

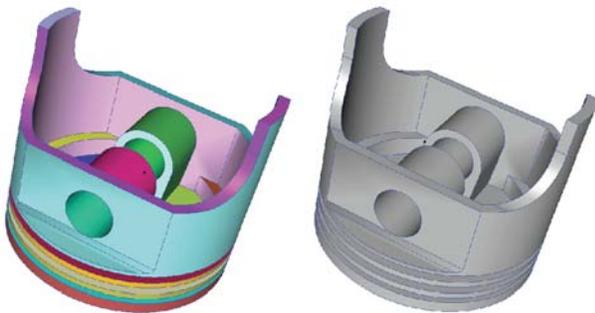
PointwisePointer

A User Tip from the Pointwise® Support Desk

Summer 2010

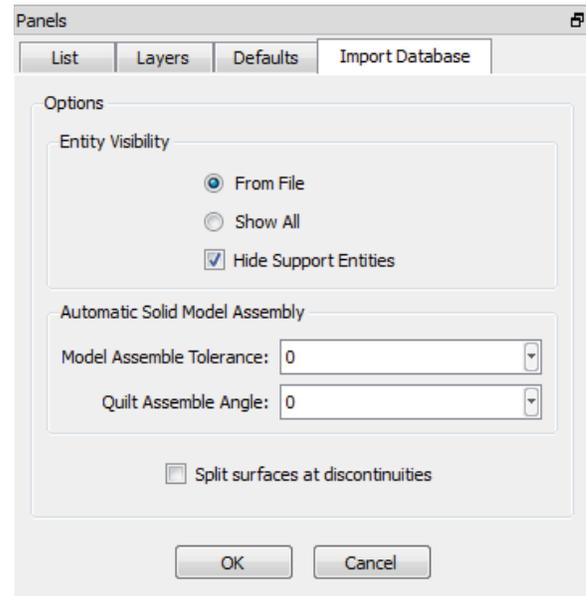
Solid Meshing

Solid Meshing is an exciting new capability recently added to Pointwise. It is a suite of tools for creating, modifying and meshing directly on database solids. Since it works directly on solid models, solid meshing creates closed, watertight meshes without any additional work by you. If you do not have a solid model to start with, Pointwise can create it for you automatically on import of your database file. For example, the case below consists of 55 separate CAD surfaces (below left), but imports automatically as a single watertight solid (below right). After setting a few simple mesh defaults, this single solid entity can be selected and meshed instantly!



To make all this happen, Pointwise supports two new database entity types, models and quilts. A model is a high level entity made up of any number of surfaces, trimmed or otherwise. Models can be imported directly from many CAD packages via supported formats. Quilts are smaller collections of surfaces that make up a topological region of your mesh. Since models inherently have no interior gaps, all connectors and domains created on models will be merged properly and linked automatically. Creating quilts saves you even more meshing time because these entities represent topographical meshing subsets of your models. For instance, all surfaces making up one side of a wing could be combined into a single quilt. Meshing the quilt directly results in a single domain, regardless of how many surfaces were used to form the quilt. Let's look now at how you actually make use of these tools in Pointwise.

Database import using **File, Import, Database** now provides an options panel with new settings for solids, as shown below.

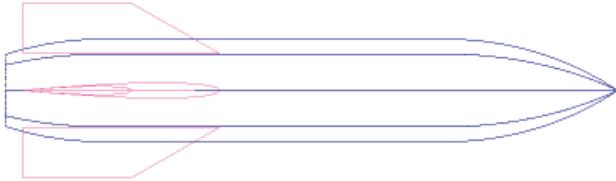


Use **Model Assemble Tolerance** to have models in the database file assembled automatically into as few models as possible with the entered tolerance. Use **Quilt Assemble Angle** to have quilts assembled based on a turning angle between adjacent quilts. Adjacent quilts with a turn angle greater than your input will not be assembled. This is a great way to have quilts assembled while still maintaining hard geometric features like corners. Note that all trimmed surfaces in a database file are promoted to quilts automatically, so they will be included in this process.

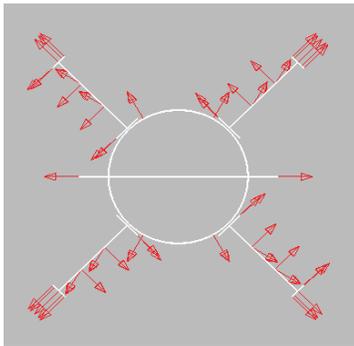
Assembly of models and quilts also can be performed explicitly via the menu command **Create, Assemble, Models** or **Quilts**. Keep in mind that quilts cannot be assembled until they belong to a single model. This ensures that all quilts are matched properly at their common boundaries, forming watertight geometry. Assembly also can be performed automatically on the current selection using the new **Create** toolbar commands shown below.



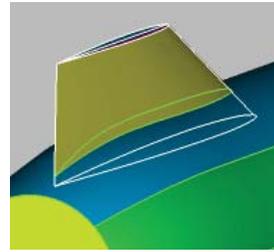
The biggest issue most analysts face when meshing their CAD geometry, however, is the surfaces do not share common edges and overlap each other. This makes the geometry difficult to mesh quickly. Pointwise has a solution for you in its new trimming tools found via the **Edit** menu: **Trim By Surfaces** and **Trim By Curves**. Take for instance this generic missile geometry in which the fin surfaces pass through the body:



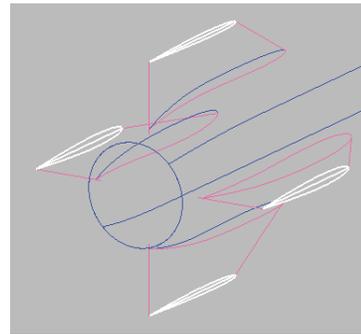
You really want the fins to be trimmed with the body and vice versa. You want topological quilts representing all the geometric features, such as each fin side and each fin tip. And finally you want all these quilts in a single closed model. Selecting all of the surfaces as they are and clicking **Assemble Models** on the toolbar yields five models (four fins, one body) because the fins pass through the body. Before attempting to trim the fins with the body, use **Edit, Orient** to ensure the fins and body have consistent parametric orientations. An end view below of the missile in the **Orient** command shows all the normals pointing consistently out of the geometry.



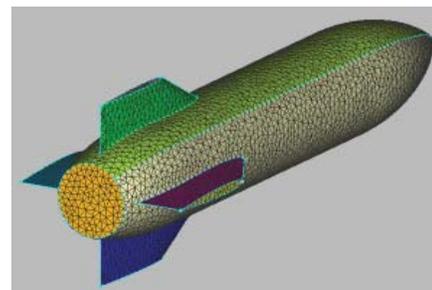
Select the body model and use **Edit, Trim By Surfaces**. Then select the fin models for **Group B** to trim against. You only want the pieces on the "outside" of the geometry, so you can toggle off the **Advanced Keep Inside** option. It is important to keep the orientations consistent so that Pointwise can easily distinguish inside from outside. Click **Imprint** to trim the models and display the candidate quilts in shaded rendering. Only one fin model is imprinted below for image clarity.



After trimming your models against each other, join them all into a single model by selecting them and using **Assemble Models** on the toolbar. Finally, assemble the tip quilts into a single quilt per tip by selecting them all as shown below and clicking **Assemble Quilts** on the toolbar.



Set a default connector **Average Δ s**, and instantly mesh this geometry using **Domains on Database Entities** on the toolbar. Simply select the single model representing the entire geometry and click the command. Done! After using **Apply Rainbow Colors** on the new domains in the **Attributes** panel, and switching them to **Shaded** display, you can see that our solid meshing has produced a topologically efficient, trimmed, and properly connected grid below.



If you are not already a Pointwise user, go to www.pointwise.com/pw now to learn more about our state of the art meshing application and click the *Get a Free Trial* link to start taking advantage of Solid Meshing and more!