

Example 3/5

Courtesy of Nathan Kistler

Figure 6 is an example of study on the effects of element numbers. Although 600 elements may be just enough.

Plotting stress vs. number of nodes is another option.

2.2 Mesh

The mesh generated for the dogbone specimen is shown in Figure 5. The region of interest is the central region encapsulated by the red dotted line. This is the region maximum stresses and strains occur. Therefore, the mesh was refined in this region relative to the other parts of the dogbone sample. Furthermore, the mesh in the region of interest maintains an aspect ratio close to 1. The other regions of the dogbone specimen are not of interest and thus, the mesh is larger to reduce computational time. Four partition faces are generated in order to gain more control of mesh generation in the region of interest.

The mesh is made up of quad element shapes using the free technique and the medial axis algorithm for mesh generation. The optimal element size in the region of interest was determined from the plot of number of elements with their respective max stress (S_{22}) shown in Figure 6. The Johnson-Cook model with values reported by Lesuer⁵ was chosen arbitrarily for the mesh experiment. The maximum stress did not substantially increase from 600 to 1500 elements. Therefore, the 1500 element mesh was used in this experiment.

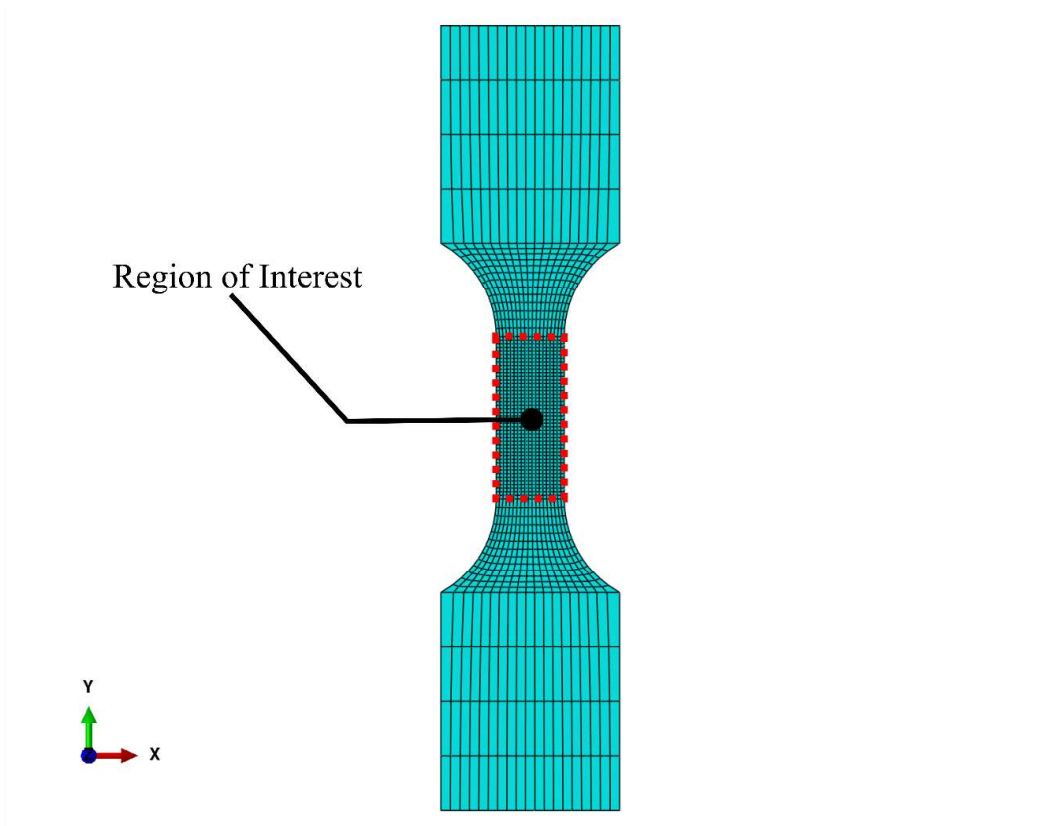


Figure 5. Mesh generated for this study. Region of interest is surrounded by dotted red line.

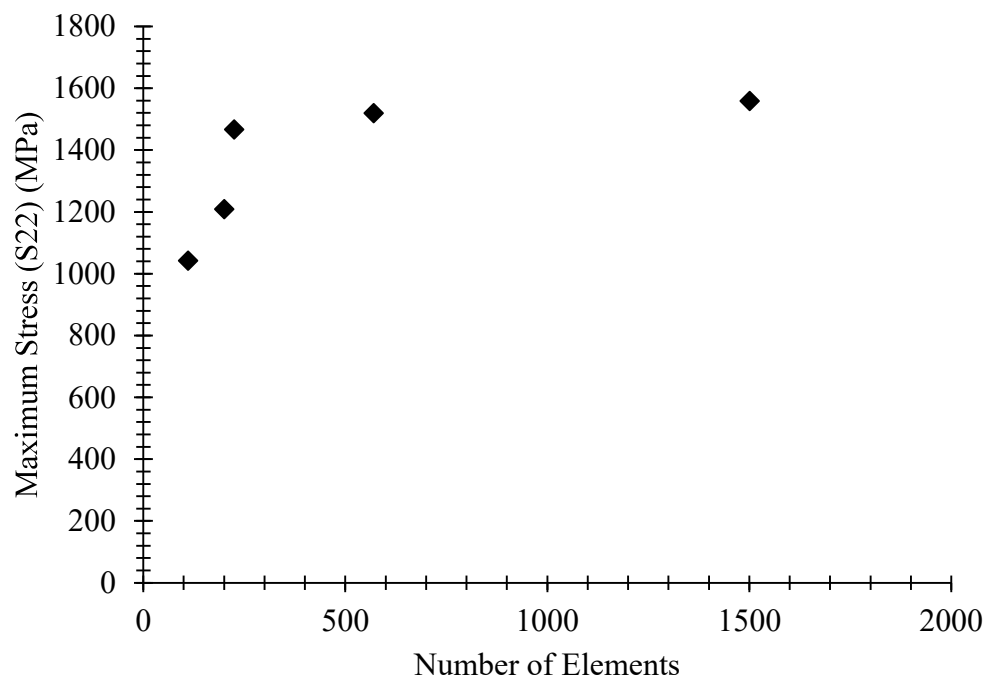


Figure 6. Maximum stress with increasing number of elements. The Johnson-Cook plastic hardening model with the Lesuer material properties was used for mesh refinement.