

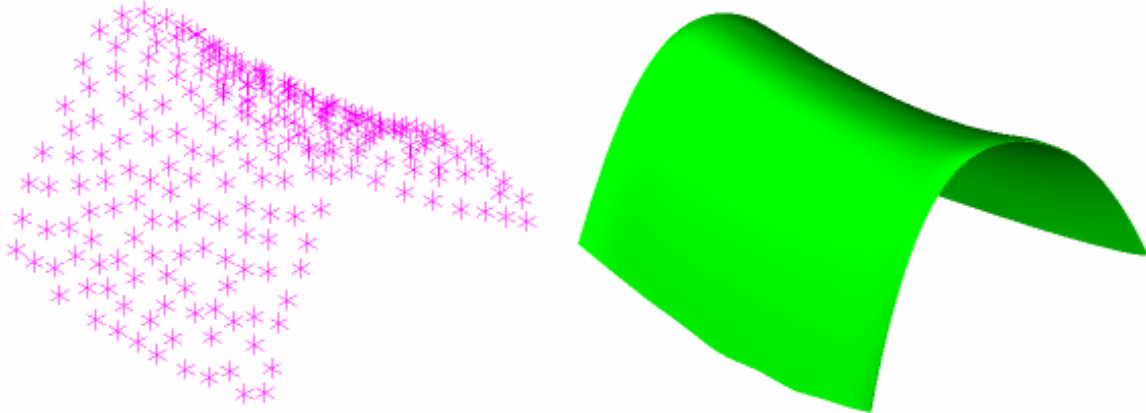


Verisurf Reverse Samples Tutorial REV A1

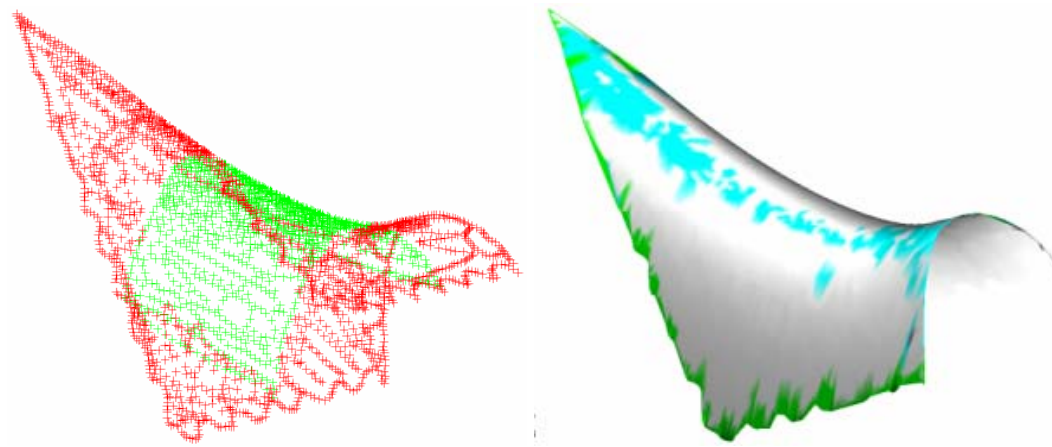
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Samples included in this tutorial

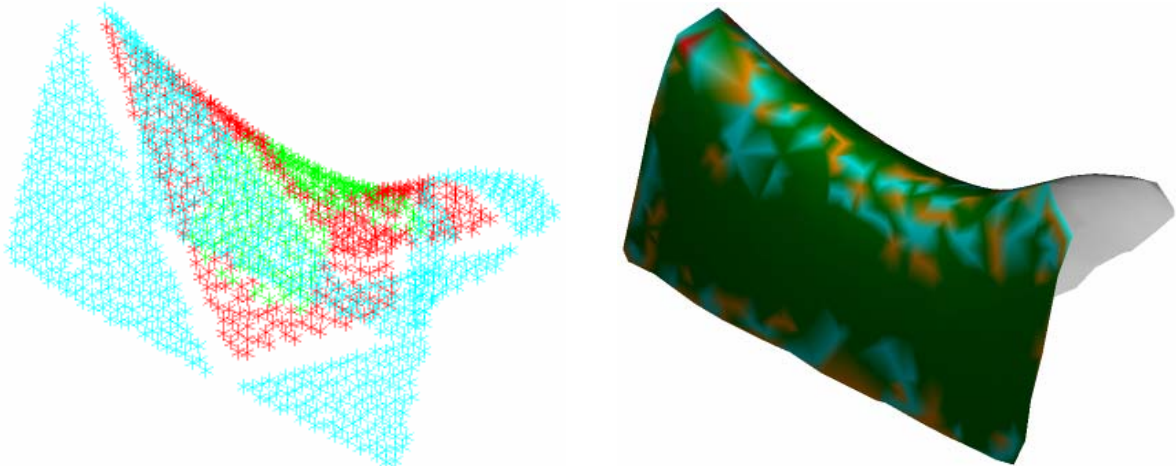
Turning points into a mesh and surface patch. Analysis of points to surface patch to show deviation. We will also display maps of error, curvature and depth.



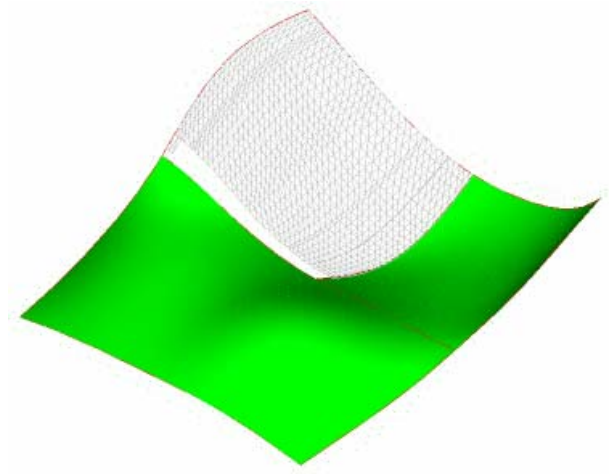
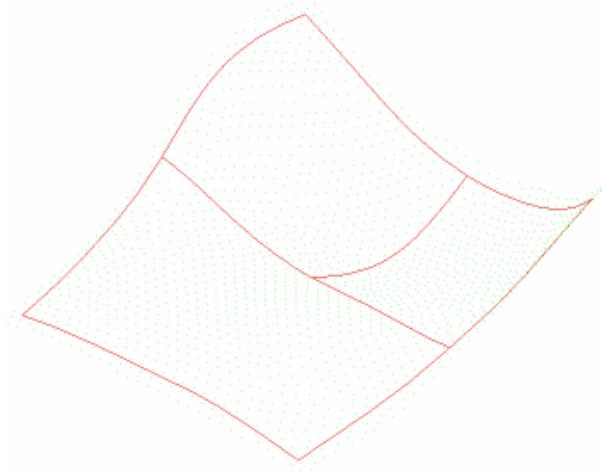
Saddle0.MC9 file with completed surface patch showing analysis deviations.



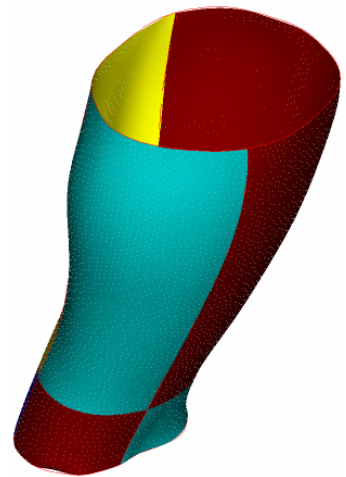
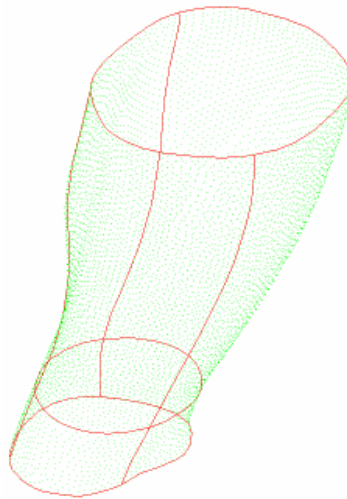
Saddle2.MC9 file with completed mesh showing curvature map.



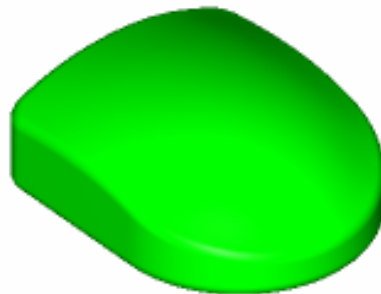
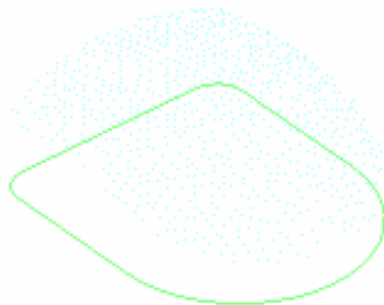
Saddle4.MC9 file with completed mesh showing error map.



Fittest.MC9 file. Show how to turn 1750 points and 10 splines into 3 separate tangent G1 surfaces.



Leg.MC9 file. Show how to turn 7399 points and 15 splines into 4 separate tangent G1 surfaces.



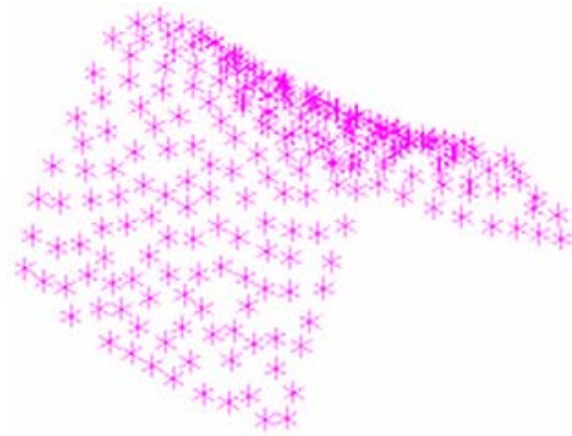
Mouse.MC9 file. Show how to reverse left image into right image.

Single Surface Patch Samples

Saddle0.MC9


1. Open saddle0.MC9.

Image has points changed from dot to 3D point.



2. There are 2 ways to access the new



Pointcloud utilities. Choosing  from the toolbar will open up the Pointcloud menu. Choosing Verisurf > Reverse > Pointcloud will also open up the point cloud menu.

This is the Pointcloud Menu. Let's briefly go through the first few selections referring to the How To?

Select the Points

SELECT POINTS

It is NOT necessary to select points. If not selected, then ALL points are used.

This should not be used unless you want to select only a group of specific points. The point selection screen will be shown to select the points with. As stated, Verisurf WILL use all points displayed if not selected.



Using the Point Filter

POINT FILTER

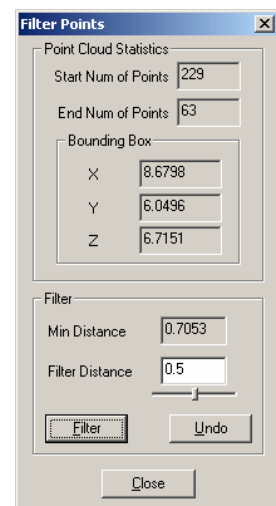
For either dense or uneven point clouds, it is recommended run point filter.

Check your statistic info to choose the best filter distance.

If the result is not as desired, then select UNDO, correct the filter distance, and then re-run.

At this time let's run the filter.

3. Choose Point Filter.
4. Drag the filter to one side of the 229 points so as to witness changes to the point cloud.
5. Change the Filter distance to 0.5.
6. Choose the Filter button. Note the change in points to 63.
7. Choose Undo and try other settings. Note the End Num of Points changes each time you choose Filter



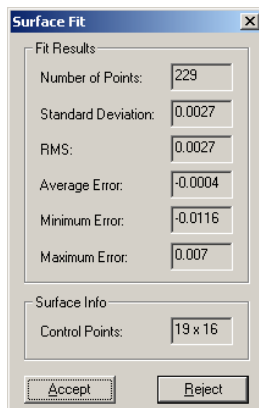
Creating a Surface Patch

SURFACE PATCH

Surface patch will create ONE surface that best fits the point cloud.
 The easiest "Start Patch Projection" is "Current Graphics View." Simply rotate the part to the desired orientation.
 The FIT will solve to errors less than the maximum standard deviation without exceeding the maximum control points.
 Setting "Max Std Dev" to 0 will solve to the maximum control points.
 Settings "Max Control U/V" to 100 will solve to the maximum standard deviation.
 Select "Display Fit Statistics" to display a FIT RESULTS dialog with deviation info and an ACCEPT/REJECT option.
 Set the "Extend Distance" to create a surface that EXTENDS out beyond the point cloud.
 Set the "Probe Offset" to create an OFFSET surface. Use negative values to offset in the opposite direction of the normal.

Let's create a Surface patch on the saddle0.mc9 file.

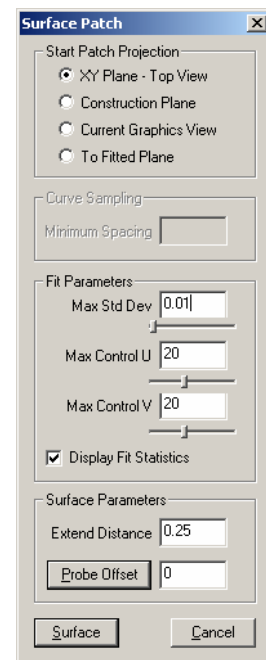
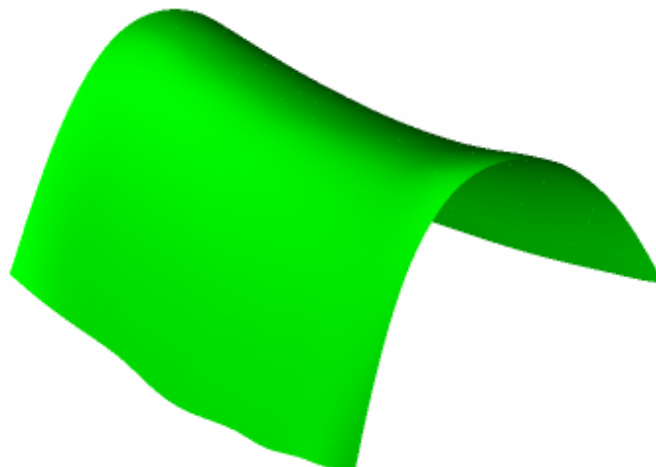
1. Change your Point Filter back to 229 points. If you have closed the Point Filter with fewer points re-open the file.
2. Choose Surface Patch.
3. This menu will be shown.
4. Change setting to match as shown to the right.
5. Choose Surface. After fitting you will see the Surface Fit Statistics.



This gives us a minimum error of -0.0116. The Max control points must be adjusted to allow closer fitting. Try 25 x 25.

This will result in a better fit.

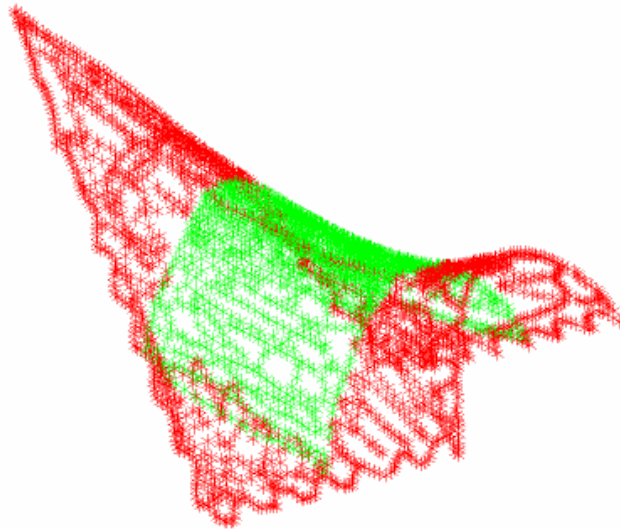
Your part should resemble this.



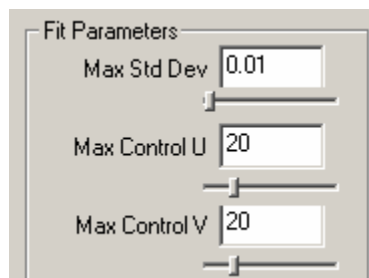
Saddle2.MC9

1. Open saddle2.MC9.

Image has points changed from dot to 3D point to see image better.

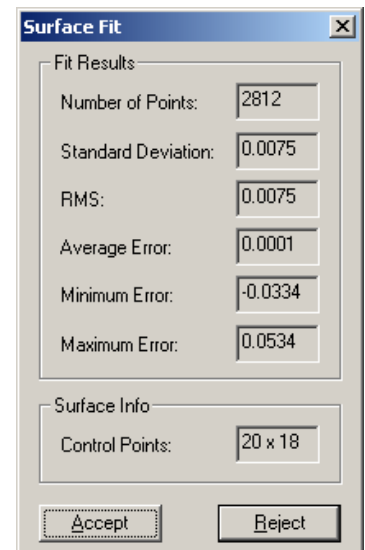


2. Choose Surface Patch.
3. This menu will be shown.



4. Change settings to

5. Choose Surface. After fitting you will see the Surface Fit Statistics as shown on the right.
6. We see that under Control Points it used a 20 x 18 to get a -0.0334 and 0.0534. This is not good enough to achieve a 0.01 Max or Min error which is what I am shooting for. Let's go up in 5 x 5 increments until we get Min and Max error under 0.01.
7. 25 x 25 almost gets it there and 30 x 30 does achieve the required result.



Creating a Mesh

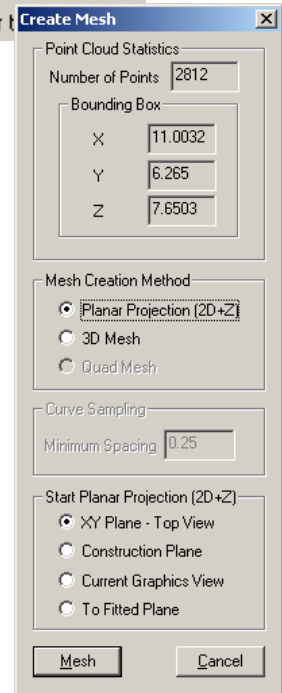
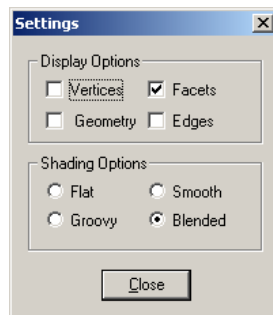
CREATE MESH

All operations require you to either "Read STL" or "Create Mesh" first.

For a FAST solution, use "Planar Projection (2D)"; For a COMPLEX solution, use "3D Mesh."

If "3D Mesh," then confirm that the "Max Edge Length" is appropriate (not too big, not too small) for t

8. Move the surface patch to Level 2 and turn Level 2 display off.
9. Choose Create Mesh and change settings to match as shown to the right.
10. Choose Mesh.
11. After the Mesh completes it may be displayed any number of different ways. Choose Mesh Utilities > Display to change settings to all the various ones available and then as shown below.



COLOR MAPS

Create an ERROR MAP of the fit deviations. This function is only available if you first run "Surface Patch."

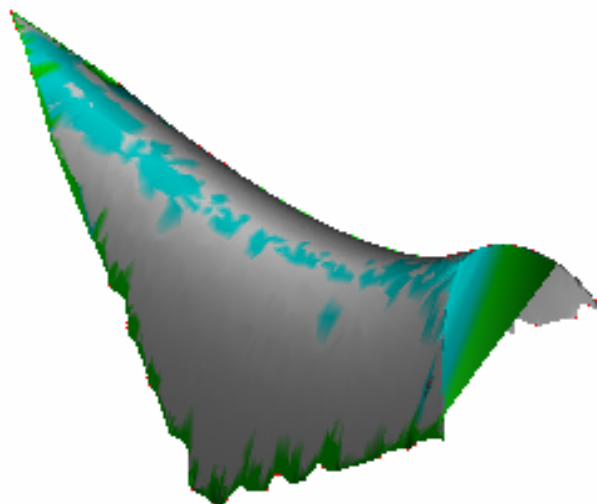
Create a CURVATURE MAP. Red represents concave, blue is convex, green is for edges and white are flat areas.

Create a DEPTH MAP of 8 colors in the current MC construction view.

DISPLAY

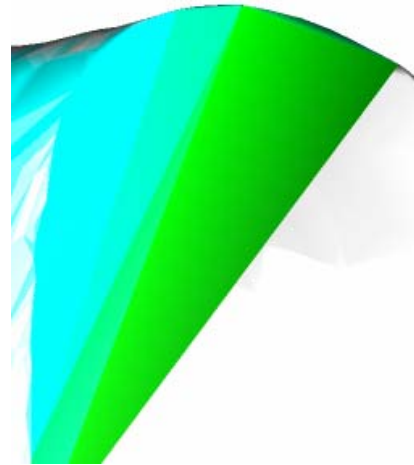
Display all combinations of vertices, edges, and triangles in different shading modes. TRY "Groovy!"

12. Backup and Choose Color Maps > Curvatur Map.
13. Your part should look as shown.



Reverse Samples tutorial

14. Zoom in near the front and use Mesh Utilities / Del Triangle to remove these to get a clearer picture as shown on page 2.



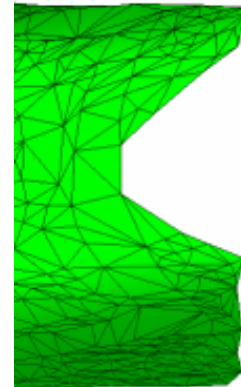
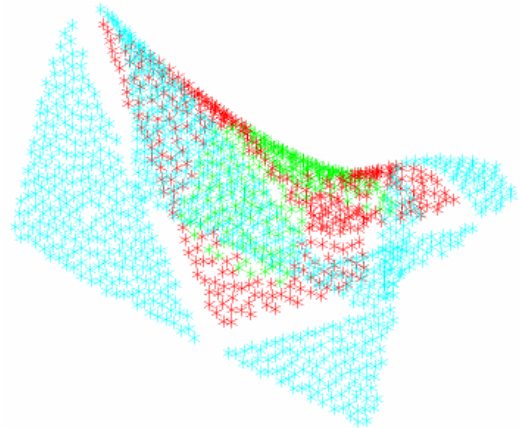
15. Looking at this curvature map let's explain the color shading. Green = edges, White = Angle between triangles is $< .5$ degrees, Blue = Convex angle between triangles is $> .5$ degrees, Red = Concave angle between triangles is $> .5$ degrees
16. At this point try the variety of maps and displays to see what is available.

Saddle4.MC9

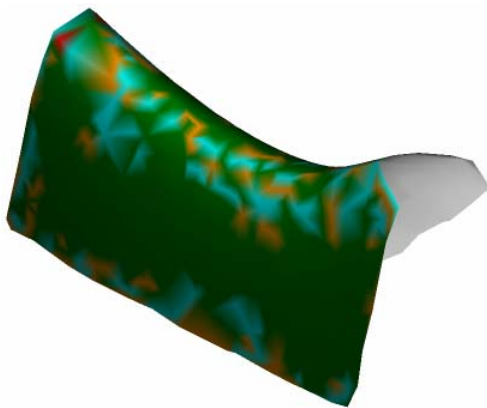
1. Open saddle2.MC9.

Image has points changed from dot to 3D point to see image better.

2. Choose Surface Patch.
3. Create a surface patch and place it on Level 2.
4. Turn off display of Level 2.
5. Create a mesh.
6. Delete triangles that are not shown in this top view.
7. Turn on display of Level 2.

**Error Map**

8. Return to ISO view.
9. Turn off shading (Cntl-S)
10. Choose Error Map.
11. Change display settings to ONLY Facets and Blended.

**Surface Patch Offset**

12. Turn Display of Level 2 off and Create Level 3 to add geometry to.
13. Choose Surface Patch and change Offset by choosing the Probe Offset Button.
This will pull the current probe radius from your VDI.
14. Choose Surface.
15. Note that the new patch is offset.

G1 Curve Network Patches

MULTI-SURFACE (with G1 Continuity and T-Junctions)

Create a Network of Surfaces with G1 CONTINUITY and T-JUNCTIONS using a mesh and MC curves as input. In addition to the fit parameters in "Surface Patch," there are added parameters for surface-surface transitions. The "G1 Tolerance" represents an angular tolerance in the transition. Set it to a low value (like 0.01). The "Boundary Ctrl Pts" is the minimum number of control points to be considered in the transition. See the SAMPLE FILES included with this CHook to get a better understanding!

Fittest.MC9

1. Open Fittest.MC9.

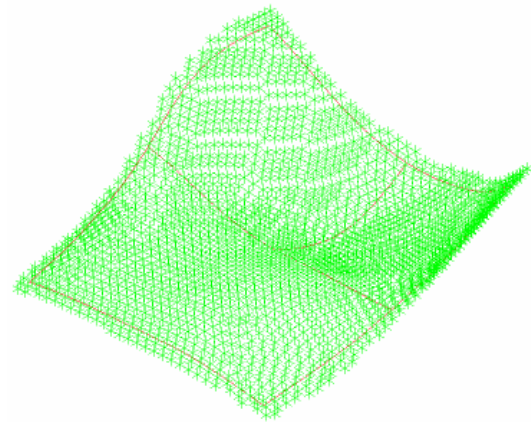
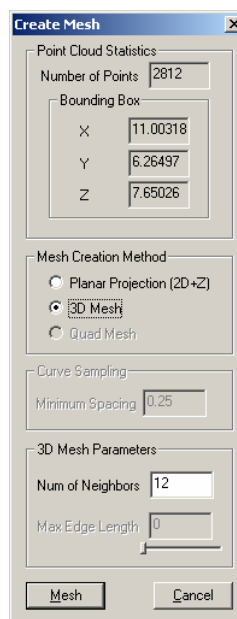
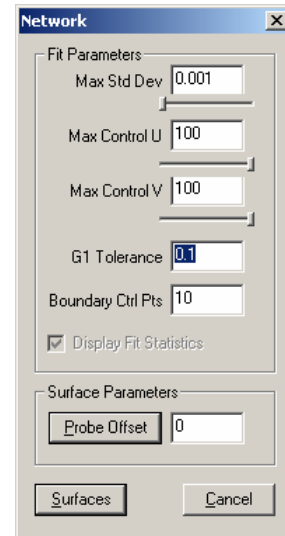


Image has points changed from dot to 3D point to see image better.

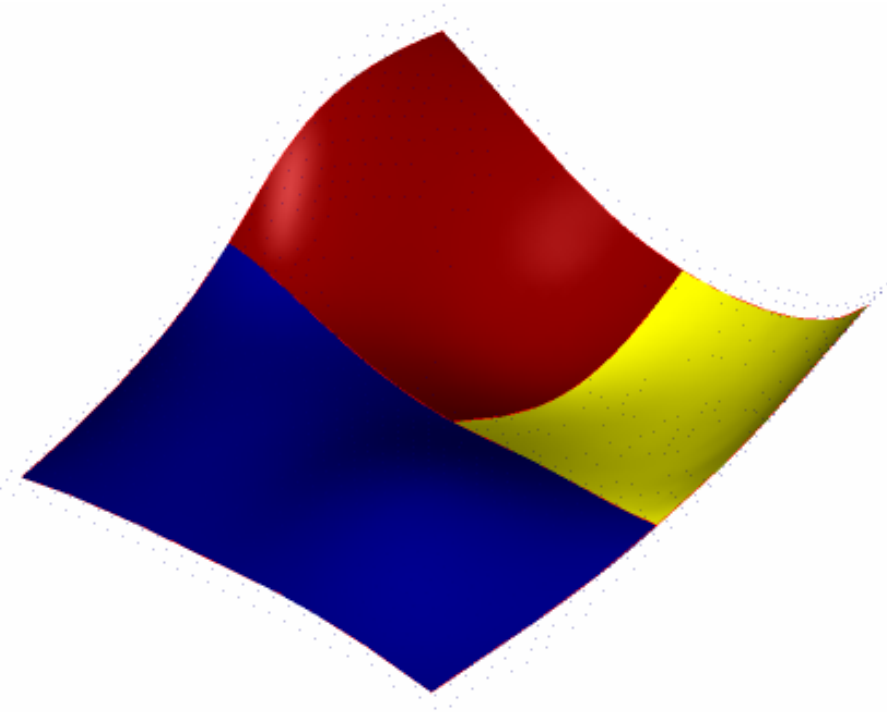
2. Create a 3D mesh with normal settings of 12 for Num of Neighbors.



3. Choose Multi-Surface to get this menu and set as shown.
4. Choose Surfaces.



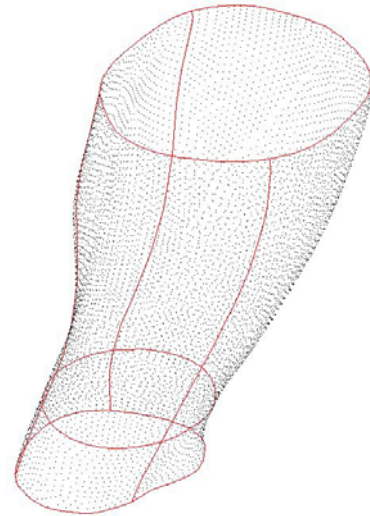
I have changed the color of each surface but now there are 3 G1 networked surfaces.



Leg.MC9

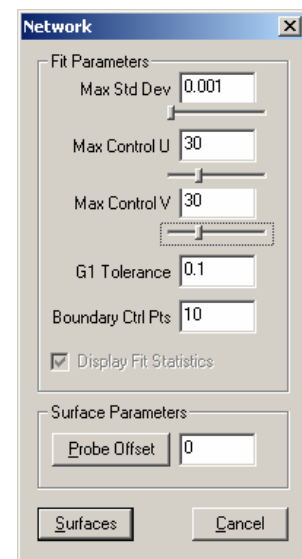
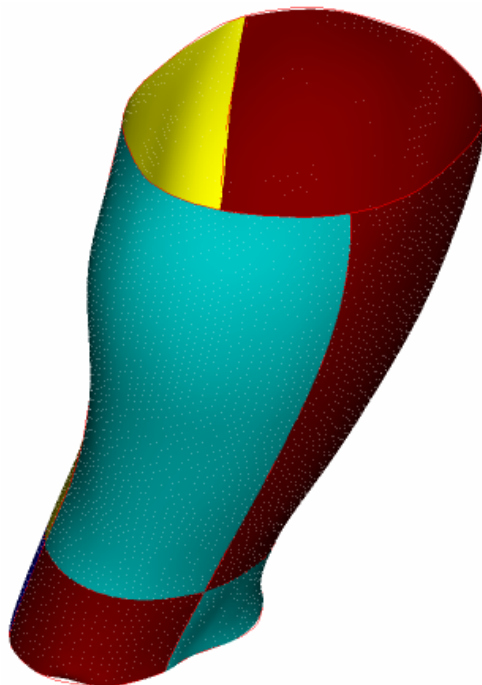
1. Open Leg.MC9.

Image has points changed from dot to 3D point to see image better.



2. Create a mesh with normal settings of 12 for Num of Neighbors.
3. Try the Smooth Mesh under Mesh Utils.
4. Choose Multi-Surface to get this menu and set as shown.
5. Choose Surfaces.

I have changed the color of each surface but now there are 6 G1 networked surfaces.



Reverse a part

Mouse.MC9

1. Open pointcloud samples/mouse.MC9.

Image has points changed from dot to 3D point to see image better.

2. Create a surface patch using experience gained from prior exercises.
3. Create a surface model from the chained spline using Create > Surface > Next Menu > Primitive > Extrude. You will be prompted to choose the chained spline. Change Height if necessary to be a minimum of 1.2 inches in plus Z. *The key to this step is to be sure that the extrusion fully envelopes the surface patch.*
4. Delete the top surface of the extrusion to expose the patch underneath.
5. Using Modify > Trim > Surface > To Surface trim the top part of the extrusion and the outer edge of the patch. You will be prompted to choose 1st set which are the 6 extruded sides. Then you will be prompted to choose the 2nd set which is the patch.
6. Choose Do it and you will be prompted to choose which side of each group you want to keep. Click on 1st set and slide arrow down to lower edge of surfaces. Then click on 2nd set, the patch and slide arrow to inner area of patch.
7. Choose Create > Surface > Fillet > Surf/surf. You will be prompted to choose 1st set which are the 6 extruded sides. Then you will be prompted to choose the 2nd set which is the patch.
8. You will be prompted for a fillet radius. Input .125.
9. Check that Trim is set to Y and then Check Norms.
10. Check Norms will allow you Cycle through all surface normals. Use Alt-S so that you can see the arrow displays. Cycle through to verify that all normals point “INTO” the model. Choose Do it and you should have a replica of the mouse to the right.

