



Altair

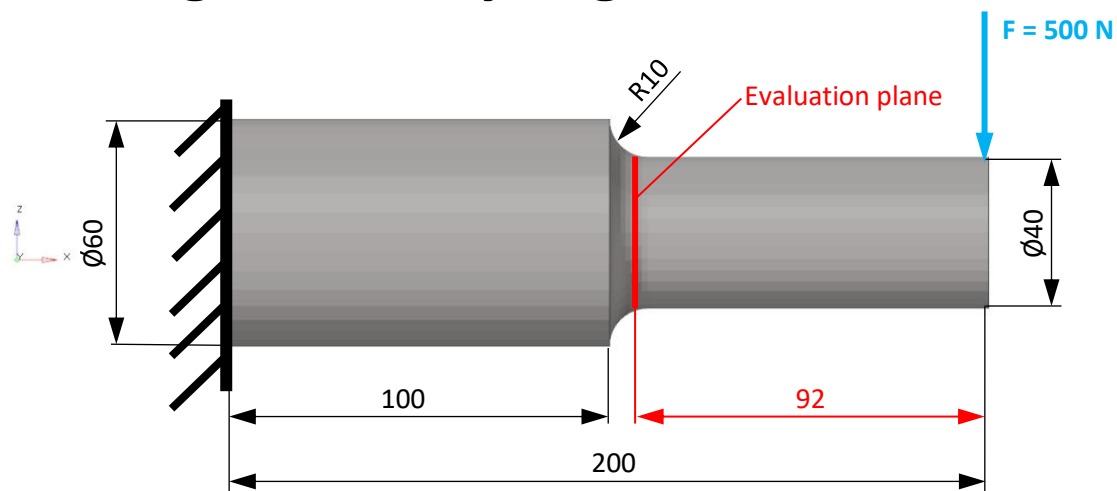
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Learning from users
Introduction to Altair HyperMesh™
and Altair HyperView™
Advanced meshing methods
Webinar part 1:

12 of December 2019 2pm – 3pm CET
by Marius Müller

Graz, December 2019

Meshing and analysing of a shaft



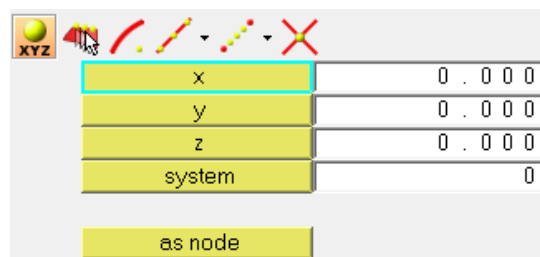
Geometry scale: 1:2

Figure 1: Geometry of shaft

1. Creation of geometry

1.1. Click F8 and choose XYZ (additionally you can click on temp nodes)

1.2. Create a node at (0/0/0)



1.3. Create a node at (0/0/30)

1.4. Create a node at (100/0/30)

1.5. Create a node at (100/0/20)

1.6. Create a node at (100/0/0)

1.7. Create a node at (200/0/0)

1.8. Create a node at (200/0/20)

1.9. Combine the nodes with lines

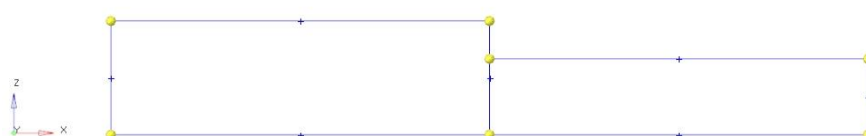
i. Create a component for the lines and choose a colour

- Right click on the model tree => create => Component

ii. Go to the Geometry panel and choose lines

iii. Choose linear nodes

iv. Create lines

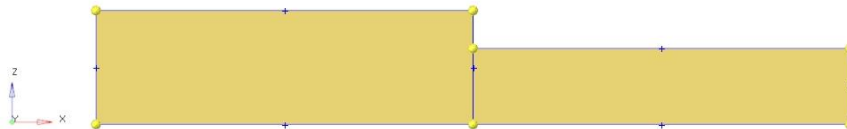


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Figure 2: Lines connected to nodes

1.10. Creation of surfaces

- v. Create a component for the surfaces and choose a colour
- vi. Go to the Geometry panel and choose surfaces
- vii. Choose Spline/Filler
- viii. Deselect “Autocreate (free edges only)”, “Keep tangency” and “keep line endpoints for planar splines”.
- ix. Change “Create in:” into “Current Component”. This way the surface will be created in the current component

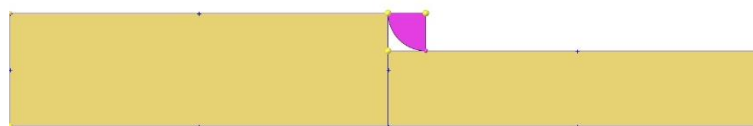


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Figure 3: Surfaces generated

1.11. For creating the radius you again need a surface

- x. Create a node at (110/0/30) and draw a circle with a radius of 10 mm
- xi. Go to the Geometry panel and click on surfaces and choose Spline/Filler and create a surface out of the lines
- xii. Geometry panel => surface edit => trim with surface/plane => choose the surface you want to trim and select the node where you want to trim the surface.
- xiii. Trim the circle with the x-axis and the z-axis and delete the not needed surfaces and lines
- xiv. Additionally you can choose the “Fillet” option in the line menu.



Geometry scale: 1:2

Figure 4: Quarter circle generated

1.12. Go again to the Geometry panel and click on surfaces

- xv. Choose spin and click on one of the lines you want to spin and set the x-axis as the rotational axis and select a node to spin around
- xvi. Delete the surfaces you don't need anymore.

1.13. Now click on Spline/Filler in the Geometry panel and close the open body

1.14. Use the function “edge edit” in the geometry panel to check if you have any free edges on your surface. If so, get rid of them by using the toggle function.

1.15. Create a new component called “solid”.

1.16. Then go to solids in the Geometry panel and choose Bounding Surfaces

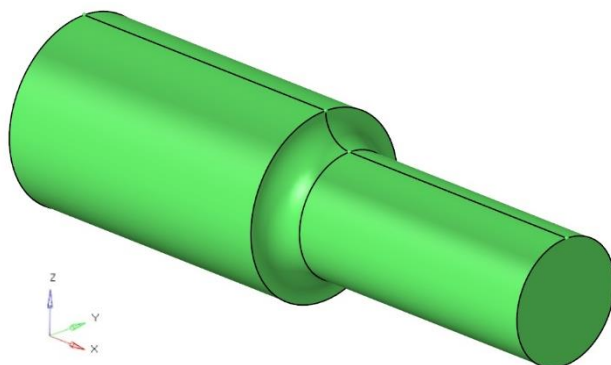


Figure 5: Solid generated

- 1.17. Delete all of the nodes: Click Shift + F2 => clear all
- 1.18. Additionally you can edit the temporary node panel by clicking on “temp nodes” in the geometry panel.
- 1.19. Delete the old surfaces: Right click on the component => Delete

2. Creation of assemblies and preparation for the mesh

2.1. Click into the model tree with the right mouse button and create the following assemblies:

- i. CAD
- ii. Surfaces
- iii. FEM
- iv. Mesh_2D

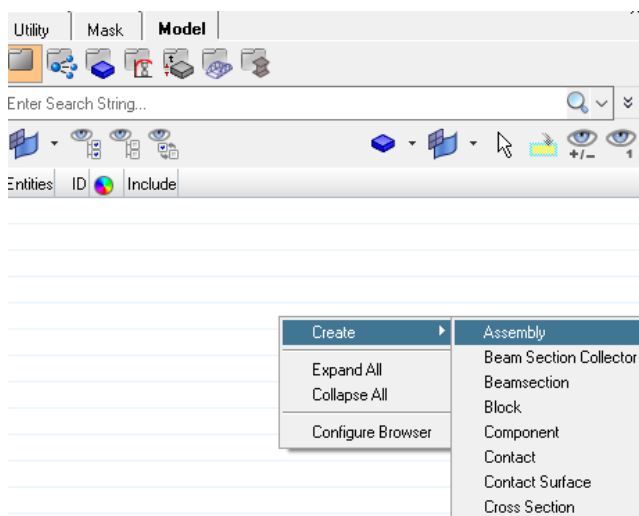


Figure 6: Creation of assemblies

2.2. Create the following components

- i. CAD_notched_shaft
- ii. Copy_notched_shaft
- iii. Surf_notched_shaft
- iv. Shell_notched_shaft
- v. Hex_notched_shaft

2.3. Move the components into the right assembly

- i. Go to the Assembly view in the model tree.

2.4. Turn your solid shaft into the component CAD_notched_shaft

- i. Go to the Tool panel and click on organise
- ii. Select solids and choose the shaft and then select move

2.5. Make a copy of your shaft

- i. Right click on Copy_notched_shaft => Make Current
- ii. Go to the Tool panel and click on organise
- iii. Select solids and choose the shaft and then select copy

2.6. Cut the “Copy_nothed_shaft” into one quarter

- i. Only display the component “Copy_nothed_shaft”
 1. Right click on the component => Isolate only
- ii. Create a node on the rotation axis of the shaft:
 - Click F8, go to Arc center and select lines
 - Click on one of the circles at the beginning or the end of the shaft and click create
- iii. Go to the Geometry panel and select solid edit and click on “trim with surfs/planes, select the z-axis and the node you created before
- iv. Do the same for the y-axis
- v. Delete the not needed solids
 - Click F2 and select solids and make sure to click on “delete bounding surfs. This way you also delete the bounding surfaces of your solid

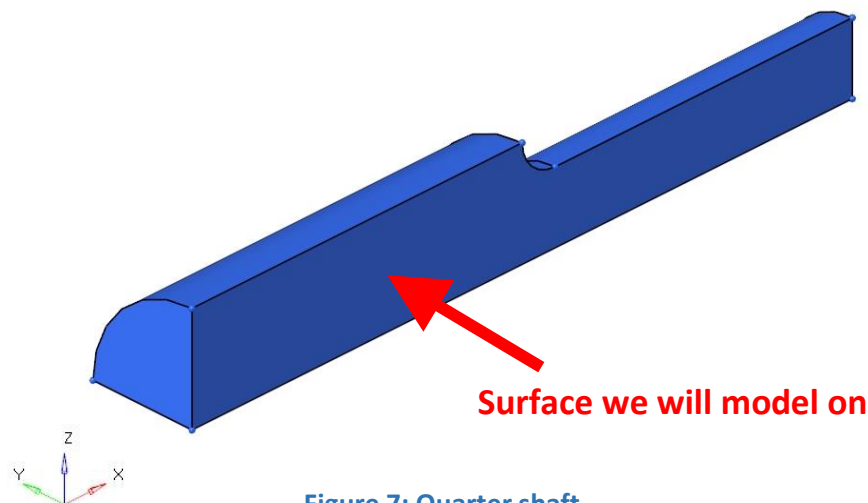
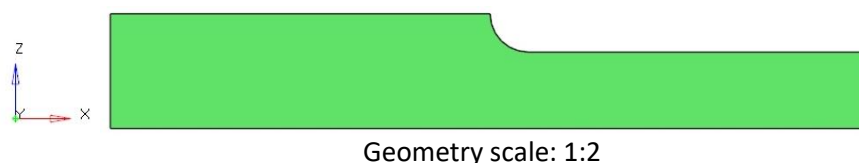


Figure 7: Quarter shaft

2.7. Create a surface where you can model on

- i. Make the component “SURF_notched_shaft” current
- ii. Go to the Tool panel and click on organise and copy the surface (the surface in the zx-plane) of the quarter shaft
- iii. Hide the solid



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Figure 8: Surface of the notched shaft in the zx-plane