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BOXER Tutorial:

Level-set A-to-B morph

BOXER version 3.10.0

For further information please contact.

Level-set A-to-B morph

In this example we will morph a stating shape (A) into a target shape (B) using Level-set morphing functionality. The user has access to all the intermediate shapes that represent the start change from A to B and these shapes can be loaded into the BOXERmesh geometry register and sent to the normal meshing process.

This tutorial assumes that the user is familiar with the general method of the BOXERmesh GUI, and the operation of the various specifier panels. If this is not the case then please review beginner BOXERmesh tutorial.

Import the A and B geometry shapes morph_shape_A.btf and morph_shape_B.btf

- `File > Import Part` from the menu bar, OR

- Click the Import Part toolbar button, OR

- Use the keyboard shortcut Ctrl-G

- `morph_shape_A.btf` and `morph_shape_B.btf` can be selected together from the file browser
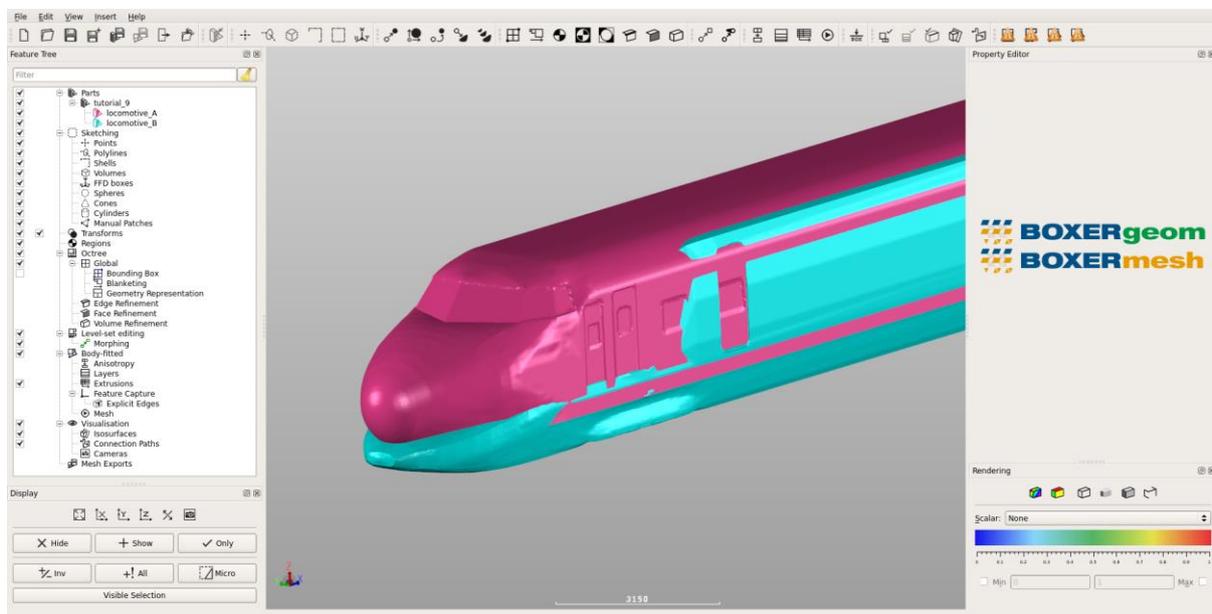
Set up the Octree domain as if for meshing

The level-set morphing operates in the same domain (bounding box) and with the same resolution as the octree mesh. Therefore, setting up a case for level-set morphing is just like setting up a case for meshing.

- Create a bounding box around the geometry with constraint:Largest Cells and the largest cells = 500

- Create a Region, with a seed point at (0,0,0)

- Create a Face Refinement specifier on all faces at Octree level 2

- Turn on Octree Preview to see the size of the surface cells relative to the geometry
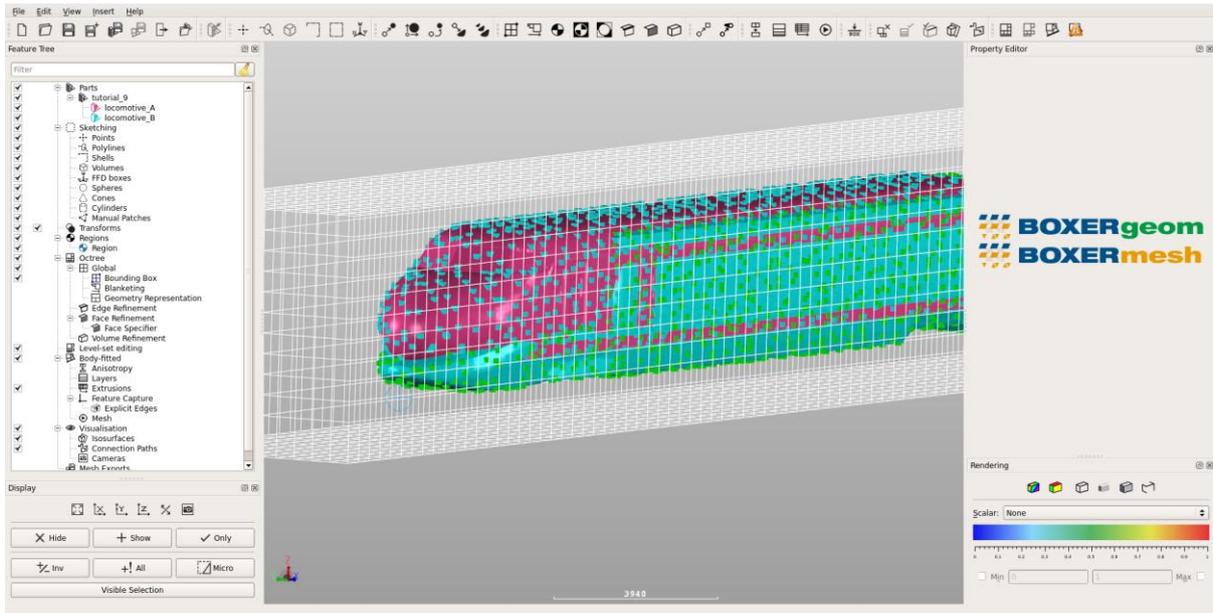
Create a Level-set morph between locomotive_A and locomotive_B

- `Insert > Level-set editing > Morphing` from the menu bar, OR

- Click the "Create new Level-set editing morphing specifier" toolbar button

- The Morphing Editor appears

- Drag-drop `locomotive_A` from the Feature Tree to the `Shape A` field on the Editor

- Drag-drop `locomotive_B` from the Feature Tree to the `Shape B` field on the Editor

- Uncheck 'Regenerate octree after the operation'

- Press `OK`, The morphing set-up node appears in the Feature Tree under the 'Level-set editing' branch
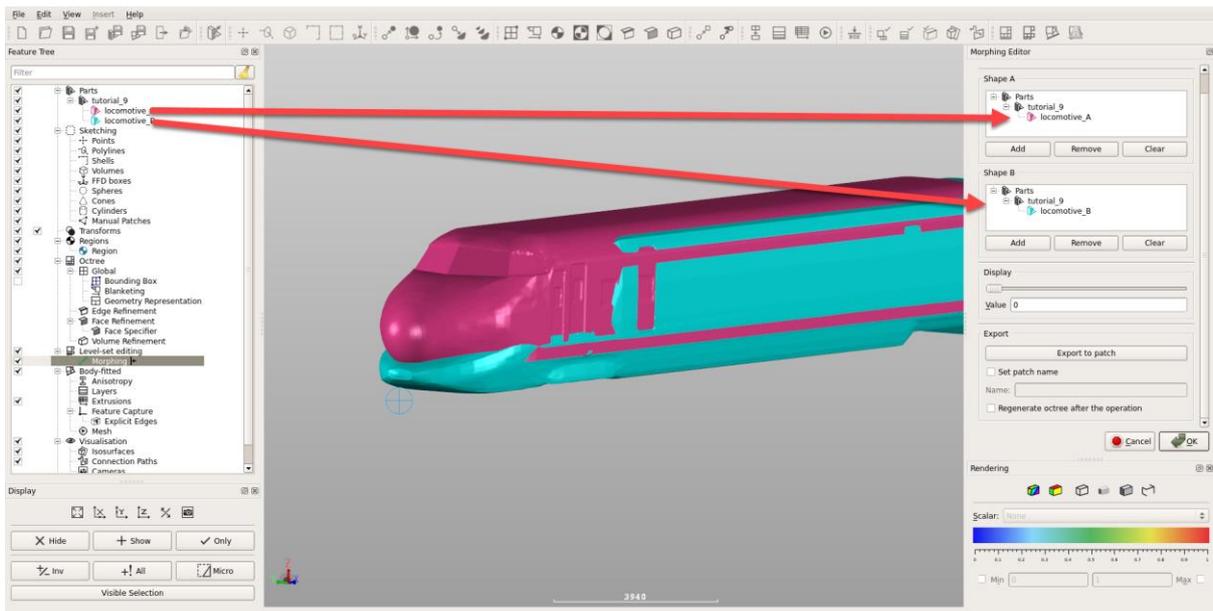
Generate the Level-set morph

- Press the 'Generate Level-set' button on the toolbar (*the button goes orange to indicate that BOXERgeom is busy*)

- When the Level-set calculation is complete, the Generate Level-set button goes grey and its action is disabled to indicate that the Level-set is up-to-date.

- The Level-set surface appears in the scene

Turn off the visibility of everything else to leave just the Level-set morph ('Morphing') envelope on screen.

Now move the 'Display' slider to some non-zero value and observer how the morph evolves through time.

At any point press 'Export to Patch and note then the current morph state is exported to the geometry register of BOXERmesh – you can choose your own name for the exported geometry by enabling Set patch name.
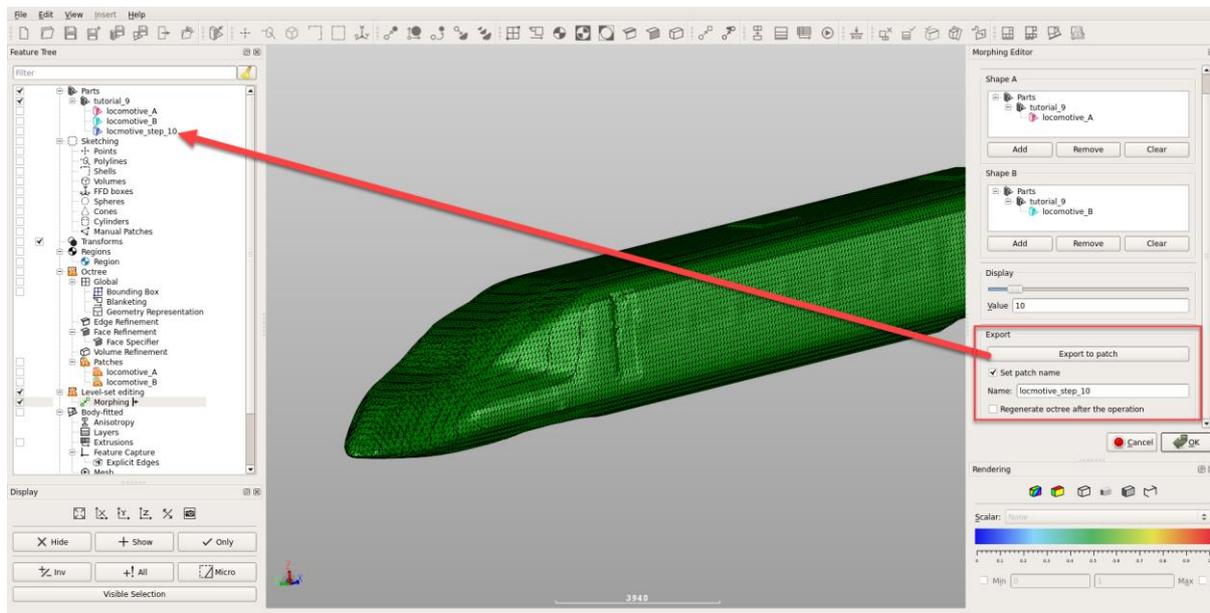
Generate a mesh around an intermediate morph shape

- Double click on the 'Morphing' node in the Feature Tree to re-activate the Morphing Editor

- Move the Display Slider value to 12

- Check the 'Regenerate octree after the operation' button

- Click OK to update the Morphing specification

- Press the 'Generate Level-set' button on the toolbar

- The Octree mesh is generated around the Level-set shape at slider value 12
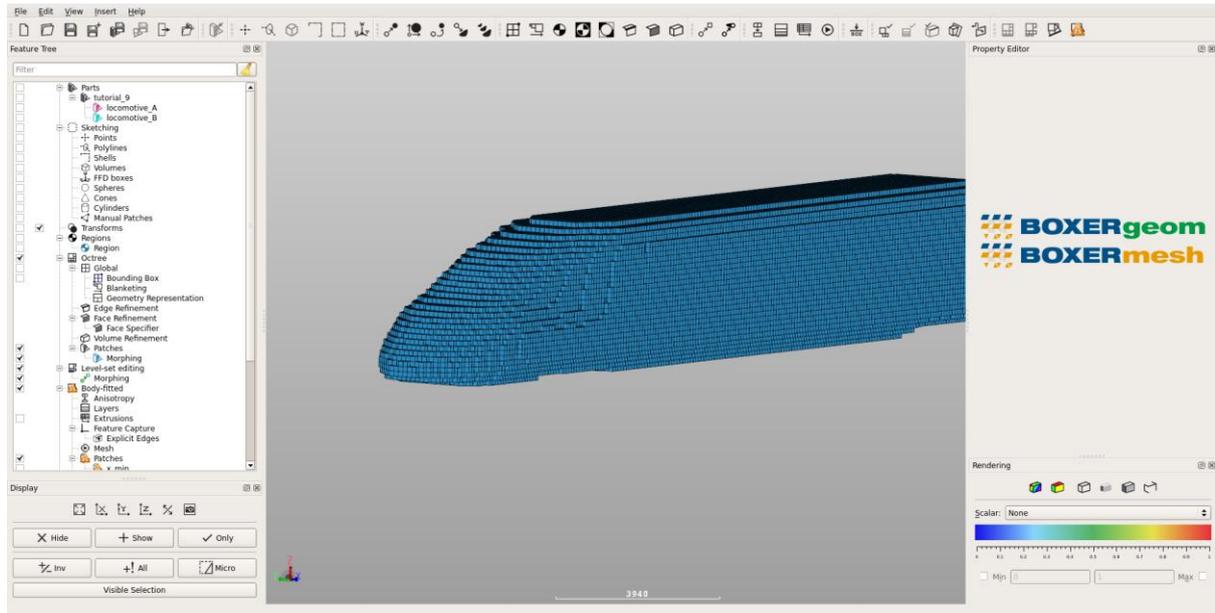
- Press the 'Generate Inviscid Mesh' button

  - BOXERmesh generates a volumetric body-fitted mesh around the Level-set shape at slider value 12 in the normal way.

  - This mesh can have layers added/be extruded/be exported for analysis in the normal way