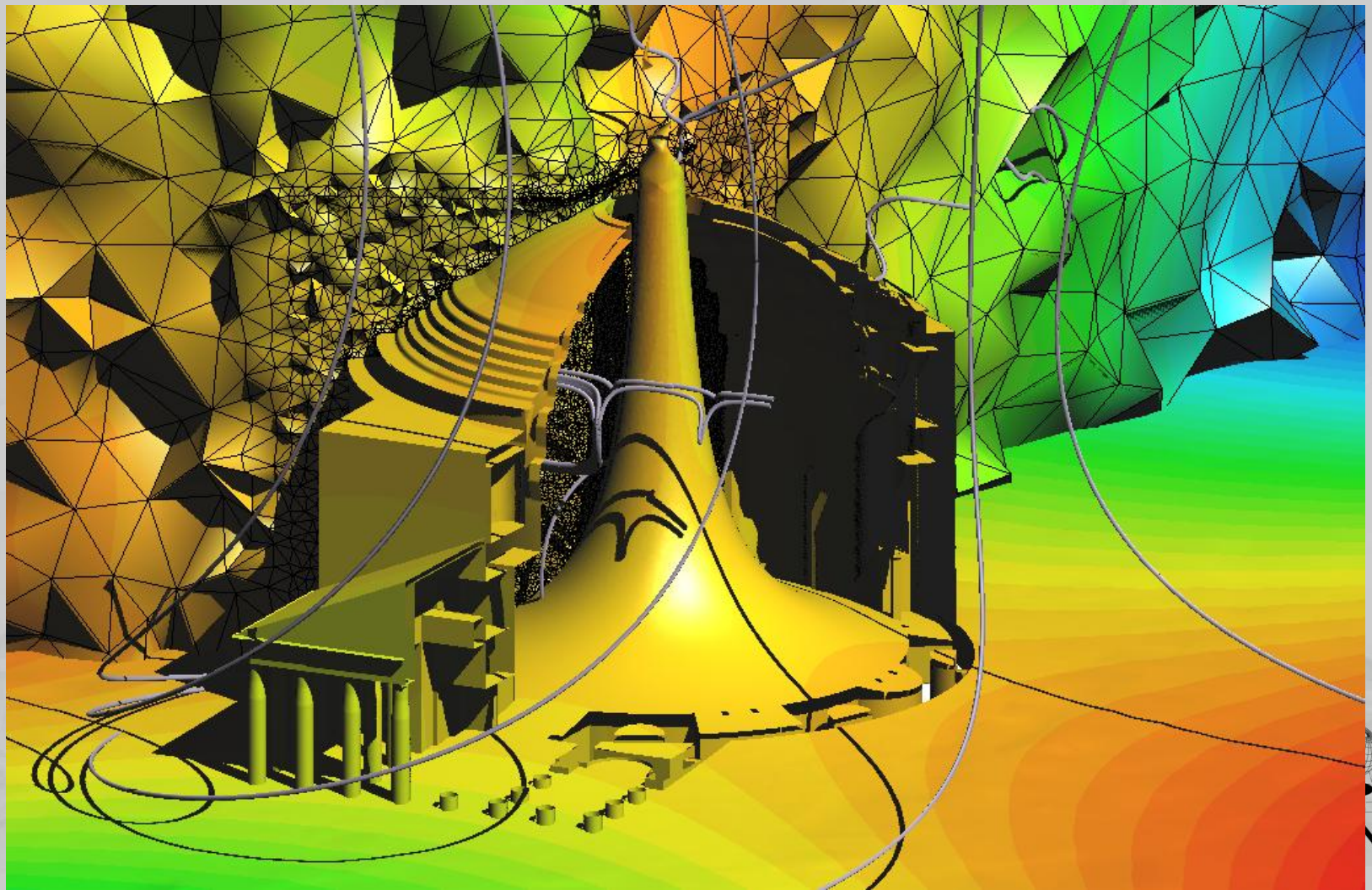
GiD 10 news – Advanced visualization

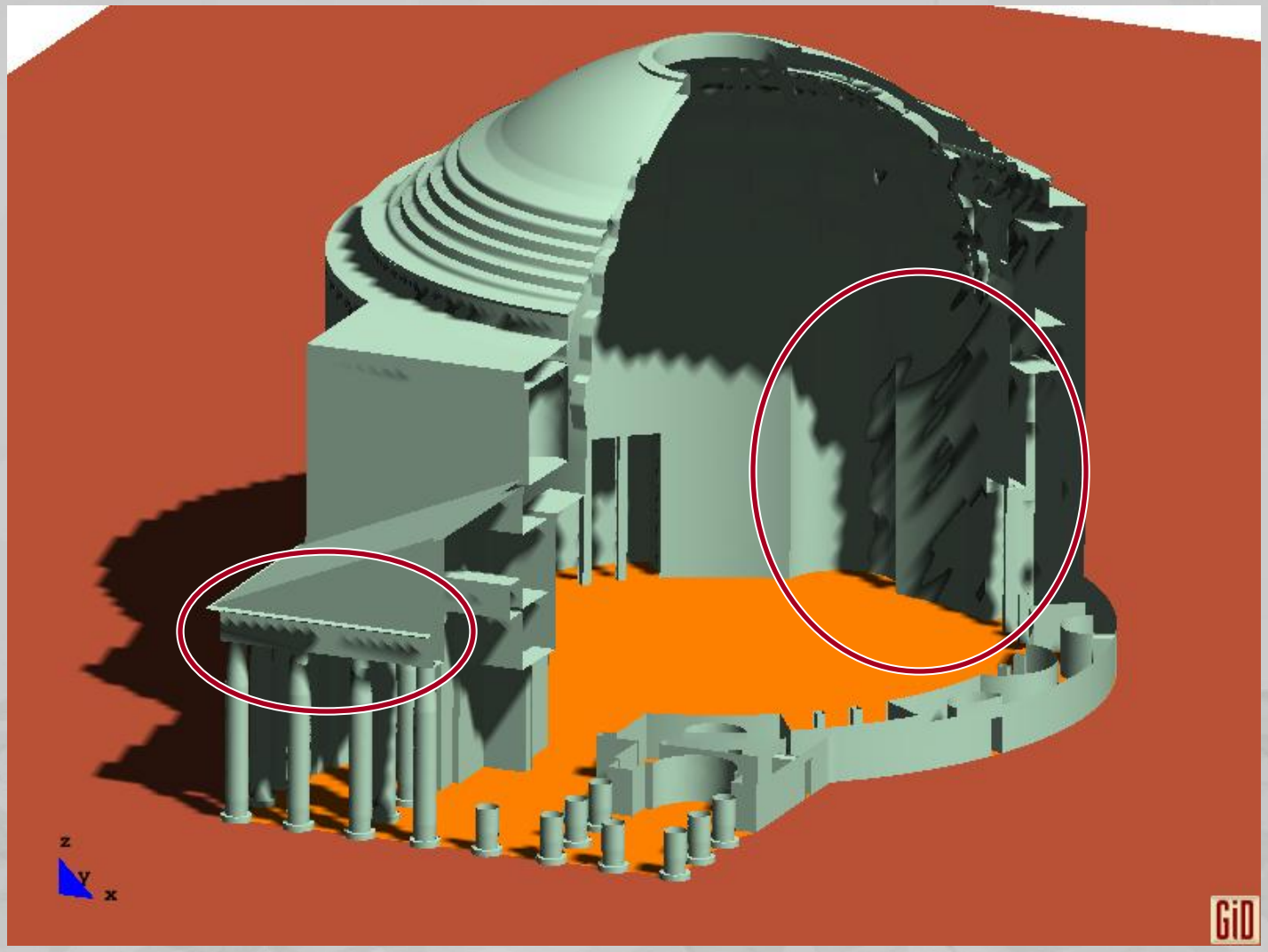
- Shadows: realism, depth perception of floating objects



GiD 10 news – Advanced visualization

- Shadow silhouette: quality and memory usage

Finer silhouette:
None



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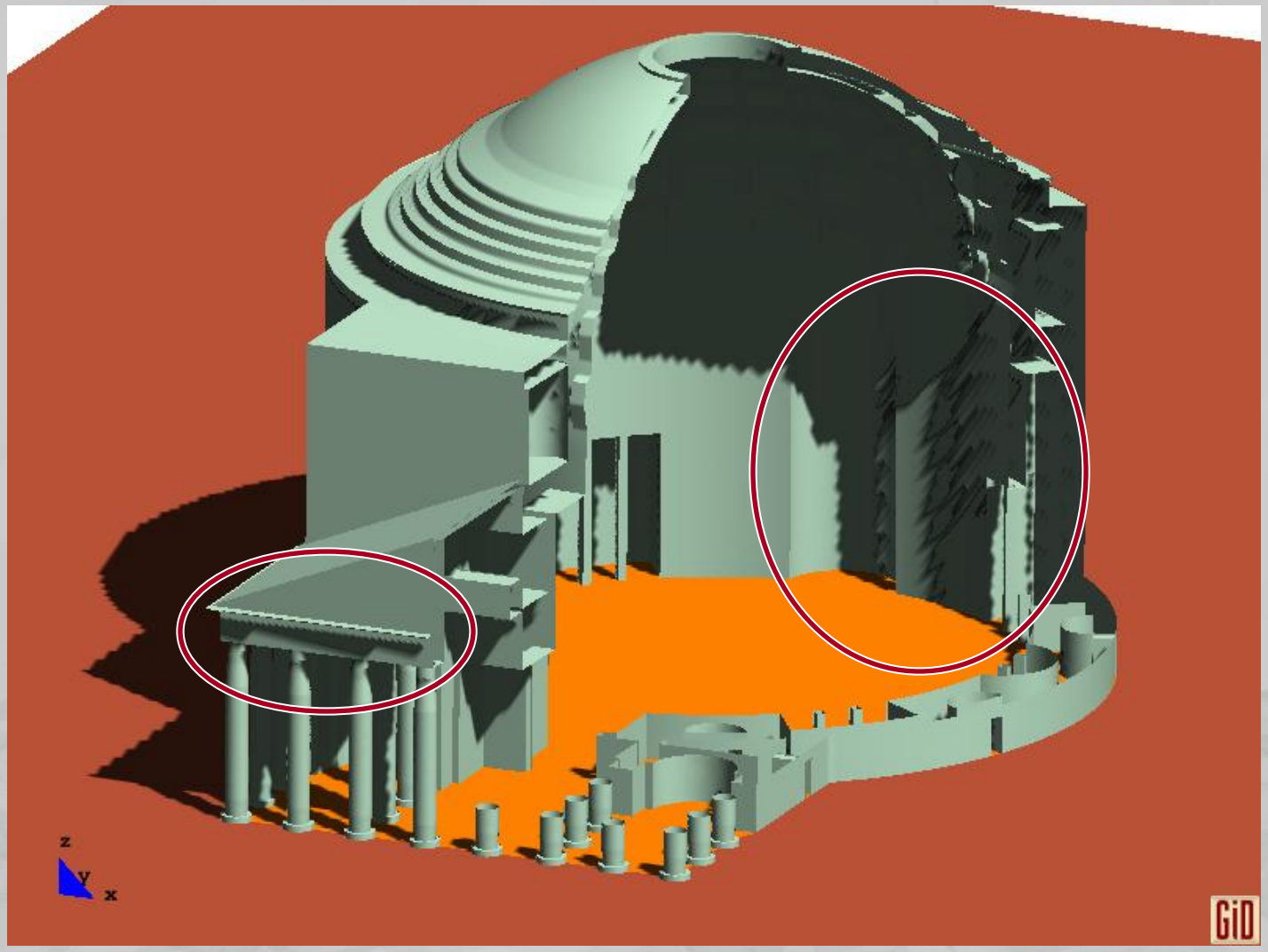
GiD 10 news – Advanced visualization

- Silhouette: quality and memory consumption



Finer silhouette:
Medium

Graphics memory used:
4 MB

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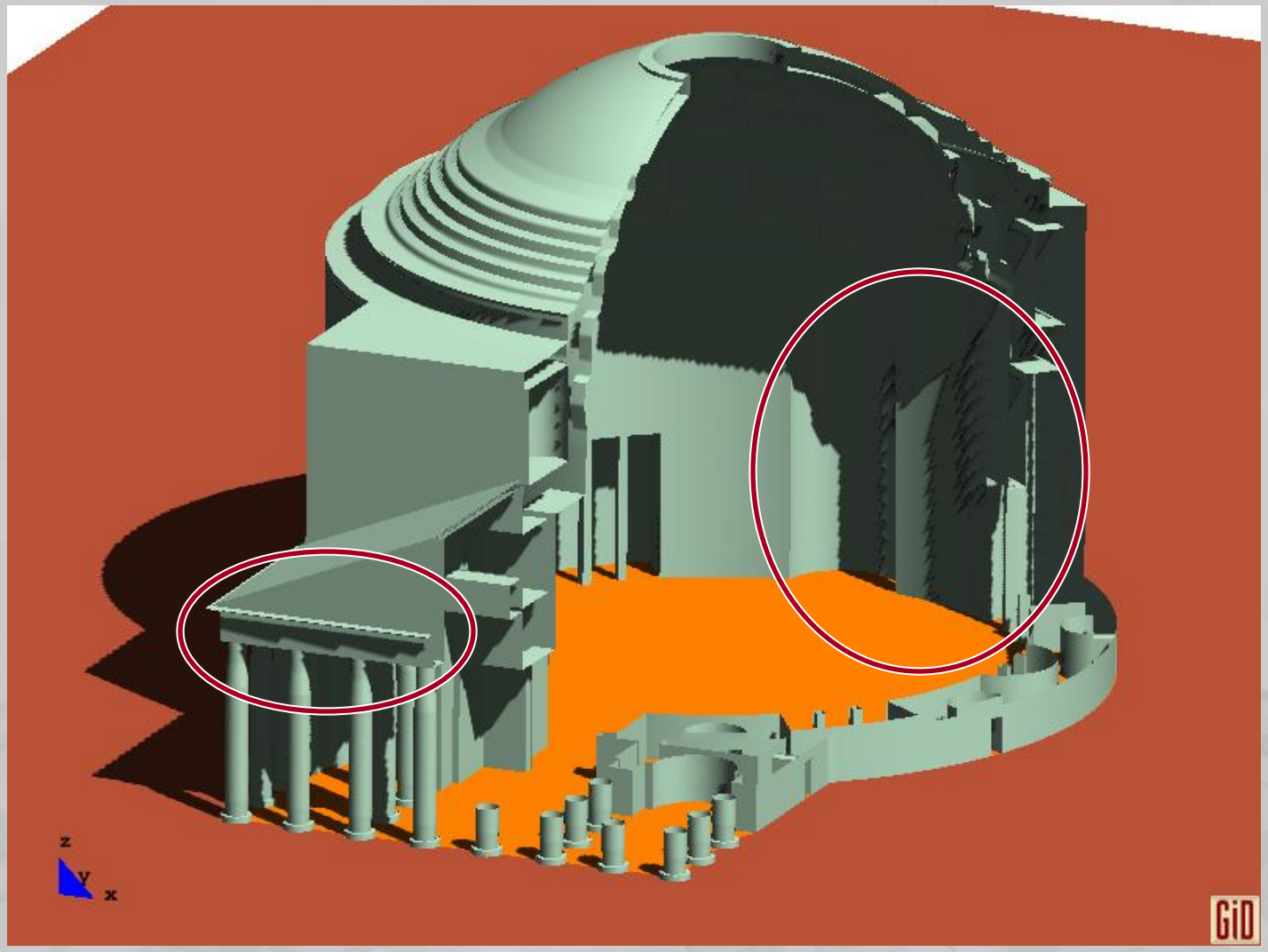
GiD 10 news – Advanced visualization

- Shadow silhouette: quality and memory usage

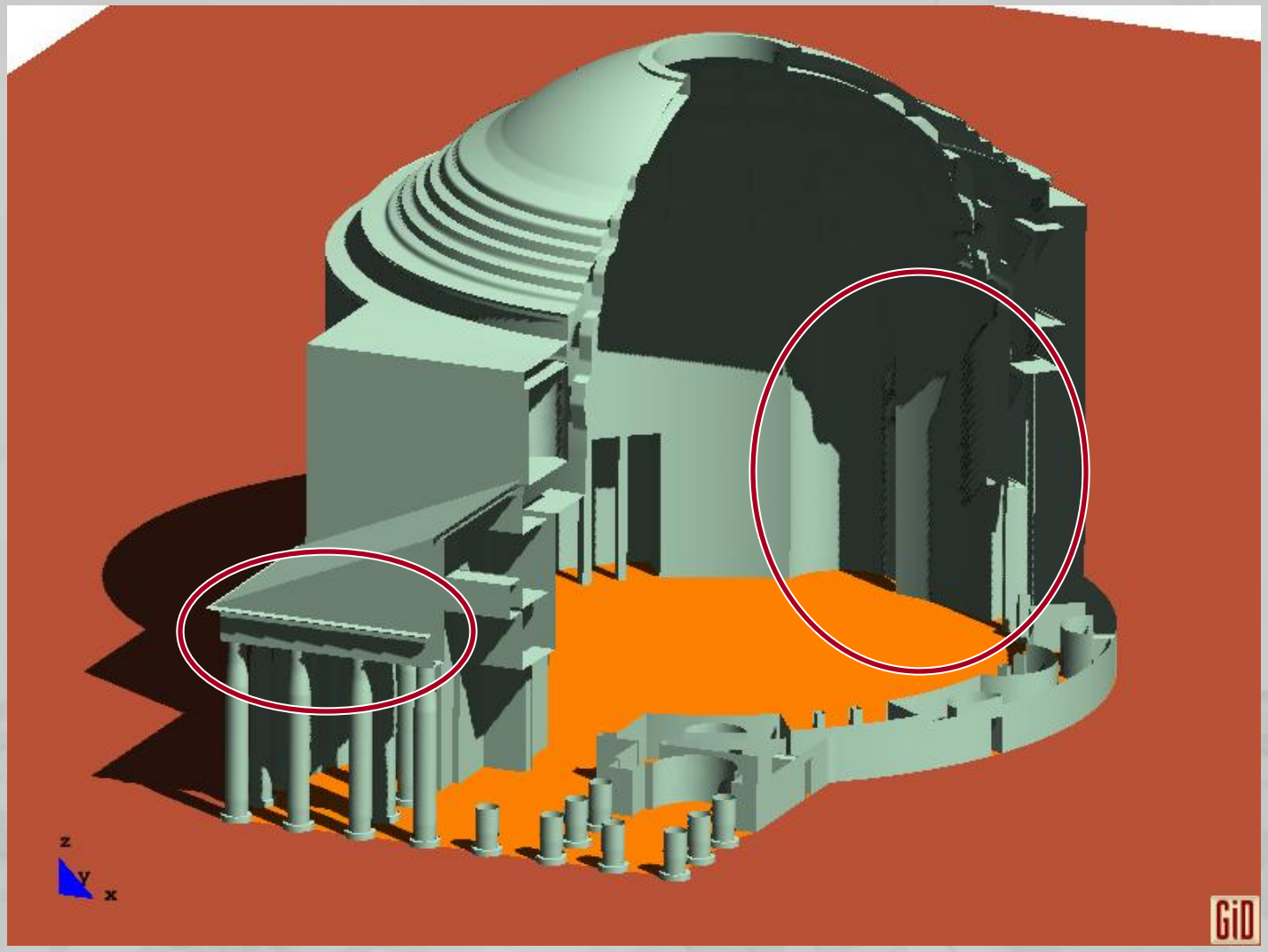


Finer silhouette:
High

Graphics memory used:
16 MB

GiD 10 news – Advanced visualization

- Shadow silhouette: quality and memory usage

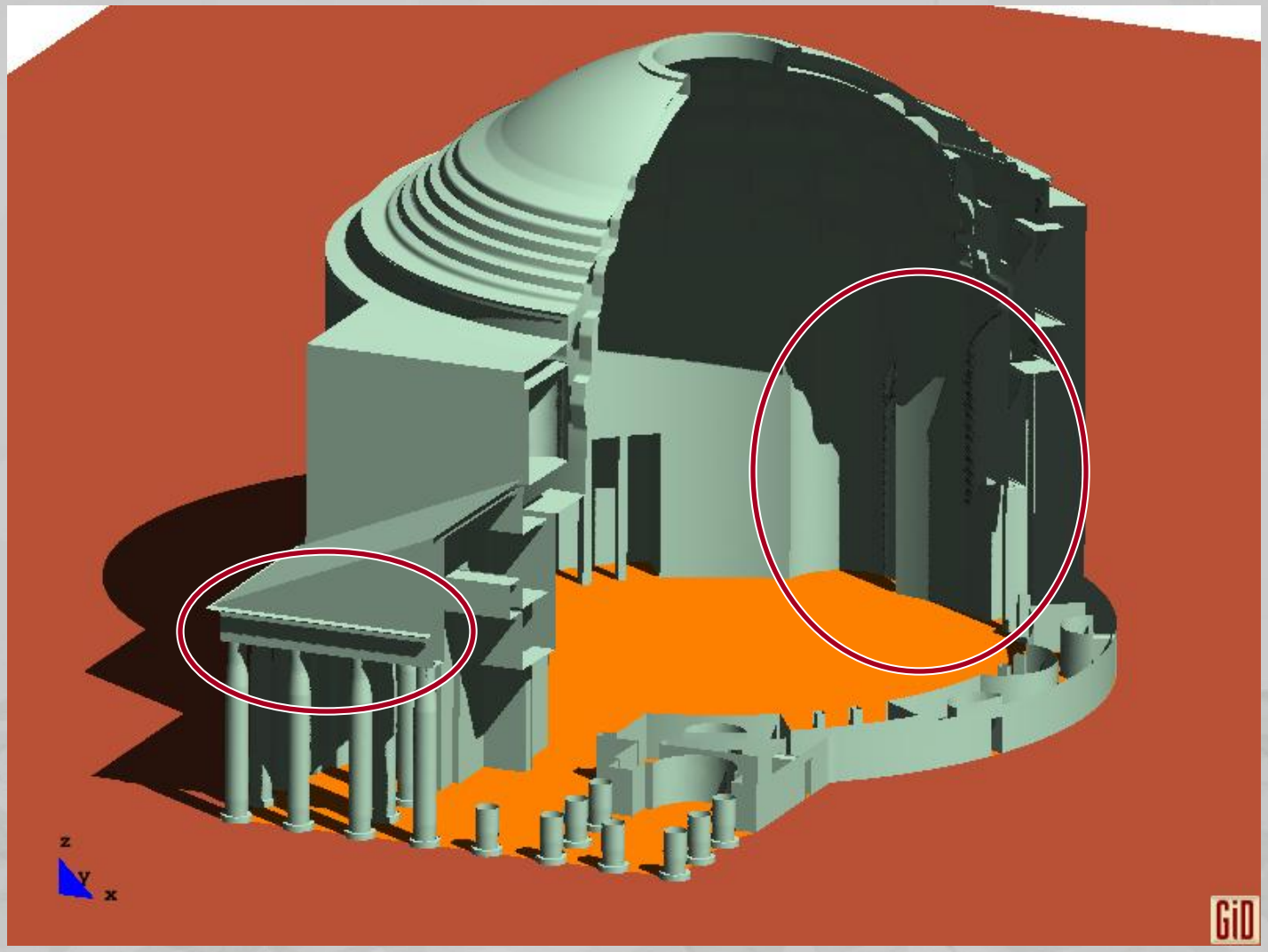


Finer silhouette:
Very high

Graphics memory used:
64 MB

GiD 10 news – Advanced visualization

- Shadow silhouette: quality and memory usage



Finer silhouette: Highest

Graphics memory used: 256 MB

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GiD 10 news – Advanced visualization

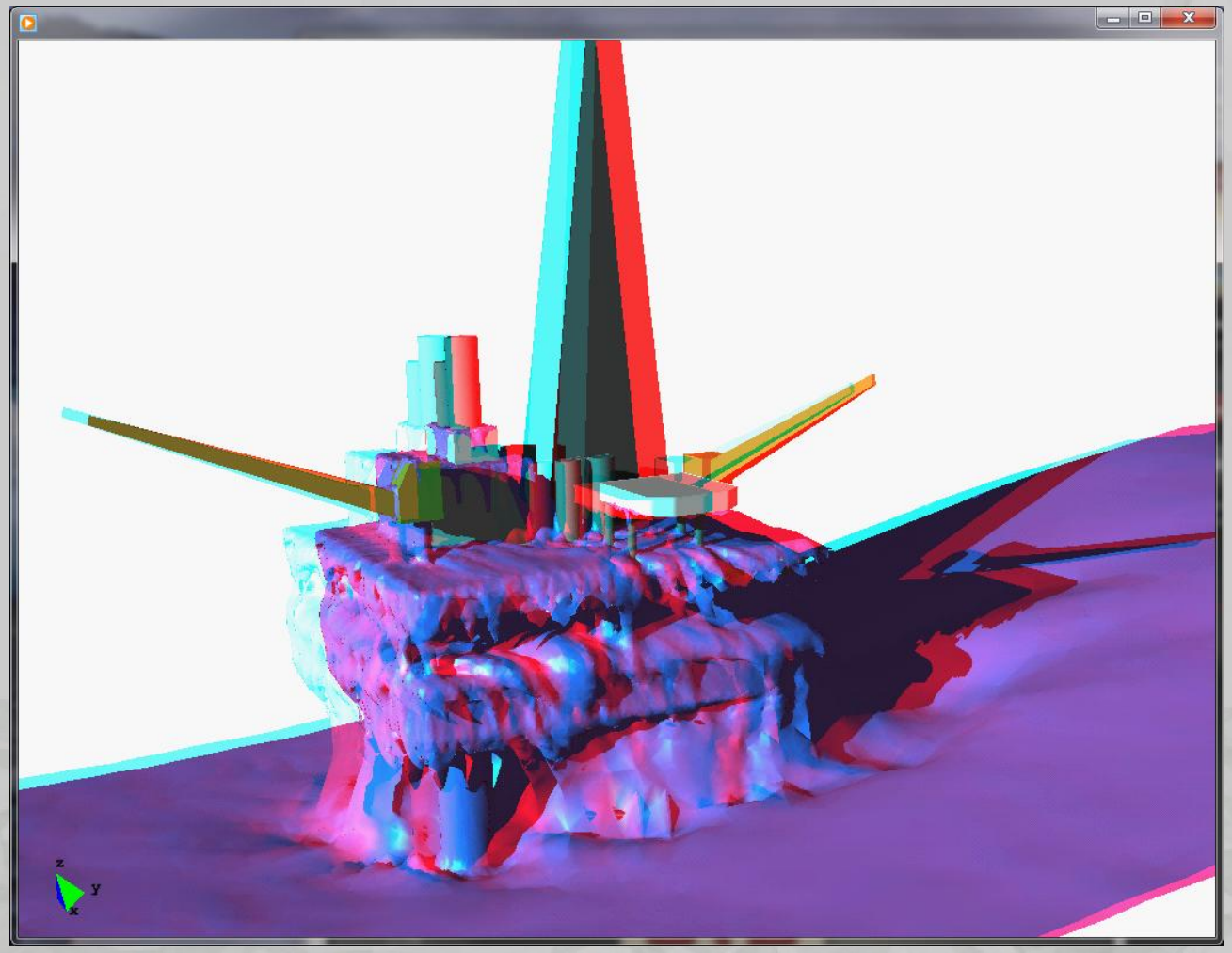
- Shadow requirements:
  - Use of shadows: OpenGL 1.4
  - Dimmed ambient in shadow regions: OpenGL 1.5
  - Finer silhouette: OpenGL 2.0

  Graphics card memory usage:

Quality	Float texture size	Graphics memory used
Medium	1024 x 1024	4 Mbytes
High	2048 x 2048	16 Mbytes
Very high	4096 x 4096	64 Mbytes
Highest	8192 x 8192	256 Mbytes

GiD 10 news – Advanced visualization

- Shadows and stereo



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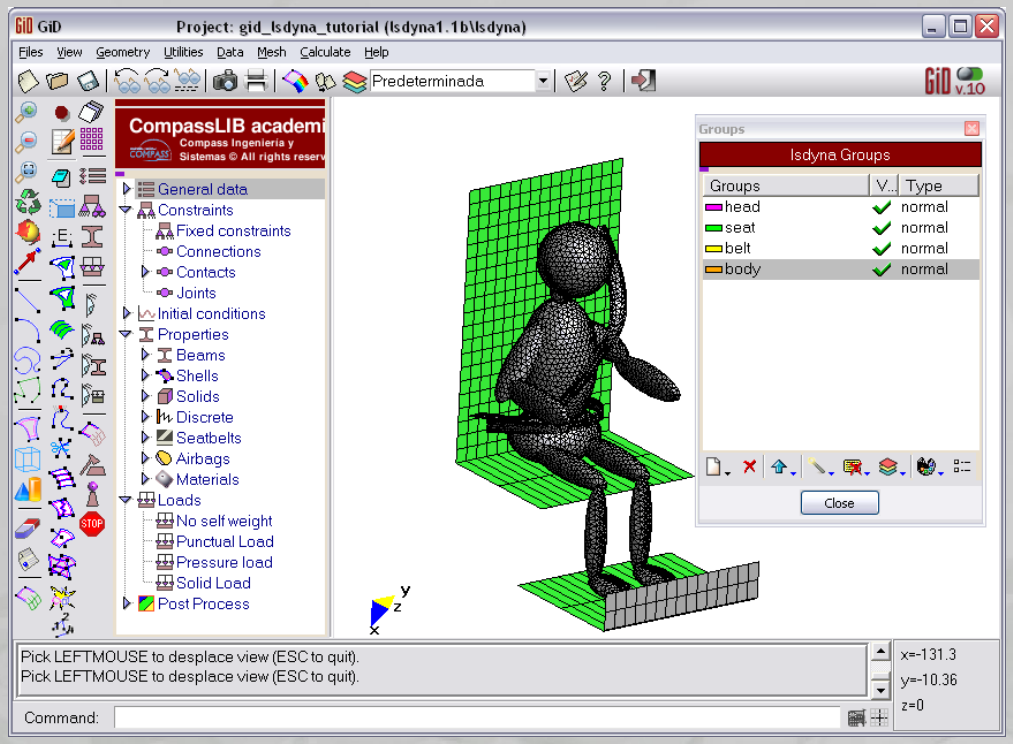
GiD 10 news – Customization

- Geometry
- Meshing
- Visualization of results
- Advanced visualization
- Customization
- General features
- Future developments

GiD 10 news - Customization

- CompassLib inside GiD, for advanced problemtype creation (special agreement has to be made with CompassIS for commercial purposes)



Data is organized in a xml tree, making easier the edition of properties to be atached to the geometry

Sample use: LS-Dyna 1.1. Interface

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GiD 10 news – Customization

- New interfases for commercial codes developed:
  - FLUENT (free)
  - ABAQUS

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Other news in customization field

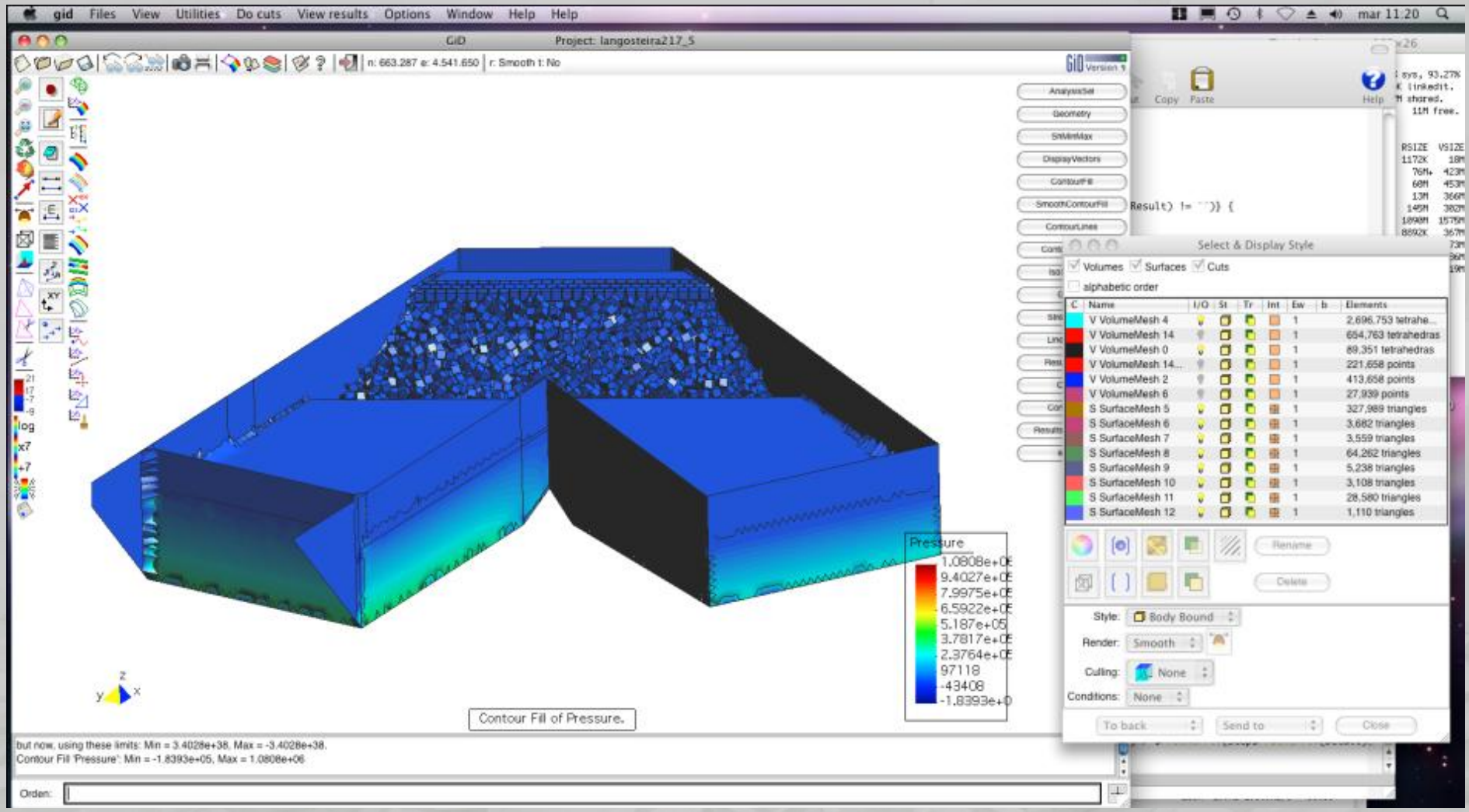
- Updated to Tcl/Tk 8.5.8.
- Customization manual separated from the others
- Several new Tcl events
- Several new Tcl-GiD commands
- New bas template commands
- Hide/show all volume related menus and toolbars when setting the global variable GidPriv(HideVolumeLevel)
- Added more Tcl packages
- Data windows enhanced with a new table widget to easily copy/paste big data, and a XY plot can be drawn

GiD 10 news – General features

- Geometry
- Meshing
- Visualization of results
- Advanced visualization
- Customization
- General features
- Future developments

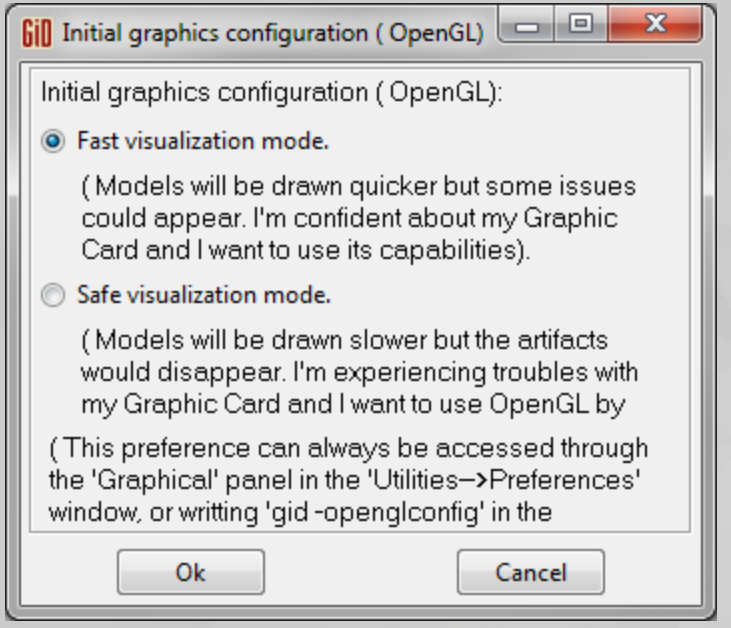
GiD 10 news – General features

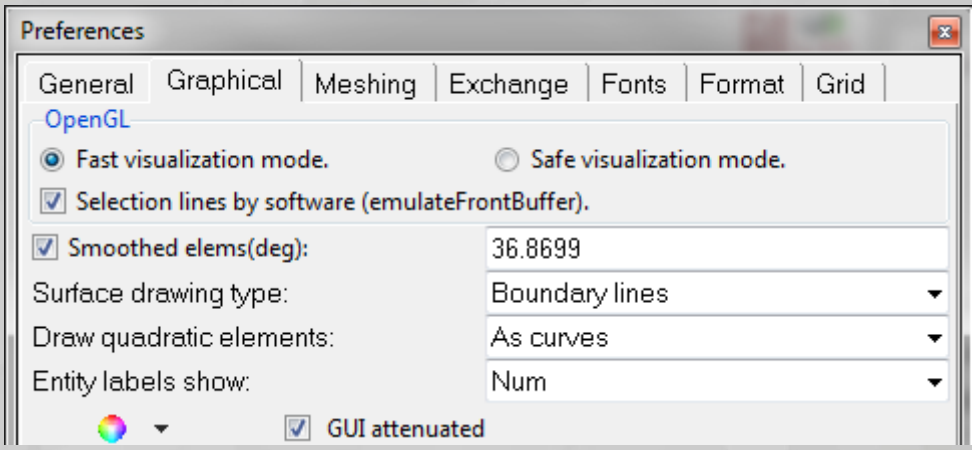
- MAC OS X version for 32 bits available.



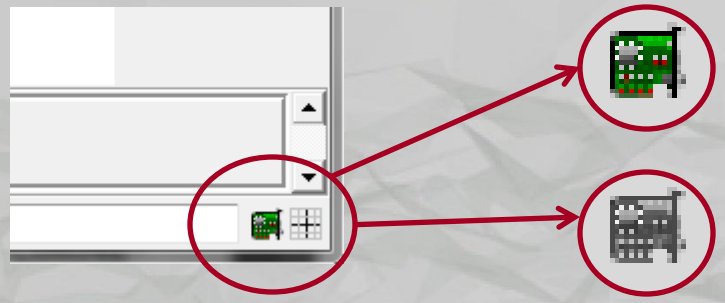
GiD 10 news – General features

- Graphics setup:





The program is restarted after accepting the preferences



Fast visualization mode: using graphics card acceleration

Safe visualization mode: using software graphics (CPU)

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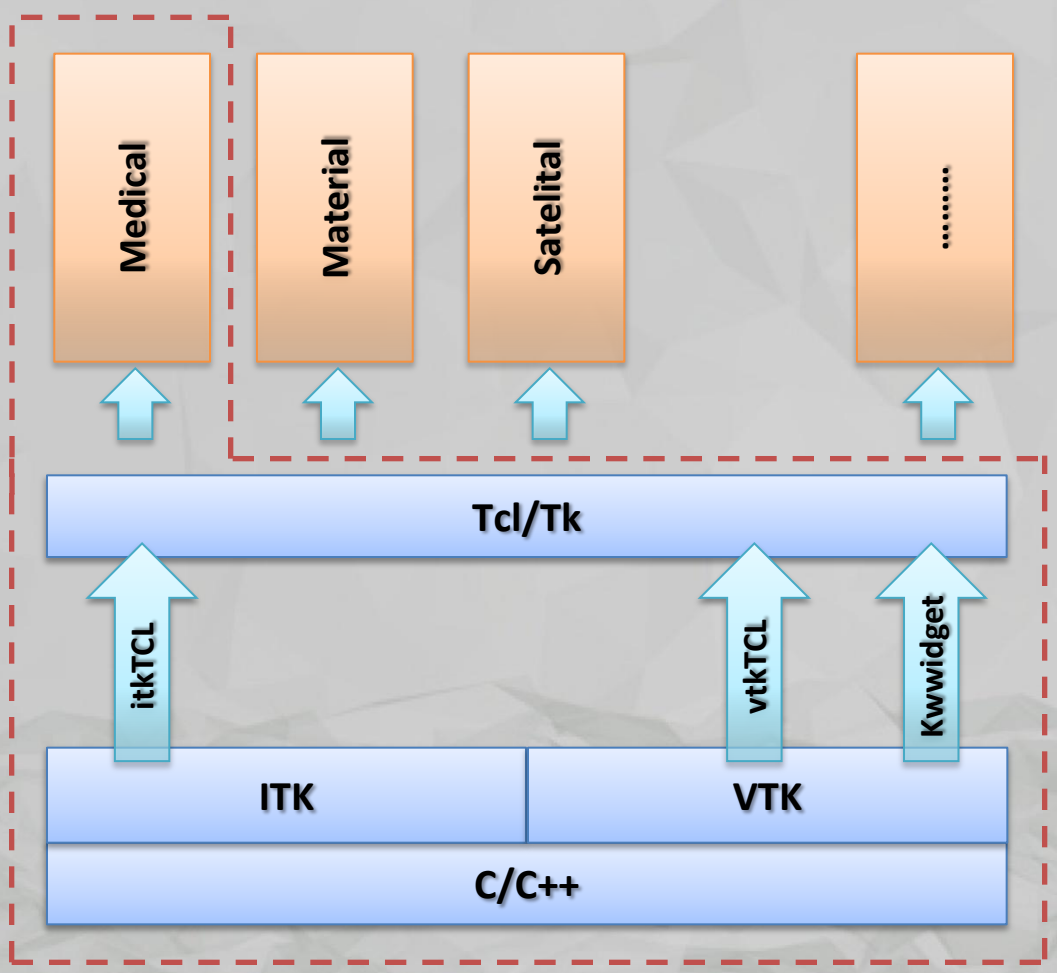
GiD 10 news - GMed

- GMed: Digital image processing platform to create simulation data from medical images (DICOM, etc)



Modules using the Digital Image Processing Platform

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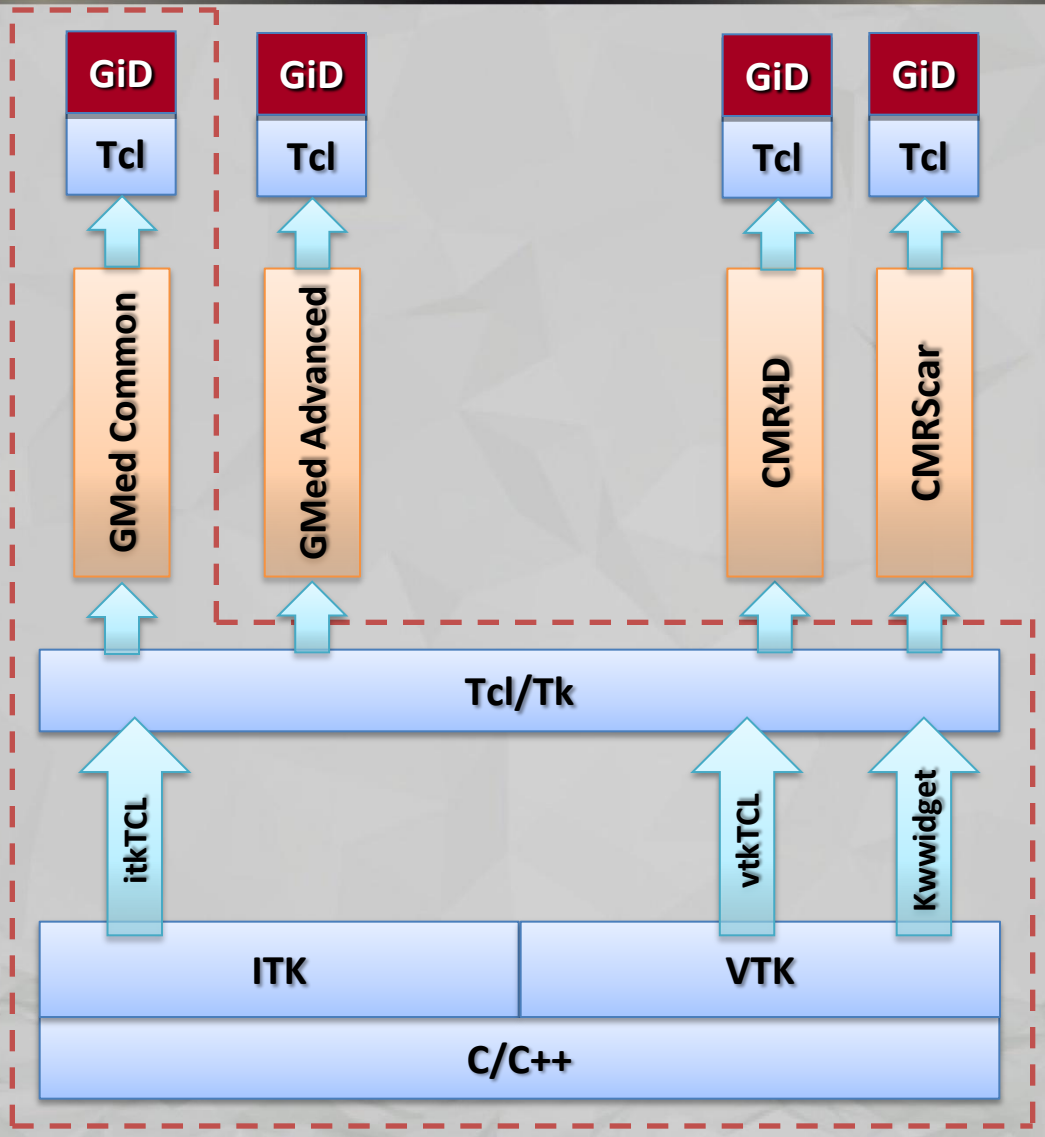
GiD 10 news - GMed



Several modules specific for each medical need

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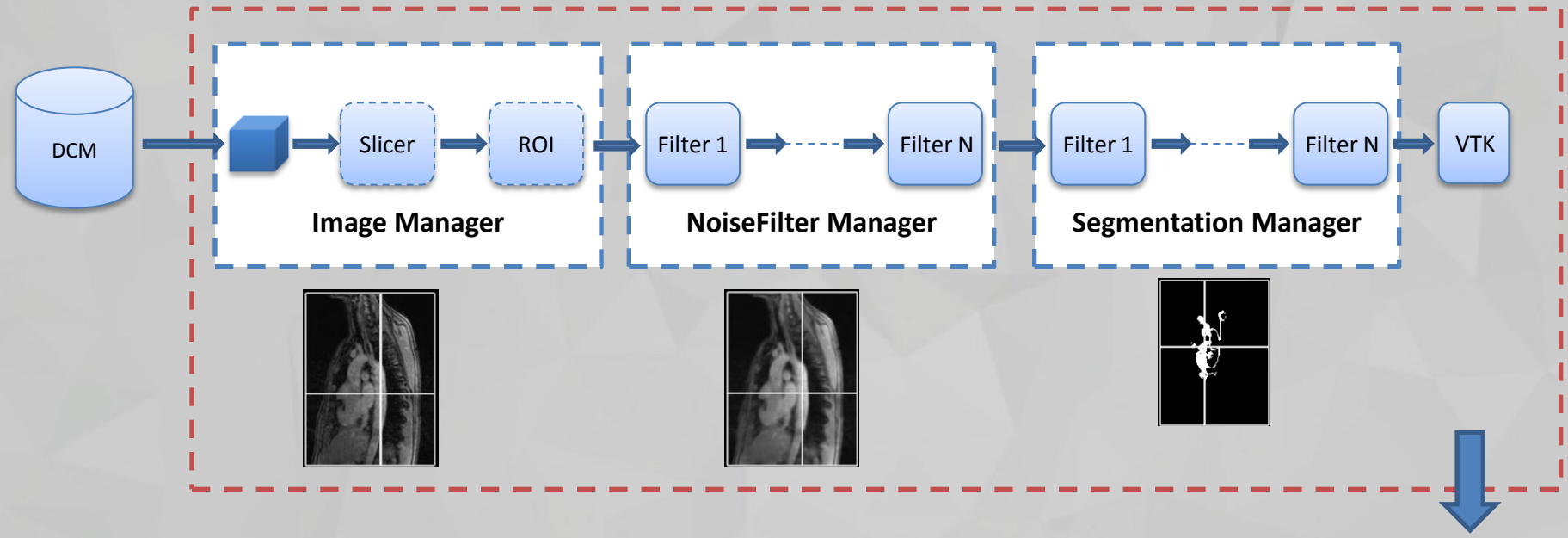
GiD 10 news - GMed

- Data flow using GMed



Once the model is in GiD, user can take profit of all the numerical simulation environment, connecting to any calculation module.

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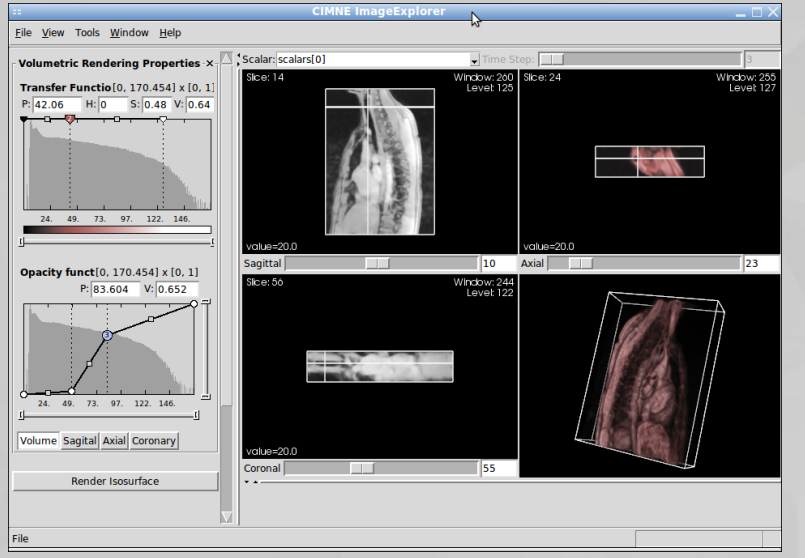
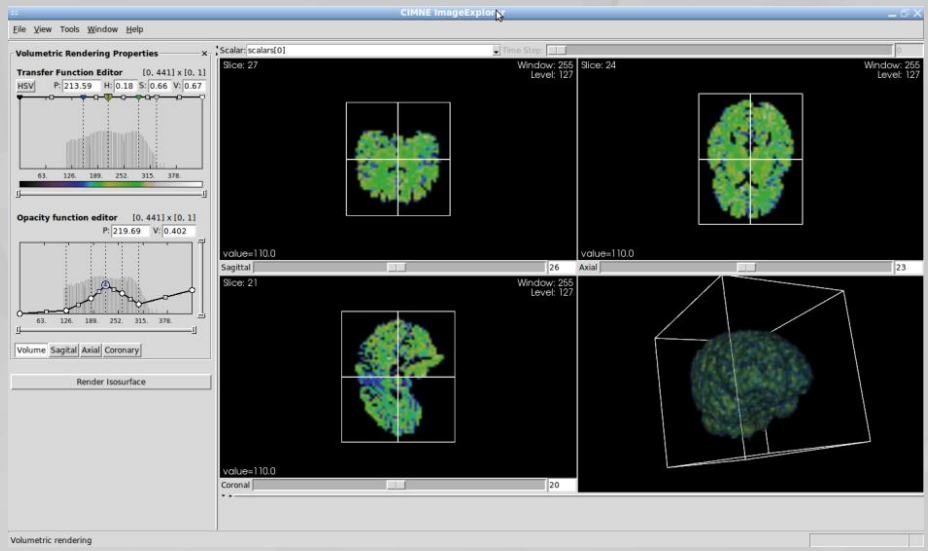
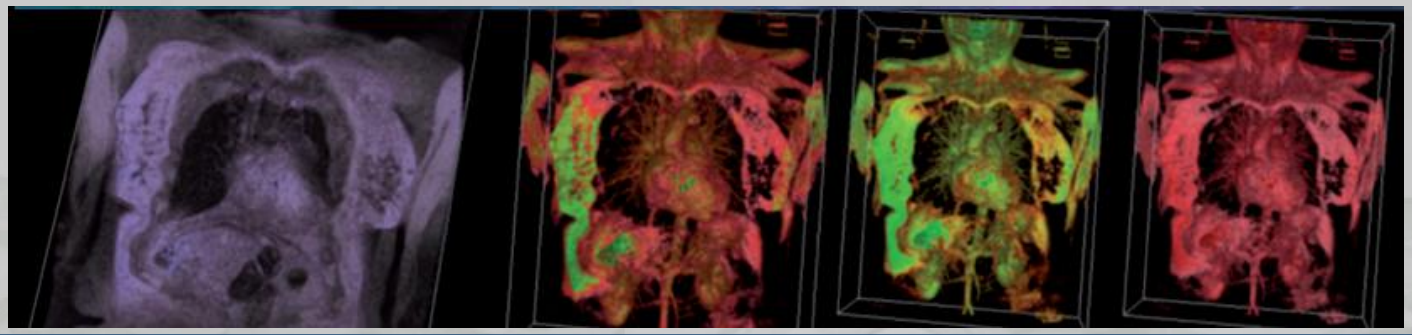
GiD 10 news - GMed

GMed Interface







GiD 10 news – General features

- **Plugins**: tcl files inside the $GIDDEFAULT/plugins folder will be automatically sourced when starting.
- **Zoom centered** on the current cursor when using mouse wheel
- Better **gif pictures** (includes dithering)
- **Layers window enhanced**
- Ready for **MS Windows 7** x32 and x64 bits
- Added support for usb's **SpaceNavigator and 3D SpaceBall** in **Linux**

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