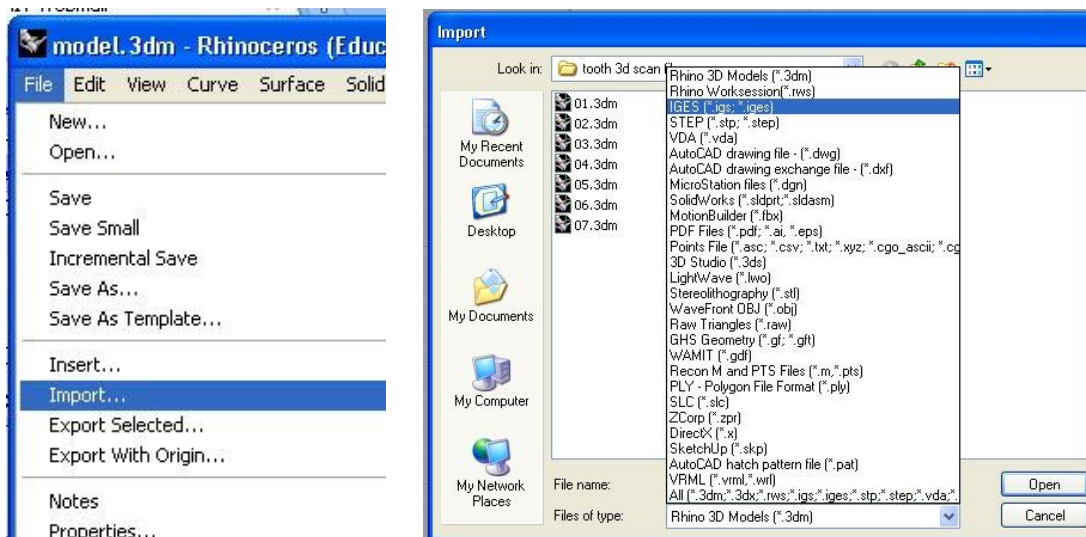


How to fix almost any surfaces

As a 3D modeling guru, there was not so many things to do. It was just good enough for students to send a finished 3D file to TA.

I thought it would be helpful for future students if I made a tutorial to work with scanned geometry with using Rhino3d software.

1. Import the scanned file in Rhino3D



2. Change the imported file to Nurb

Generally scanned file is made of Meshes. They are not easy to manipulate. With nurb surfaces, you can manipulate in rhino. Use MeshToNurb command

MeshToNURB

Convert each polygon in a polygon mesh into a NURBS surface.

Steps:

- ▶ **Select** the objects.

Note:

- Complex meshes will create NURBS surfaces that use large amounts of memory.
- Meshes with more than 20,000 faces are not accepted as input.

Warning

This command converts each polygon face to a NURBS surface. It is not meant to convert entire mesh models to NURBS models and there is, in fact, no simple way to accomplish this.

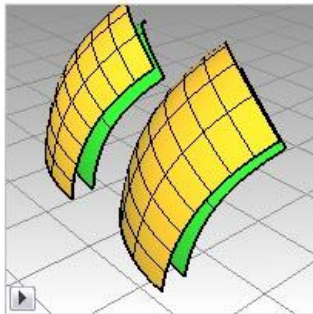


3. Make thickness

When you have only surface model, use OffsetSrf

Check about “Solid’ option to make closed surfaces.

OffsetSrf



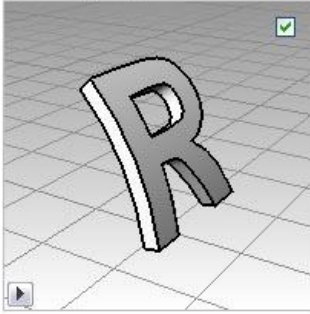
Copies a surface so that locations on the copied surface are the same specified distance from the original surface.

Steps:

1. **Select** a surface.
2. Type the **offset distance** and press **Enter**.

Solid

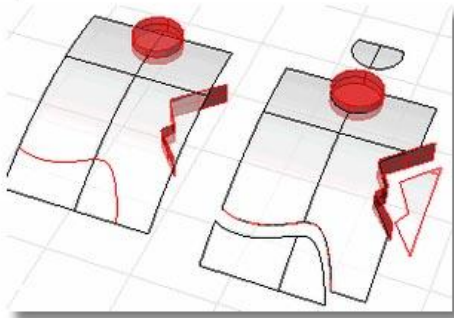
Makes a closed solid from the input and offset surfaces by lofting a ruled surface between all of the matching edges.



4. Cutting surface

In case you need to cut some parts, I recommend using “Split” command

Split



Divides NURBS into parts using other objects as cutters.

Steps:

1. **Select** objects.
You can select multiple objects to split with multiple objects.
2. **Select** the cutting objects.
3. Press **Enter** to end the command.

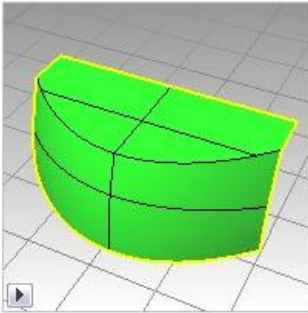
Notes

- The **Isocurve** option only appears when a single surface is selected.
- Use **Untrim** to remove a trimming boundary from a surface.
- When you split a surface with a curve in a plan parallel view like the default Top, Front, and Right view, the cutting curve is projected on the surface in the view direction.
- When you split a surface with a planar curve in an angled parallel or a perspective view like the default Perspective view, the cutting curve is projected on the surface in a direction perpendicular to the curve plane.
- When you split a surface with a 3-D curve in an angled parallel or a perspective view, the cutting curve is pulled onto the surface by closest points.

5. Combine surfaces

“Join” is a popular way to combine separate surfaces. It can fill small gabs between objects automatically.

Join



Connects objects together to form a single object: lines into polylines, curves into polycurves, surfaces and polysurfaces into polysurfaces or solids.

Steps:

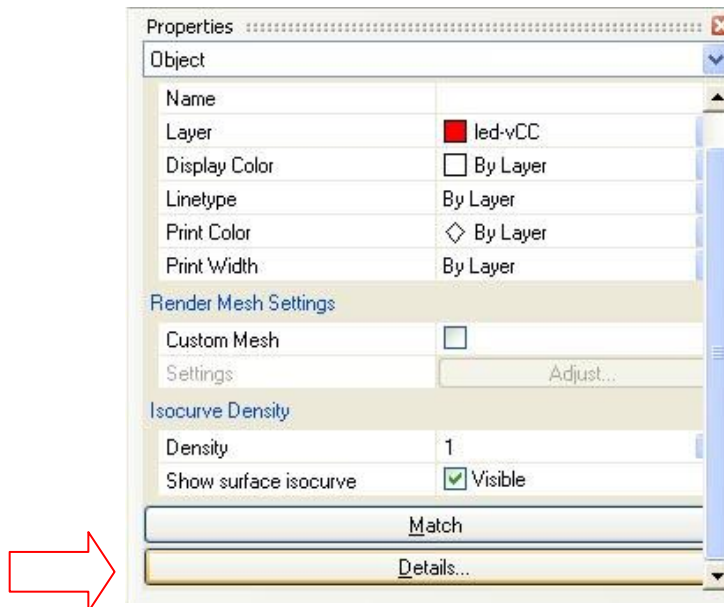
- ▶ **Select** the objects (curves, surfaces, polysurfaces, or meshes) to join.
Note: Use **SelChain** to select a string of curves that touch end to end.

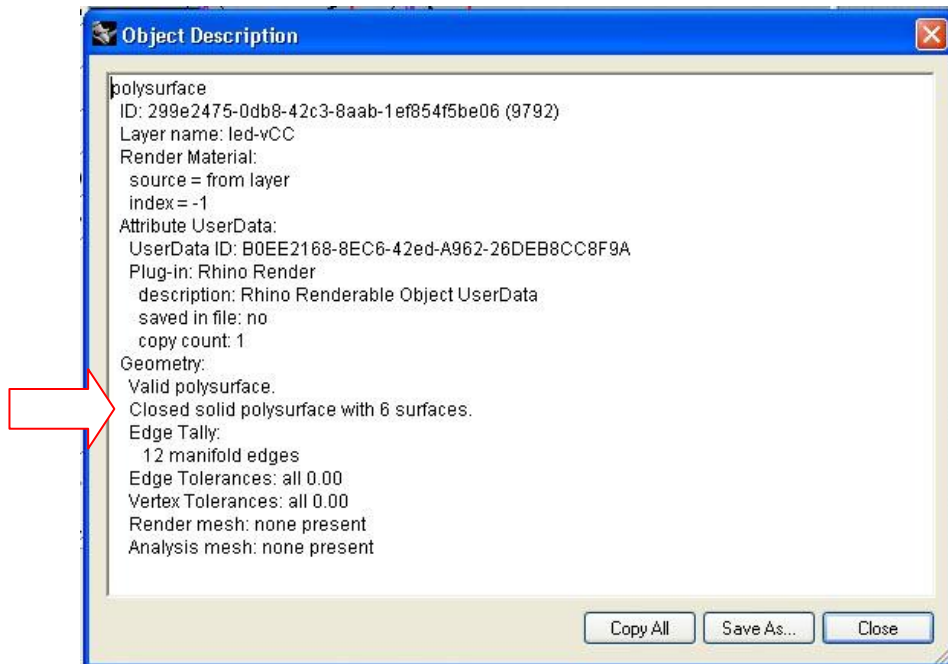
To select objects one by one

1. **Select** an object (curve, surface, polysurface, or mesh).
2. **Select** the next object.
Note: To select a surface edge as a curve to join, see sub-object selection.
3. When you are finished selecting objects to join, press **Enter**.

6. Checking feasibility

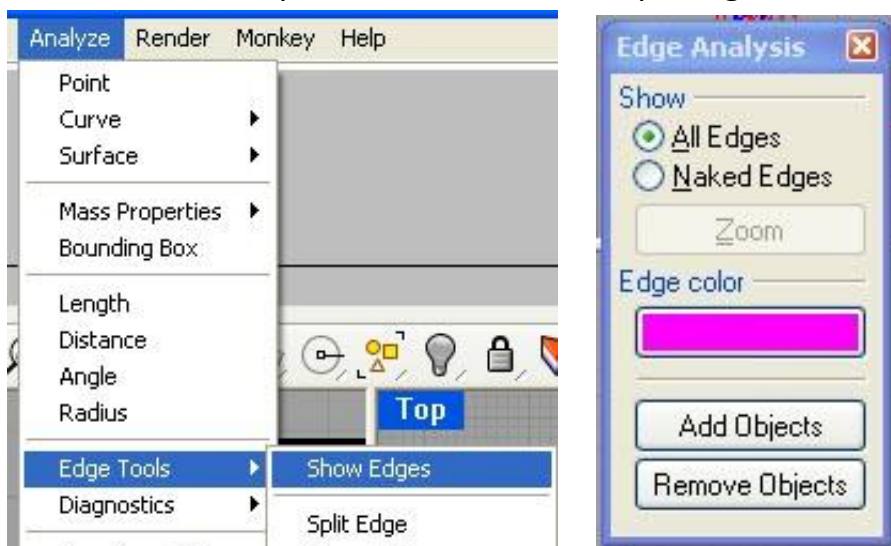
To check your model is fine with 3d printing, see detail information. Your model should be closed solid.





7. When your surface is not closed

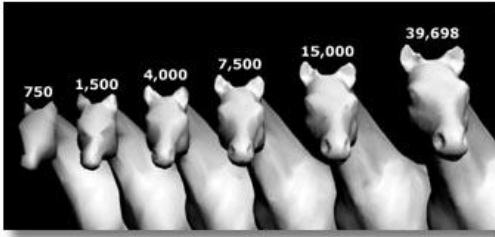
This method is helpful to find where are openings



8. Reduce mesh sizes

When your mesh is too big to convert to Nurb, use "Reduce Mesh"

ReduceMesh



Reduces the number of polygons in a polygon mesh and converts mesh quadrangles to triangles.

Steps:

1. **Select** mesh objects.
2. Set the new polygon count.
3. To see the results of the reduction, click **Preview**.

Notes

- If the mesh has quadrangles in it, the count of starting triangles is the number of triangles after all of the quadrangles are split. Only triangles can be made in the new mesh, so it is possible to reduce the mesh and have more faces than you started with.
- It is possible to end up with meshes whose edges are shared by more than two faces (non-manifold), which may be undesirable in some cases. For one thing, this makes it hard to tell where the inside is.

.stl (Stereolithography)

File Exchange Steps

Note: STL files contain polygon mesh objects. Polygon mesh objects import into Rhino as polygon mesh objects. They are not converted to NURBS.

STL Mesh Export Options

Tolerance

The maximum distance between the original object and the polygon mesh created for the STL file.

Detailed Controls

STL Export Options

File type

Binary

ASCII

Export open objects

Allows objects that are not fully closed to export. Do not use this option for rapid-prototyping machines.

If this checkbox is cleared, the STL file will not be created if there is an open object.

When the file does not export, the offending meshes/surfaces are selected. Use the **ShowEdges** command to find the edges that need repair. [Ideas for repairing the mesh.](#)

Adjust Mesh

Opens the **STL Mesh Export Options** dialog box.

STL mesh export diagnostics

For some rapid prototyping machines, STL files must contain completely closed ([watertight](#)) polygon mesh objects.

You might want to do this to ensure that the meshes really do fit together before exporting them for use in an expensive STL job.

Use the **Join** command, then **Weld** (angle=180), and **UnifyMeshNormals** to turn a group of meshes into a single [watertight](#) mesh object. Then use **SelNakedMeshEdgePt** to find the open (naked) edges.

To test for [watertightness](#)

1. **Join** the mesh objects.
Conceptually, this command gets all the triangles into one bag, but it doesn't glue the edges together. (The situation is similar to having surfaces that all fit together but have not been joined into a solid.)
2. **Weld** the new mesh object.
3. At the **Angle tolerance** prompt type **180**.
An angle tolerance of 180 tells the **Weld** command to glue adjacent triangle points together no matter what.
4. **UnifyMeshNormals**.
This changes all the triangles so they are oriented the same way, that is, if two triangles share an edge, then they have the same idea of up.
5. To see if the result has any holes or gaps, type **SelNakedMeshEdgePt**.
If a mesh point is highlighted, then it is part of a "naked" triangle edge.

9. If you want to simply fix your original files, check Mesh/Mesh Repair Tools.

