T010: Initial Mesh Refinement Technique

Introduction

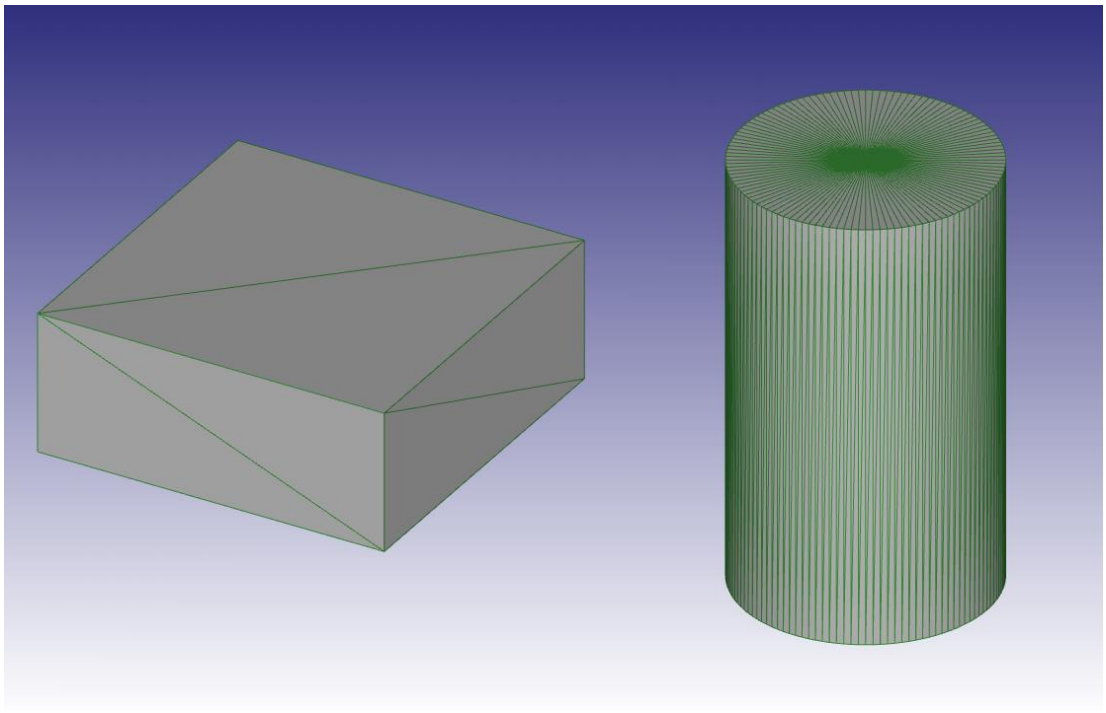
This document describes a meshing technique that may be needed when using windows to create an initial mesh for an object in DEFORM-3D.

Problem Description

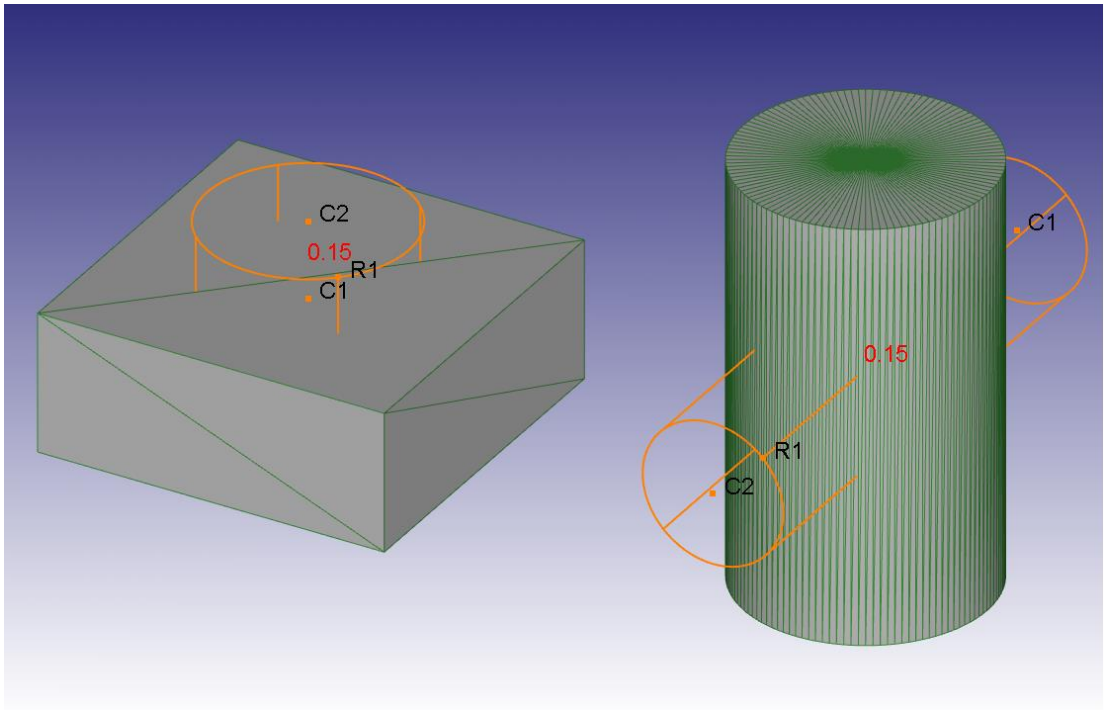
Mesh windows can be used to generate a refined mesh at certain locations on a part. There are times when mesh windows are defined, but the resulting mesh does not look like the windows were taken into account. This is due to the way the mesh windows use the underlying geometry. This technical note will show how different geometries for the same object will change how the mesh windows are used.

Background Information

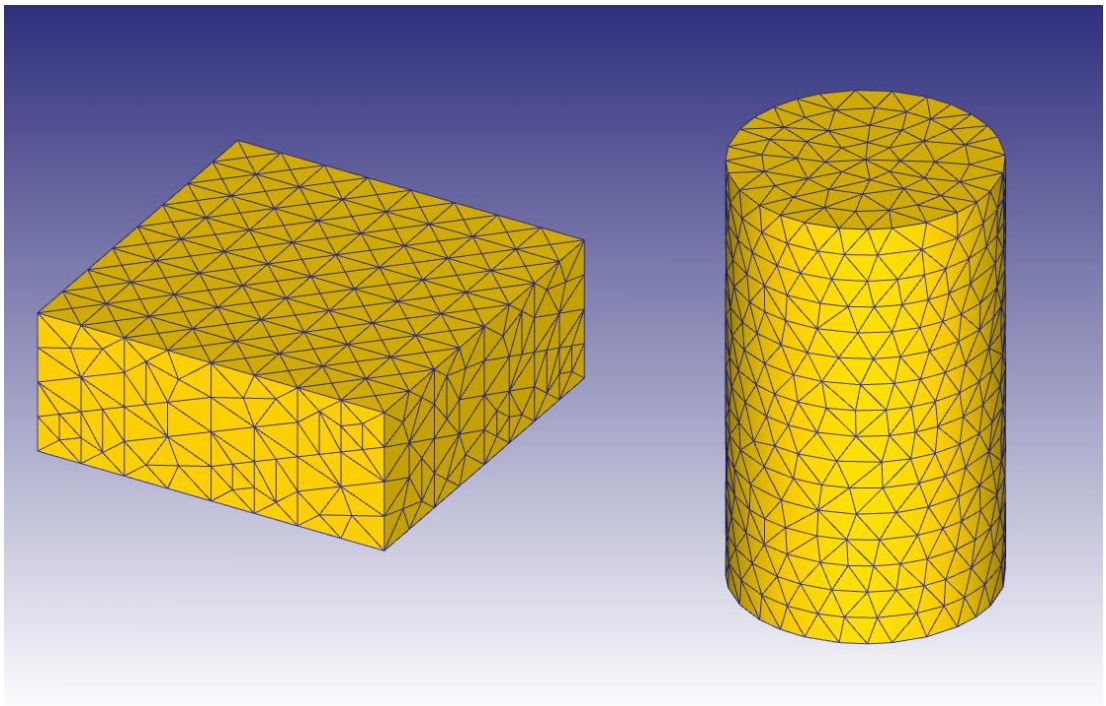
The geometries for a simple block and cylinder are shown below. When a standard .stl file is generated for these objects, the geometry uses the fewest number of triangles to represent the object. This is why the triangles on the objects stretch from one side to the other.



If you want to use windows to refine the mesh in the center of these objects, you may run into difficulty. This is because the mesh windows act at the corners of the geometry facets. Due to the discretization of the geometries, there are no facet corners in the center of the objects. Mesh windows defined as shown below will not be recognized for these geometries.



The resulting mesh will appear as if mesh windows were never defined.



Solution

The mesh windows would work as expected if there were geometry facet corners in the region were the mesh windows were defined. Depending on the CAD package used, sometimes different .stl export settings can be used to generate geometries with more/smaller facets.

Alternatively, the following procedure can be used to create a geometry that will work better for the mesh windows.

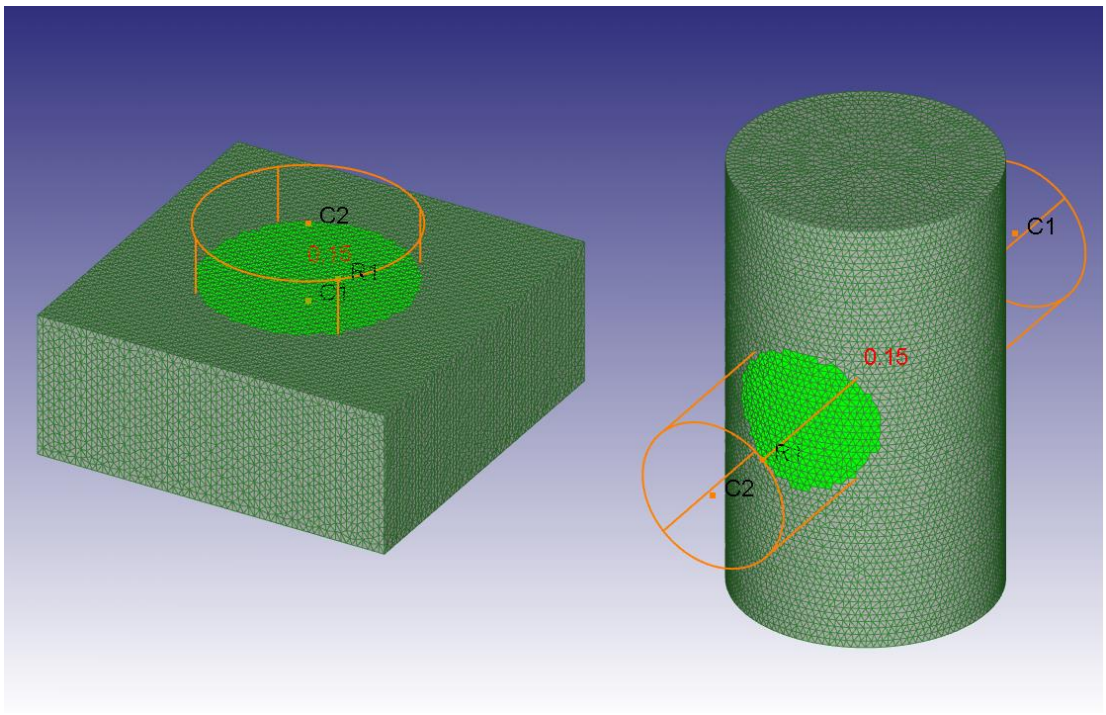
1. Generate a very fine surface mesh on the object. You can use either Relative or Absolute mesh settings to do this. Use as many elements as needed to accurately discretize the object. If features of the geometry are being truncated or chopped off in the surface mesh, symmetry surfaces can be used (Geometry --> Symmetric Surface) to mark the surfaces of these features so that this does not occur. Using more elements will also help preserve these features.

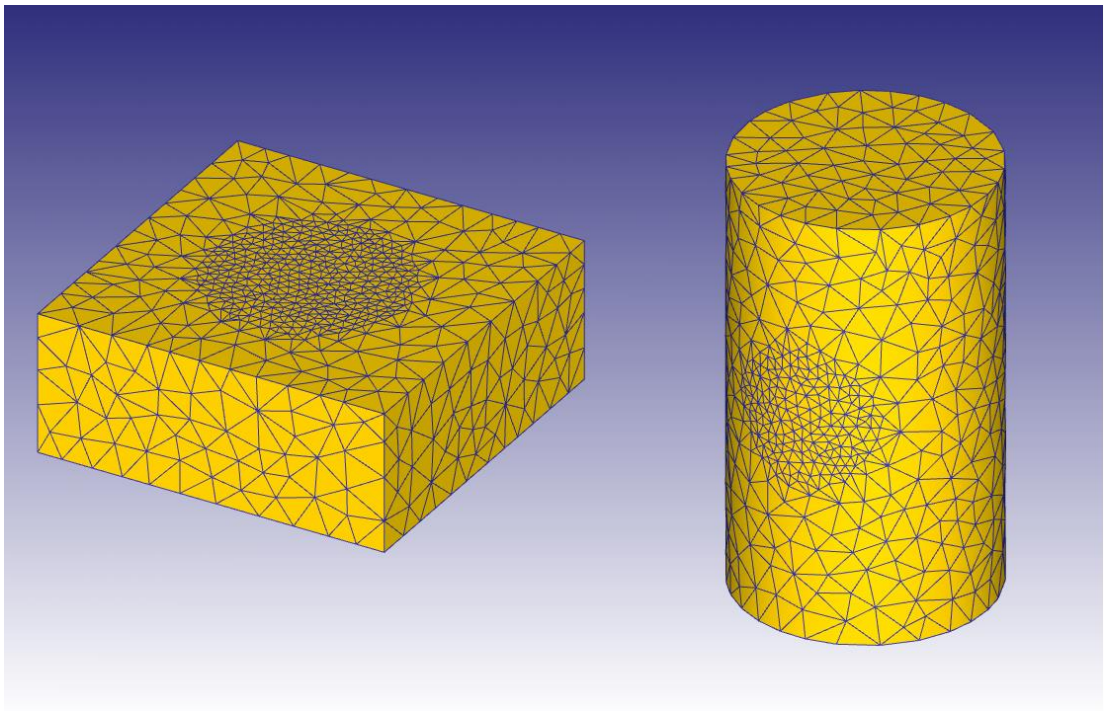
2. Once the fine surface mesh is generated (no need to solid mesh the object), click “Save Mesh…” on the Mesh --> Tools tab to save the surface mesh to a file such as **FineSurfaceMesh.GEO**.

3. Click on the Geometry button. A window will pop up telling you that a solid mesh has not been generated yet. Click “Yes” to exit mesh generation.

4. Import **FineSurfaceMesh.GEO** as the geometry for the object.

5. Mesh the object. The mesh windows that previously did not work will now be used as expected. When defining the mesh windows, the  icon in the Window Definition dialog can be used to see the geometry location where the mesh windows will act. On the previous geometries, nothing highlighted when doing this.





Related Information

None