Walk-in Slide: AU 2014 Social Media Feed

1. Click on the link below, this will open your web browser

http://aucache.autodesk.com/social/visualization.html

2. Use “Extended Display” to project the website on screen if you plan to work on your computer. Use “Duplicate” to display same image on screen and computer.

Advanced Meshing Techniques in Simulation Mechanical (SM6725)

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Class summary

In this class we will go over how to find and fix problem CAD geometry to get a successful mesh. We will also highlight some of the advanced meshing tools within Simulation Mechanical software.

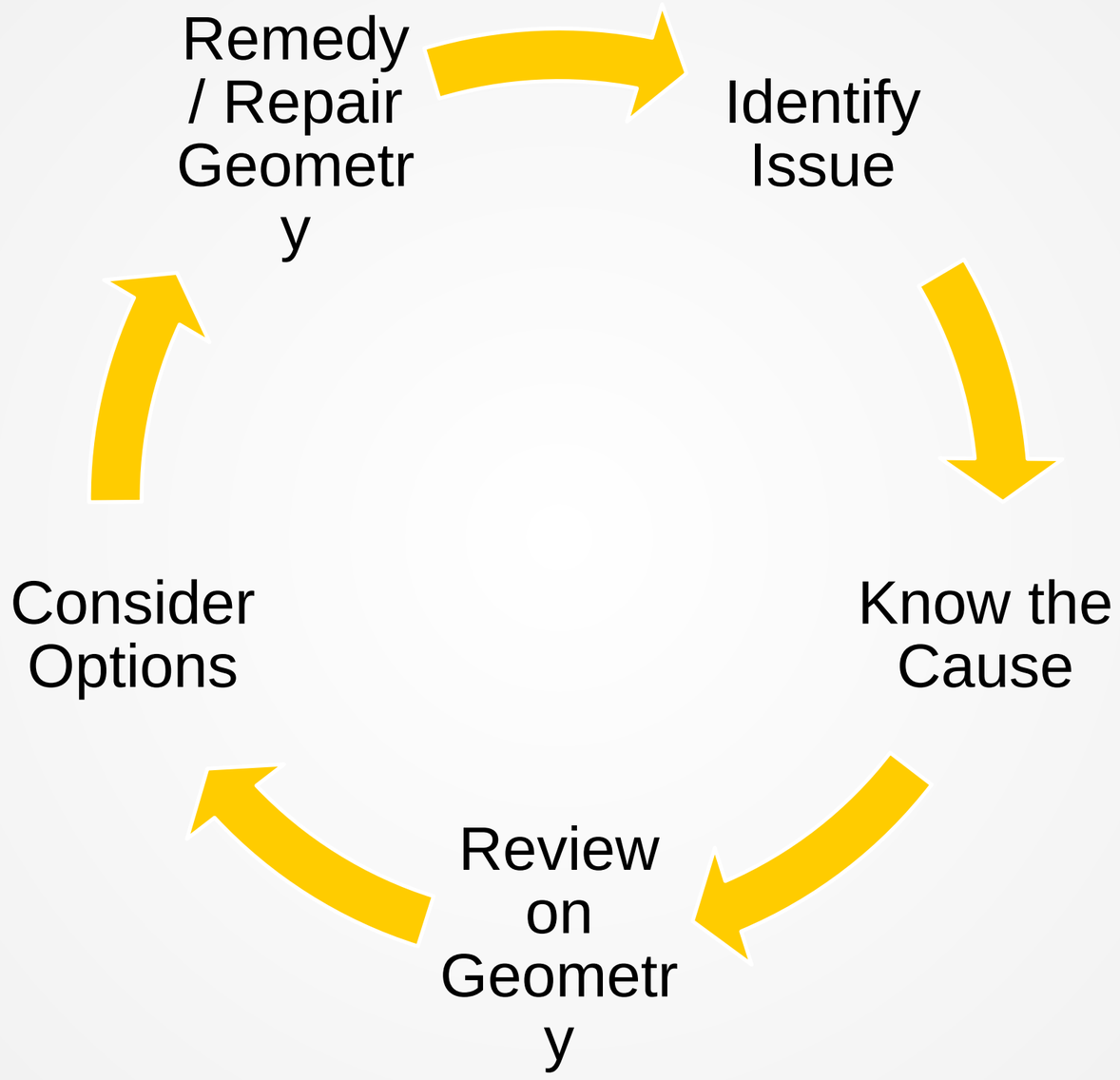
Key learning objectives

At the end of this class, you will be able to:

- Identify non-watertight mesh issues and know some of the causes and fixes
- Identify multi-matched geometry and know the cause and fixes
- Identify unmatched cad geometry and know the cause and fixes
- Know the use of the “virtual imprinting” and “imprinting within parts” options and their limitations as applied to surface based cad geometry
- Know the process for re-meshing a single part within an assembly (new for V2015)
- Manually repair a surface mesh and generate a solid mesh

The Future of How Things are Made

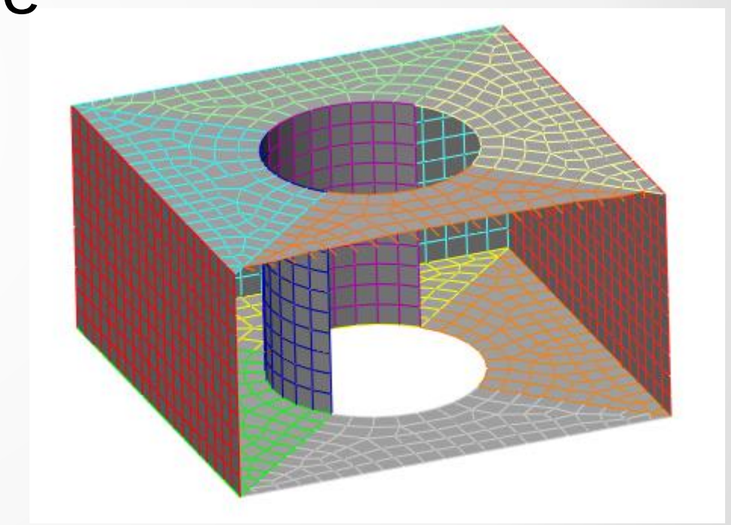
The Future of How Things are Tested?


Remedy / Repair Geometry
Identify Issue
Know the Cause
Review on Geometry
Consider Options

Chapter 1: Non-watertight Mesh

Non-watertight Mesh

Watertight means that the mesh on all of the surfaces is complete, the lines of the mesh create valid elements, and the mesh properly connects to adjacent surfaces so that the volume is fully enclosed.



Non-watertight Mesh

Non-watertight mesh processing

- Identify Issue – the “View Mesh Results” will indicate that the geometry is not watertight.
- Know the Cause – fundamentally, mesh is not good (3 & 4 sided regions). May be due to coarse mesh, sliver surfaces, tolerances, unmatched or multi-matched edges, interfering geometry.
- Review on Geometry – the “Layer Control” will list problem layers 2 and/or 6. The “Color by” option can show model colored by layers.
- Consider the Options – finer mesh, correct CAD, Feature Matching
- Remedy / Repair Geometry – Choose the option that best suits the observed cause.

Non-watertight Mesh

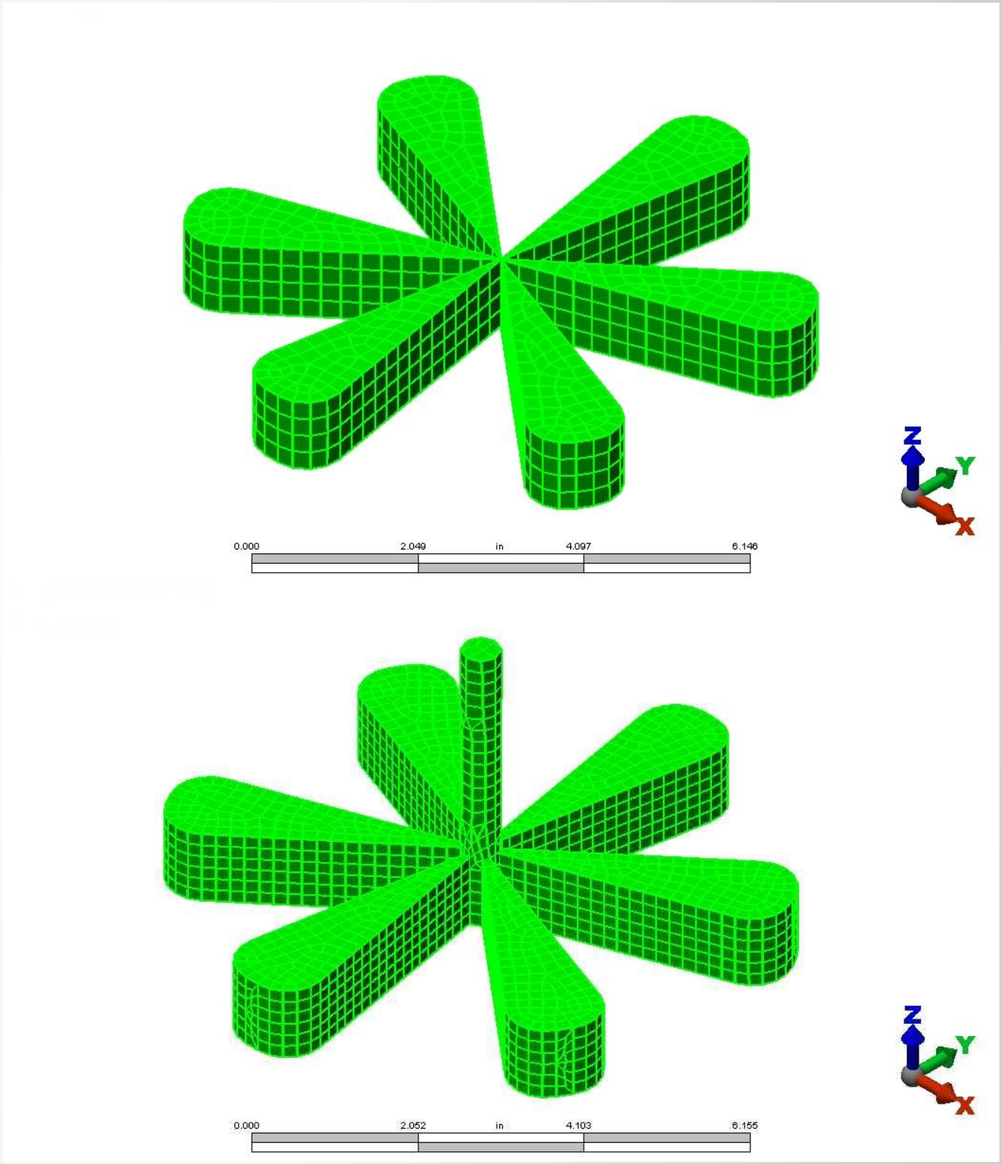
Non-watertight mesh example: Tapered Panel.ipt

- We’ll open the model and mesh it coarsely and then identify the issue, know the cause, review on the geometry, consider our options and repair the model.

Chapter 2: Multi-matched CAD Geometry

Multi-matched CAD Geometry

A multi-matched feature line occurs when more than two surfaces on one part share an edge. To enclose a continuous volume, only two surfaces can meet at an edge.



Multi-matched CAD Geometry

Multi-matched geometry processing

- Identify Issue – look for the part icon in the menu tree to have a change in state (red outline) and/or becomes badged with an x
- Know the Cause – any feature line should be shared by only 2 surfaces. If multiple surfaces share that edge or a surface is so thin that the edges across the gap are considered as one, it is flagged as multi-matched.
- Review on Geometry – multi-matched line(s) show in dark blue when the model is displayed with visual style of Edges vs Shaded with Mesh
- Consider the Options – Feature Matching adjust, repair cad, ignore
- Remedy / Repair Geometry – Choose the option that best suits the observed cause.

Multi-matched CAD Geometry

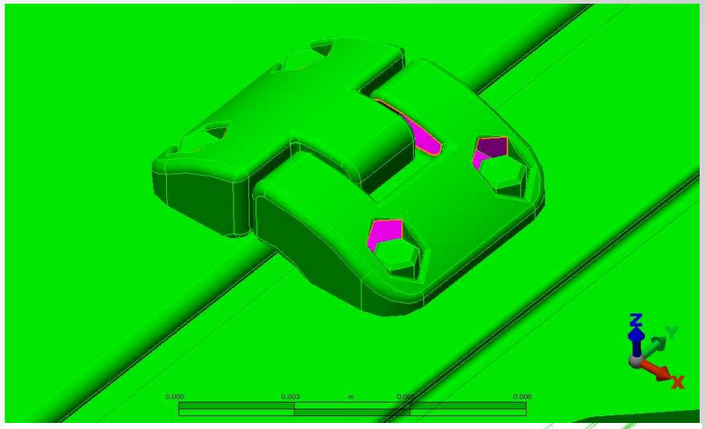
Multi-matched edge example: Edge Guard.ipt

- We’ll open the model and can immediately observe that the part icon in the menu tree has a change of state and is badged. We will then mesh the model and then identify the issue, know the cause, review on the geometry, consider our options and decide on remedy/repair to the model.

Chapter 3: Unmatched CAD Geometry

Unmatched CAD Geometry

An unmatched feature line is one that is not shared by two surfaces. It means that one surface ends in the middle of space and does not connect with another surface. This configuration does not enclose a volume and will therefore not allow the solid mesh engine to create a solid mesh.



Unmatched CAD Geometry

Unmatched geometry processing

- Identify Issue – look for the part icon in the menu tree to have a change in state (red outline) and/or becomes badged with an x
- Know the Cause – any feature line should be shared by 2 surfaces. If only a single surface shares that edge, it is flagged as unmatched. Plate (surface) geometry, by nature, is unmatched at the edges. The general source in volumes is due to missing surfaces.
- Review on Geometry – unmatched line(s) show in orange when the model is displayed with visual style of Edges vs Shaded with Mesh
- Consider the Options – Feature Matching adjust, repair cad, ignore
- Remedy / Repair Geometry – Choose the option that best suits the observed cause.

Unmatched CAD Geometry

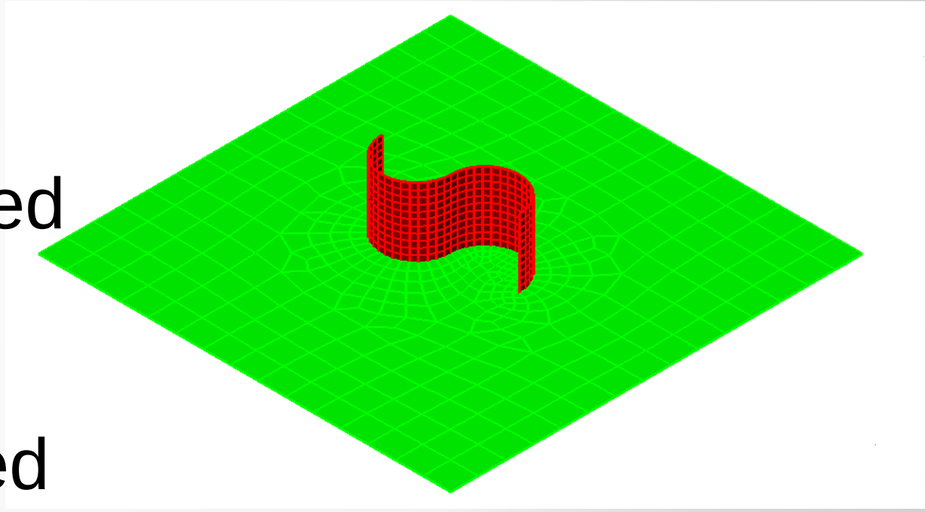
Unmatched features example: Bicycle Frame 1.igs

- We’ll open the model and can immediately observe that the part icon in the menu tree has a change of state and is badged. We will then mesh the model and then identify the issue, know the cause, review on the geometry, consider our options and decide on remedy/repair to the model.

Chapter 4: Imprinting

Imprinting

Imprinting, when activated, will split the faces of different CAD parts where they intersect each other, without creating additional surfaces. This virtual imprint is used as the basis of surface mesh generation. Since the matched virtual surfaces are meshed only once, this results in a better quality mesh. When unchecked, the mesh match is accomplished by meshing both surfaces and then adjusting the mesh on one part to conform to the mesh on the other part.



Imprinting

Imprinted parts

- Identify Issue – visual inspection shows unmatched mesh, layer 15 not present, parts not attached in solution.
- Know the Cause – generally due to parts that pass through one another.
- Review on Geometry – the “Layer Control” will not show layer 15 matched mesh where there should be, or obvious non-matched nodes. The “Color by” option can show model colored by layers.
- Consider the Options – correct CAD
- Remedy / Repair Geometry – Choose the option that best suits the observed cause.

Imprinting

Imprinting mesh example: BeamsAsm.iam

- We’ll open the model and then identify the issue, know the cause, review on the geometry, consider our options and repair the model.

Chapter 5: Single Part Meshing in Assemblies

Single Part Meshing in Assemblies

Beginning with 2015, it is now possible to re-mesh a single part within an assembly of parts and then execute the analysis on the entire assembly. This is helpful when there is just a single part, or a few parts, out of many that needs to be meshed differently and you do not want to have to mesh the entire assembly over.

Single Part Meshing in Assemblies

Single Part Meshing Process

- Identify Issue – a single or a few parts fail while meshing a large assembly. Potentially different parts fail when meshed at a new size.
- Know the Cause – the default mesh matching is a function of the mesh size. Changing the mesh size will result in a different mesh at the interface of matched parts, sometimes with a negative impact.
- Review on Geometry – a part fails to mesh, typically as a non-watertight type of failure. Part is able to mesh on its own.
- Consider the Options – globally finer mesh, mesh refinement, single part re-mesh
- Remedy / Repair Geometry – This topic is concentrating on that single part and ensuring a good mesh on it, then run entire

Single Part Meshing in Assemblies

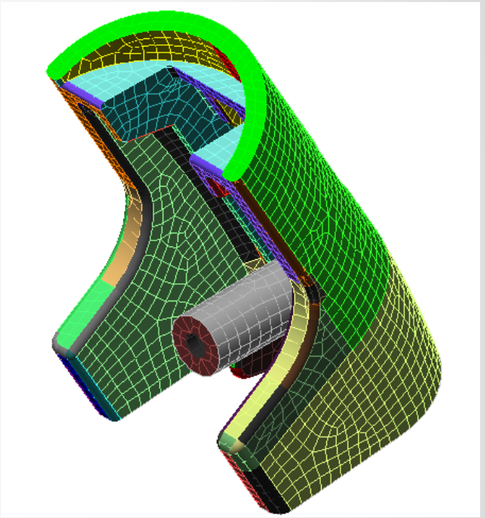
Single part re-mesh example: Bow Riser.iam

- We’ll open the model and mesh the assembly and then identify the issue, know the cause, review on the geometry, consider our options and repair the model.

Chapter 6: Mesh Repair

Mesh Repair

In Autodesk Simulation Mechanical, we have the ability to make changes to the mesh. It is possible to add and remove lines, move nodes, intersect lines, snap nodes within proximity to one another and more. In some situations, your best path to a solution might be to alter the surface mesh that has been given to you.



Mesh Repair

Fixing a Surface Mesh - Process

- Identify Issue – various issues (non-watertight issues, unmatched mesh regions and element quality issues).
- Know the Cause – fundamentally, mesh is not good (3 & 4 sided regions). May be due to coarse mesh, sliver surfaces, tolerances, unmatched or multi-matched edges, interfering geometry.
- Review on Geometry – the “Layer Control” will list problem layers 2 and/or 6. Isolate the problem surface(s) and review.
- Consider the Options – ask yourself if the region is something you feel comfortable repairing or back to the CAD for repair.
- Remedy / Repair Geometry – Choose the option that best suits your chance for greatest success.

Mesh Repair

Mesh repair example: Plastic Cover.dwg

- We'll open the model and mesh it coarsely and then identify the issue, know the cause, review on the geometry, consider our options and repair the model.

Session Feedback

- Via the Survey Stations, email or mobile device
- AU 2015 passes given out each day!
- Best to do it right after the session
- Instructors see results in real-time

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