Company: Pointwise, Inc.
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Mesh: Fender Jazzmaster & Abdominal Atlas (Thoracic Vertebrae and Intervertebral Disc)

Description of Fender Jazzmaster Mesh

Pointwise was used to generate a tetrahedral volume mesh for the Fender Jazzmaster geometry provided by the International Meshing Roundtable steering committee. Because the primary structural component of an electric guitar is the neck of the guitar, we elected to mesh the solid geometry for a structural analysis. The STEP file was used for the analysis. Missing surfaces were reconstructed within Pointwise and a watertight solid model was generated to ensure that no gaps, overlaps, or duplicate surfaces would impede the ability to automatically generate a watertight triangular surface mesh. Topological entities relating a collection of underlying trimmed surfaces known as quilts were used to define the surface topology. Boundaries of quilts act as hard edges in the mesh and were used to define the hard edges of the geometry. Quilts were also used to define regions where boundary conditions would be specified for the structural analysis. With the watertight model and quilts defined, an advancing front triangular surface mesh was created automatically. Domains were then reviewed and some areas refined or decimated as necessary to resolve surface curvature. An unstructured volume mesh consisting of tetrahedra was constructed from the resulting surface mesh and initialized using a modified Delaunay algorithm. The final mesh consists of 4.8 million tetrahedra.

Description of Abdominal Atlas Mesh

We also elected to mesh two thoracic vertebrae and a single intervertebral disc. The geometry is a subset of the SPL Abdominal Atlas provided by the Surgical Planning Laboratory at Brigham and Women's Hospital, Harvard Medical School. The atlas was derived from a CT scan and converted to a triangulated (STL) format prior to import into Pointwise. The focus of this meshing study was automation for a finite element analysis. A script was written using Pointwise's Glyph scripting language to import the geometry and automatically generate a conformal Delaunay triangulated surface mesh. The vertebrae and intervertebral disc surface grids were used to construct watertight volume meshes that were then initialized using a modified Delaunay algorithm. This process created 1.05 million tetrahedral elements.