

PanelingTools

Panels are repeated patterns on surfaces, polysurfaces or a grid of points. Paneling Tools offer two ways to create panels. The first is to use an ordered paneling grid of points (ordered by row and column) and the second is by objects (NURBS surface or polysurface). Panels are added in the form of edges, faces borders, face patches, flat faces and a mesh. All panels are serialized.

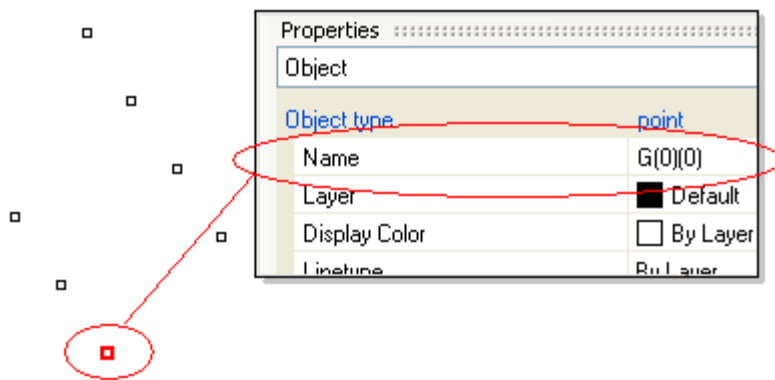
Paneling Tools use some geometry concepts such as NURBS curves and surfaces, the U and V direction of a NURBS surface, trimmed vs untrimmed surfaces and polysurfaces. For a quick review, you can check the Nurbs Surfaces wiki page.

Paneling by ordered grid of points:

- *Step one: Create an ordered grid of points'*

Points must be ordered in rows and columns. Each point location is marked in its object name (shows in the object properties).

Syntax is: Name(intRow)(intColumn)



While Paneling Tools offers many commands to create the ordered grid, users can create their own, through scripting for example. All that is required is to name point-objects and use for paneling.

Another advantage of separating grid generation from paneling is that users can edit the grid before paneling. They can run commands like pull, project or transform to edit the grid, then panel.

- *Step two: Create panels*

Select an ordered point grid, a reference object (optional), pattern and the kind of output you like to get. Custom paneling and quads is also possible.

Paneling surfaces and polysurfaces directly:

These are tools to panel directly using a reference surface or polysurface.

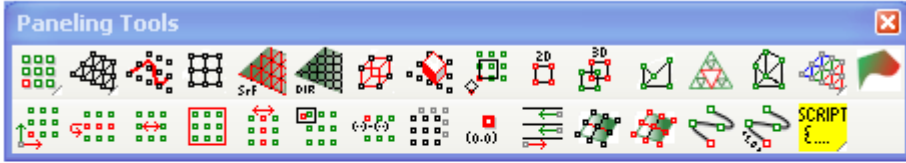
It is also possible to combine grid generation commands with paneling by grid commands using macros. Here is an example where you can have a **PanelByGridArray**:

```
ptGridArray Pause Pause ptPanelGrid _Enter
```

COMMAND DESCRIPTIONS

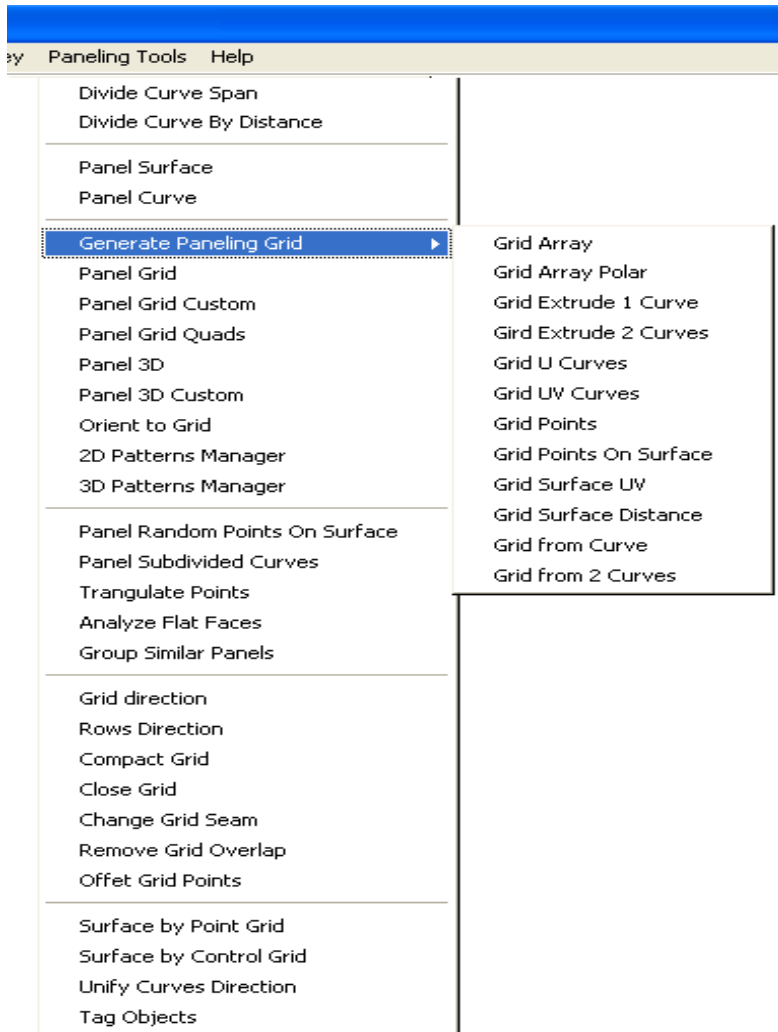
Toolbars

Paneling Tools toolbars offer two sets of scripted commands that combine grid generation with paneling. Toolbars are available for download.



Menu

This is the Paneling Tools menu. Note that it shows only after PanelingTools is loaded (usually after calling one of the plugin commands for the first time in a session).



Available Commands

Grid Creation



ptDivideCurveSpan



ptDivideCurveByDirectDistance



ptGridArray



ptGridArrayPolar



ptGridExtrude1



ptGridExtrude2



ptGridUCurves



ptGridUVCurves



ptGridPoints



ptGridPointsOnSurface



ptGridSurfaceUV



ptGridSurfaceDistance



ptGridCurve



ptGridCurve2

Grid Editing



ptDirection



ptRowsDirection



ptCompactGrid



ptCloseGrid



ptGridSeam



ptRemoveOverlap



ptShiftGrid



ptOffsetPoints

Paneling



ptPanelSurface



ptPanelCurve



ptManage3dPatterns



ptPanel3D



ptPanel3DCustom...new



ptOrientToGrid



ptManage2dPatterns"



ptPanelGrid



ptPanelGridCustom



ptPanelGridQuads



ptPanelRandomPoints



ptPanelSubDivide



ptAnalyzeFlatFaces



ptTriangulatePoints



ptGroupSimilarPanels

Others



ptTagObject



ptUnifyCurvesDirection



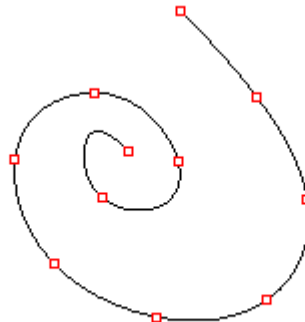
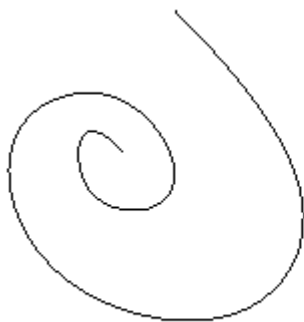
ptSurfaceFromGridOfEditPoints



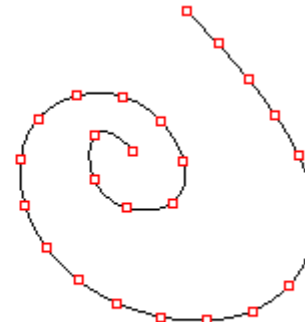
ptSurfaceFromGridOfControlPoints

ptDivideCurveSpan

Find curve division points by number or distance on curve.



Number = 10



Distance = 1.0

Command Options:

Method (Number, ArcLength)

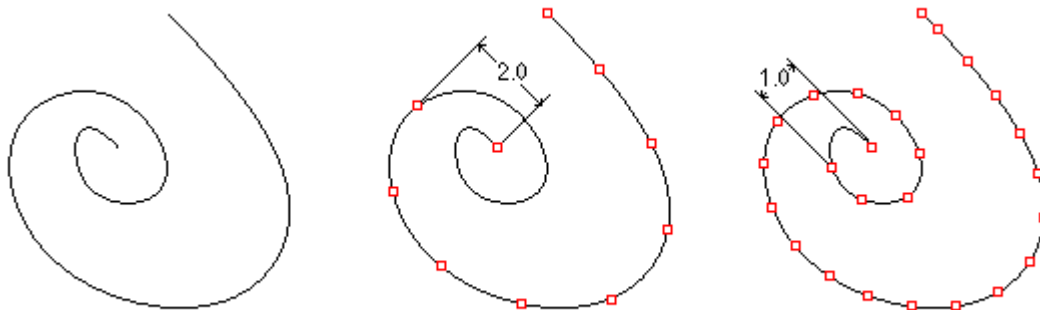
Method=Number:

NumberOfSpans: Number of spans on curve.

Method=ByDistance
 Length: on curve, between divide curves.
 Round: Option to round distances to fill the span of the curve
 RoundingMethod: Up or down
 Group: Option to group result

ptDivideCurveByDirectDistance

Find curve divide points by direct distance

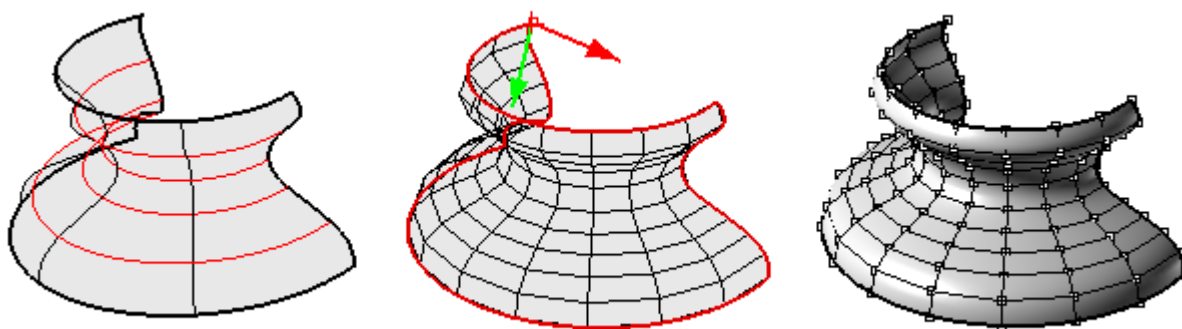


Command Options:

Distance: Direct distance between points
 AddEndPoint: Add end point
 Group: Option to group result

ptPanelSurface

Using a base surface, the command generates the paneling grid and panels.



Command Options:

DivideMethod (BySurfaceUV, BySurfaceDistance)

DivideMethod=BySurfaceUV:

U_Method (Number, ArcLength) – First surface direction divide method.

U_NumberofSpans: Number of spans.

U_Length: Distance on base (first) iso-curve.

U_Round: Option to round distances to fill the span of the

curve

U_RoundingMethod: Up or down
V_Method (Number, ArcLength) – Second surface direction divide

method.

V_NumberofSpans: Number of spans.

V_Length: Distance on base (second) iso-curve.

V_Round: Option to round distances to fill the span of the

curve

V_RoundingMethod: Up or down

DivideMethod=BySurfaceDistance

U_Length: Distance in first direction

V_Length: Distance in second direction

Extend: Option to extend surface when calculating the grid (get better converge)

Pattern (Box BoxX Triangular TriBasic Dense Diamond AngleBox Wave Brick New)

PanelShape (Straight, Pull)

AddPointsGrid: Add grid of points

AddEdges: Add paneling edges

AddFacesBorder: Add face outlines

AddFaces: Add face patches (this can be time consuming for large sets of panels)

AddFlatFaces: Calculate and trim best fit planar panels.

BestFit - Best fit through all four panel points (0,1,2,3)

TangentToCenter (only when there is a base surface) - plane tangent to surface at the center of panel

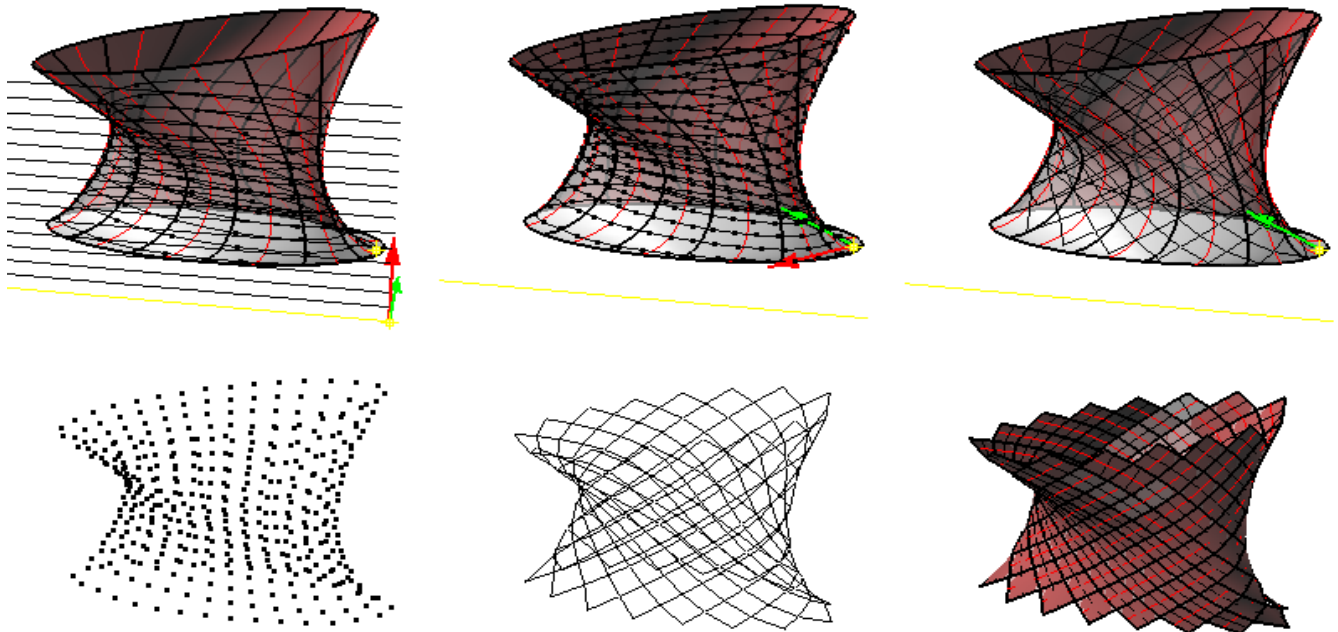
AddMesh: Add a mesh

Group: Option to group result

Name: Name of panels

ptPanelCurve

Generate panels for a surface or polysurface using direction curve. Curve can be open or closed.



Command Options:

Line: Option to define direction curve with two points

CurveOptions

NumberOfCuts: Number of curves to be projected to object

Spacing: Distance between curves

ExtrudeDirection: Extrusion direction

ProjectionDirection: Projection direction

GridOptions

Method (Number, ArcLength) – curve divide method.

NumberOfSpans: Number of spans.

Length: Distance on base (first) iso-curve.

Round: Option to round distances to fill the span of the curve

RoundingMethod: Up or down

Pattern (Box BoxX Triangular TriBasic Dense Diamond AngleBox Wave
Brick New)

PanelShape (Straight, Pull)

AddPointsGrid: Add grid of points

AddEdges: Add paneling edges

AddFacesBorder: Add face outlines

AddPatchFaces: Add face patches (this can be time consuming for large sets
of panels)

AddFlatFaces: Calculate and trim best fit planar panels.

BestFit - Best fit through all four panel points (0,1,2,3)

TangentToCenter (only when there is a base surface) - plane tangent
to surface at the center of panel

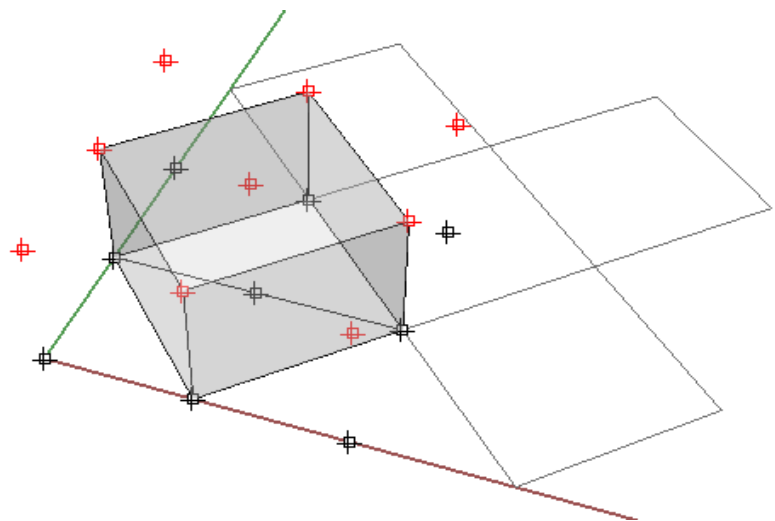
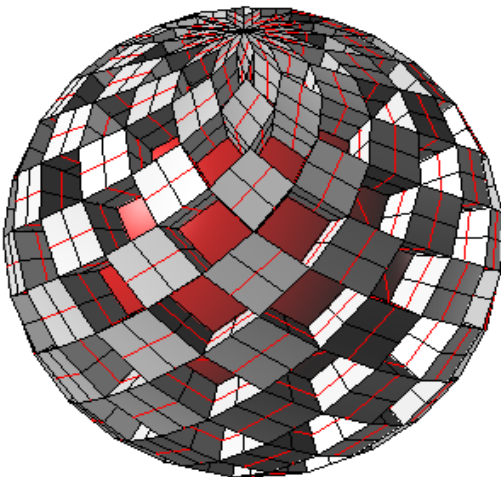
AddMesh: Add a mesh

Group: Option to group result

Name: Name of panels

ptManage3dPatterns

User can create new 3D patterns that connect grid points, save, delete or edit them. These patterns are saved to document and are listed in commands like ptPanel3D with other built-in patterns.



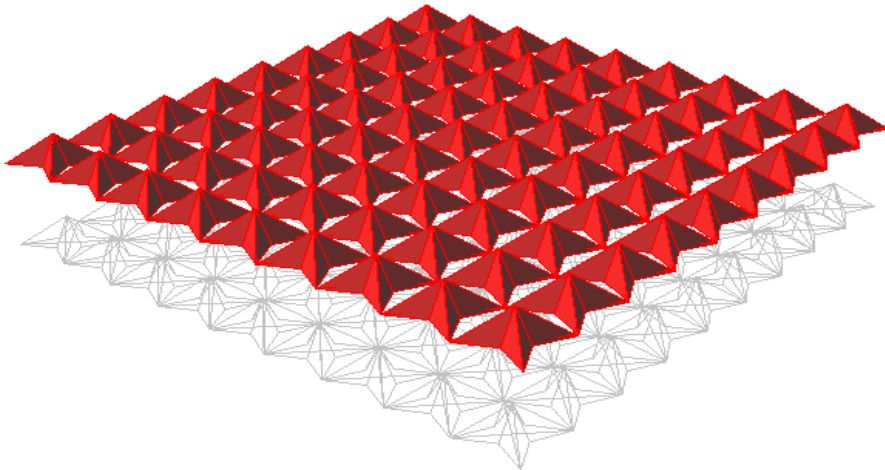
Command Options:

New: For creating new pattern

Edit: To edit existing patterns
Delete: To delete existing patterns

ptPanel3D

Panel with 2 grids. There are few pre-defined patterns to select from. There is also the option to create new ptttern that connects grid points. Panels are added in the form of edges, faces and polysurfaces. Spacing of unit patterns depends on grid spacing.



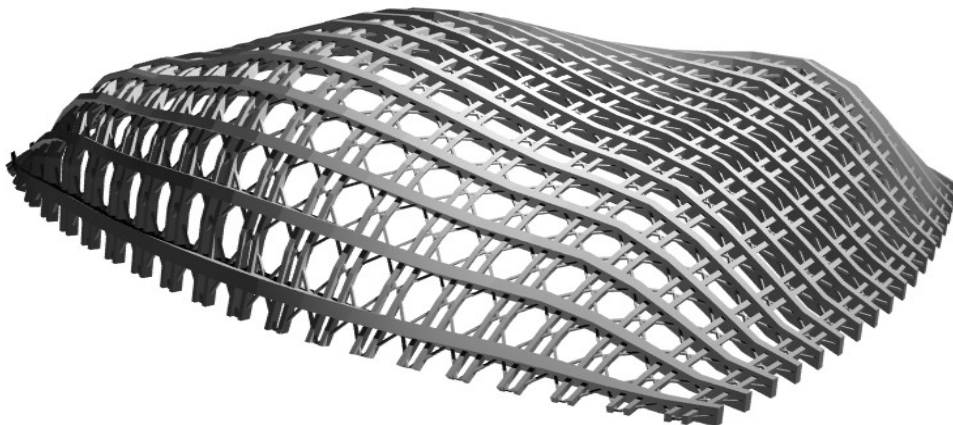
Command Options:

Pattern (WireBox Partitions Box Wedge Pyramid1 Pyramid2 New). The ''New'' option for patterns allows creating a user-defined pattern.

Group: Option to group result
Name: Name of panels

ptPanel3DCustom

Morphes 3D patterns between 2 bounding grids. There is the option to select a base surfaces.

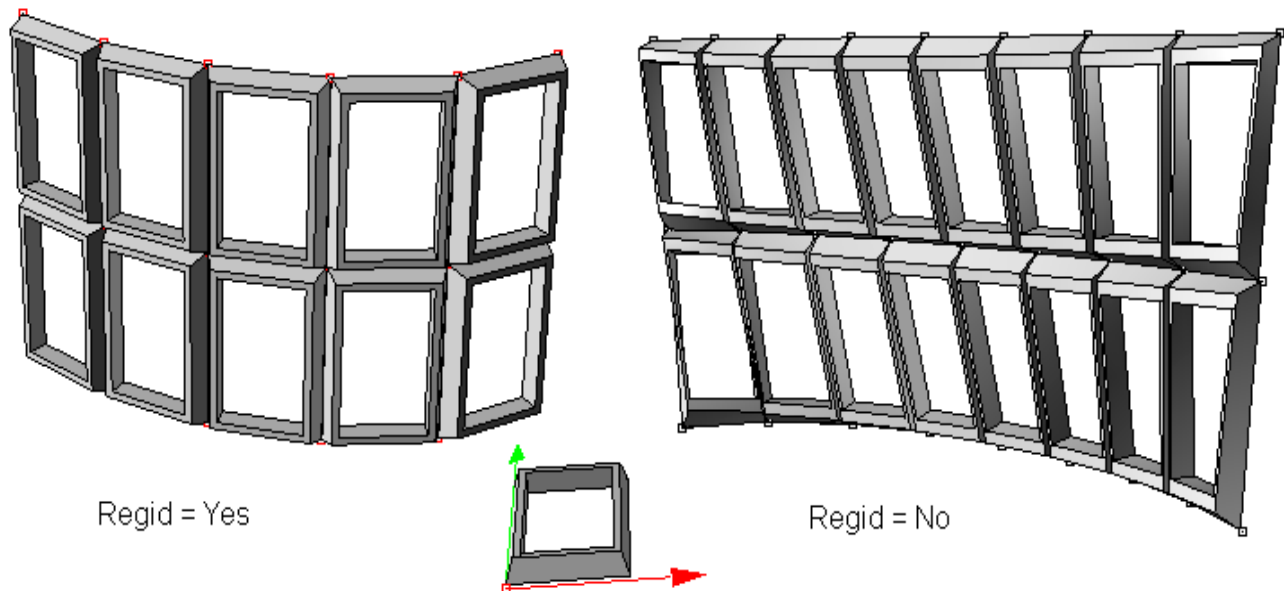


Command Options:

Base_x: Start x index relative to grid
Base_y: Start y index relative to grid
Shift_x: Spacing between pattern units in x direction
Shift_y: Spacing between pattern units in y direction
X_Length: Scale in x direction
Y_Length: Scale in y direction
Z_Length: Scale in z direction

ptOrientToGrid

It allows selecting any number of objects, then orient (flow) them along paneling grid. It is possible to select a base surface. the user select 3 reference points and the fourth point is option to deform pattern to fit the grid.

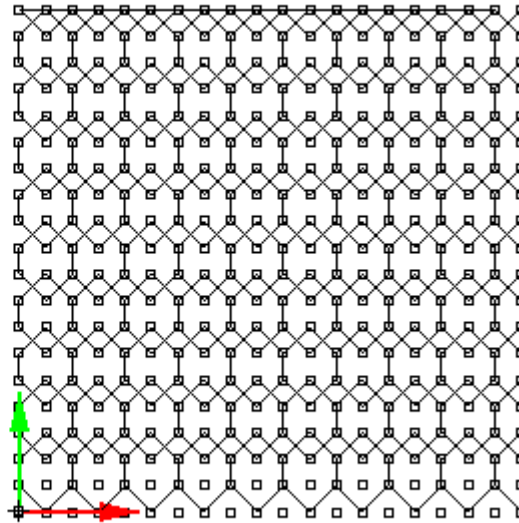
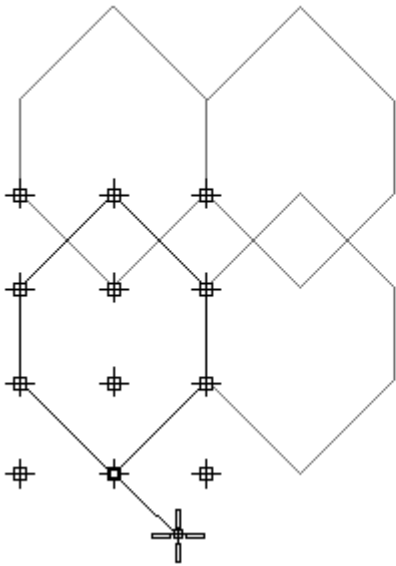


Command Options:

Base_x: Start x index relative to grid
Base_y: Start y index relative to grid
Shift_x: Spacing between pattern units in x direction
Shift_y: Spacing between pattern units in y direction
X_Length: Number of unit grids to map to in X direction
Y_Length: Number of unit grids to map to in Y direction
Flip: to change normal direction.

ptManage2dPatterns

User can create new patterns that connect grid points, save, delete or edit them. These patterns are saved to document and are listed in commands like ptPanelGrid with other built-in patterns.

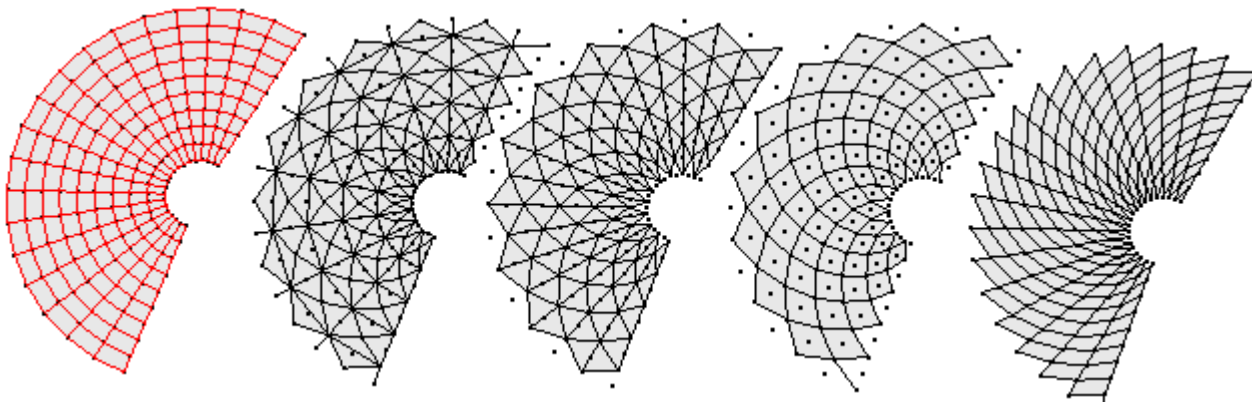


Command Options:

- New: For creating new pattern
- Edit: To edit existing patterns
- Delete: To delete existing patterns

ptPanelGrid

Panel with ordered grid of points. Reference object (surface or polysurface) is optional. There are few pre-defined patterns to select from. There is also the option to create new pattern that connects grid points. Panels are added in the form of edges, faces borders, faces (edgesrf or patches), flat faces and a mesh.



Command Options:

- Pattern (Box BoxX Triangular TriBasic Dense Diamond AngleBox Wave Brick, etc(user defined patterns))
- PanelShape (Straight, Pull)
- AddEdges: Add paneling edges
- AddFacesBorder: Add face outlines
- AddFaces: Add face patches (this can be time consuming for large sets of panels)

AddFlatFaces: Calculate and trim best fit planar panels.

FlatFacesMethod

BestFit - Best fit through all four panel points (0,1,2,3)

FitBasePt0 - Fit through points 0,1,2

FitBasePt1 - Fit through points 1,2,3

FitBasePt2 - Fit through points 2,3,0

FitBasePt3 - Fit through points 3,0,1

TangentToCenter (only when there is a base surface) - plane tangent to surface at the center of panel

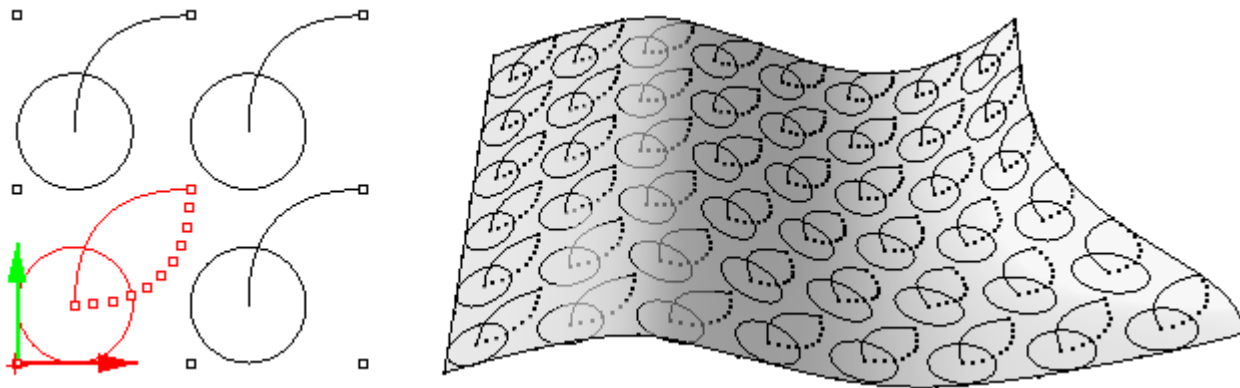
AddMesh: Add a mesh

Group: Option to group result

Name: Name of panels

ptPanelGridCustom

Panel grid with user-defined pattern curves and points. There are options to scale pattern relative to the grid.



Command Options:

GridWidth: Width of the grid. Default to pattern width.

GridHeight: Height of the grid. Default to pattern height.

U_Spacing: Unit spacing in first direction.

V_Spacing: Unit spacing in second direction.

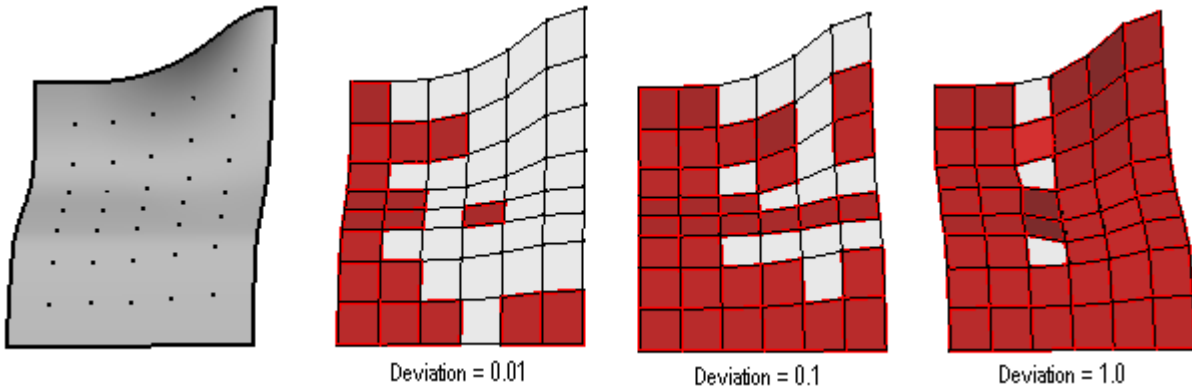
Group: Option to group result

Name: Name of panels

ptPanelGridQuads

Adjust paneling grid to create maximum number of quads within tolerance.

One way to have better quads coverage is by increasing **MaxDeviation**, but that would increase distortion. Another way is to use more dense grid.



Command Options:

MaxDeviation: Deviation from base grid - higher deviation=better coverage and more distortion

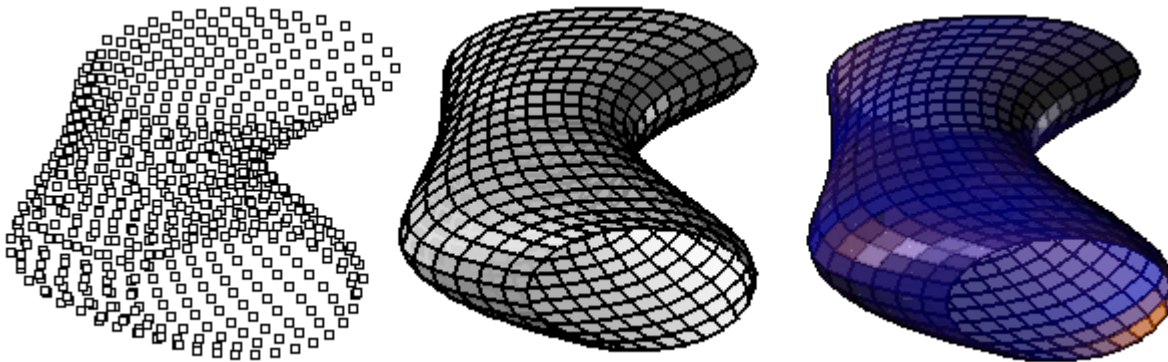
Triangulate: option to split remaining non-planar faces into triangles

Group: Option to group result

Name: Name of panels

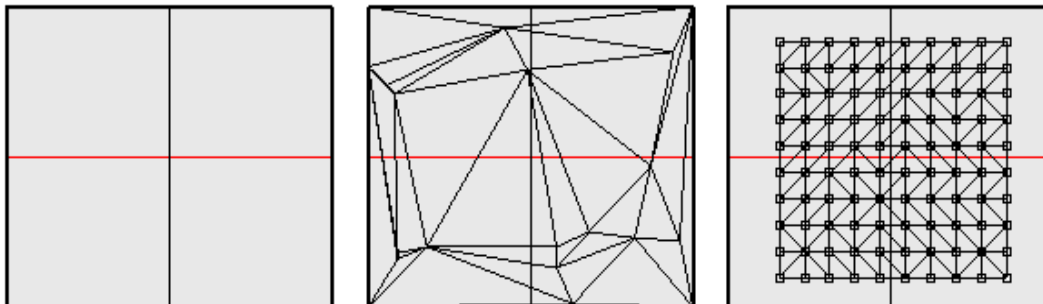
ptAnalyzeFlatFaces

Color panels or faces (previously created with [FlatFaces](#) option in paneling commands) from red to blue based on their deviation from base point grid or surface (red=furthest).



ptPanelRandomPoints

Select base surface, any number of points on surface or have the command generate points.

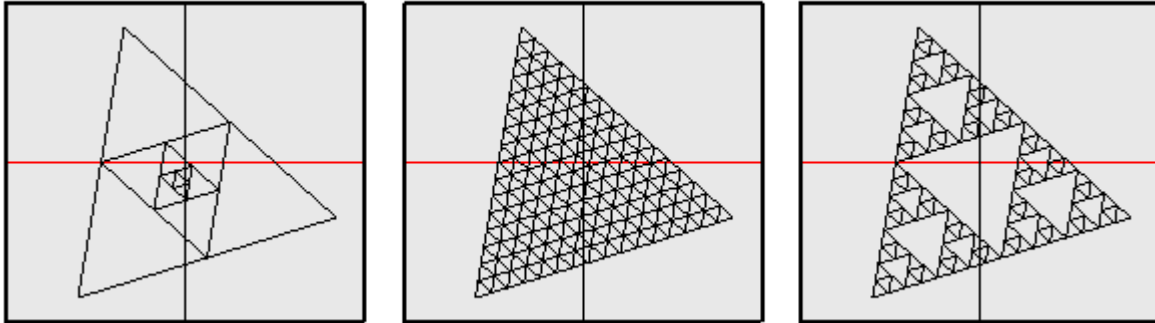


Command Options:

GenerateRandomly: Random generation of points.
PointCount: Number of points. Appears only when GenerateRandomly=Yes
PanelShape: Straight or Pull

ptPanelSubDivide

Select base surface, any number of closed polylines with end points on surface.



Command Options:

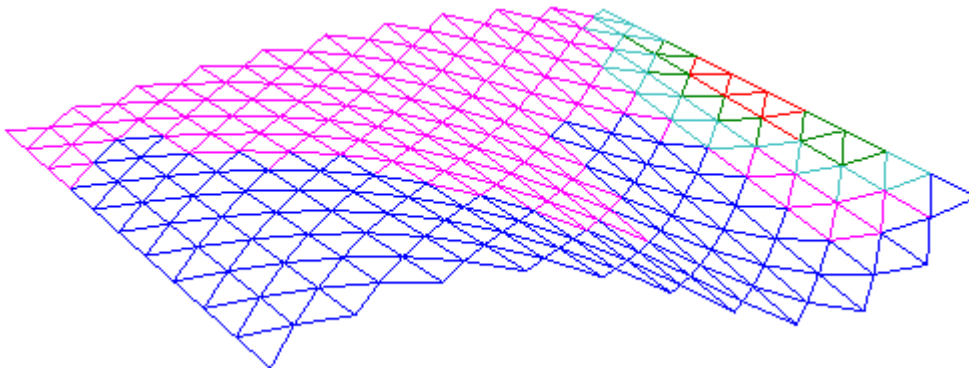
Degree: Number of subdividing steps.
Method: All/SubsOnly/MainOnly. Different methods of sub-paneling as in the image.
PanelShape: Straight or Pull

ptTriangulatePoints

Use Delaunay triangulation to create a mesh from points.

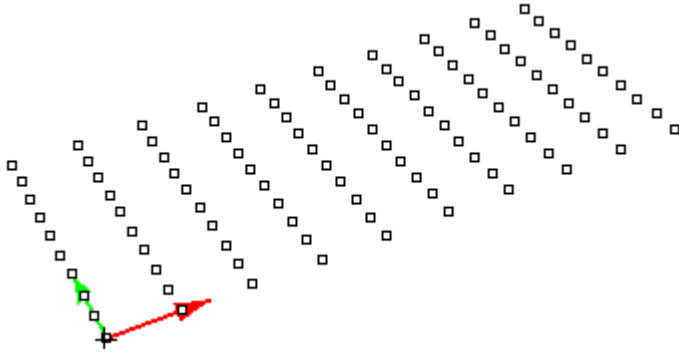
ptGroupSimilarPanels

Group similar curves together within given tolerance.



ptGridArray

Create array of ordered points. User defines first and second directions (these need not be orthogonal).

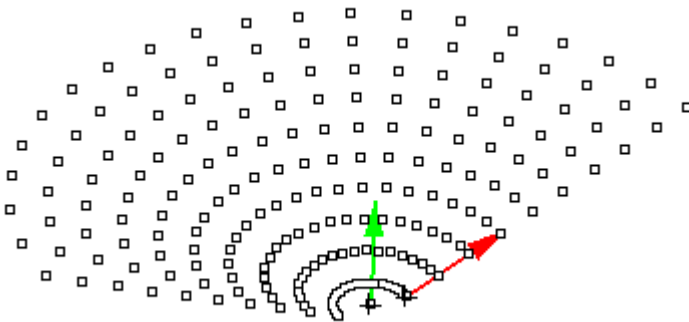


Command Options:

U_Number: Number of elements in U (first) direction.
U_Spacing: Distance between elements in U direction.
U_Direction: Option to set new U direction.
V_Number: Number of elements in V (second) direction.
V_Spacing: Distance between elements in V direction.
V_Direction: Option to set new V direction.
Group: Option to group resulting point grid
NameOfGrid: Grid name

ptGridArrayPolar

Array need not be flat. User selects rotation center and axis, then sets base point and direction of the polar array.

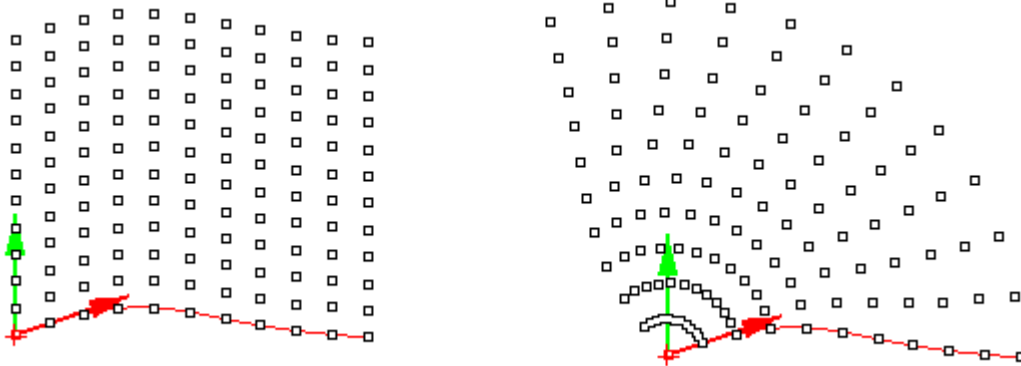


Command Options:

U_Number: Number of elements in U (first) direction.
U_Spacing: Distance between elements in U direction.
U_Direction: Option to set new U direction.
V_Number: Number of elements in V (rotating) direction.
V_Angle: Angle between elements.
Group: Option to group resulting point grid
NameOfGrid: Grid name

ptGridExtrude1

Select a direction curve and create a parallel or polar grid.



Command Options:

U_Method (Number, ArcLength or DirectDistance) – Curve divide method.

U_NumberOfSpans: Number of divide points.

U_Length: Distance on curve.

U_Round: Option to round distances to fill the span of the curve

U_RoundingMethod: Up or down

U_Distance: Direct distance

U_AddEndPoint: Option to add end point on curve

V_Number: Number of points in second direction.

V_Method (Parallel, Polar) – extrusion method

V_Distance: Distance value.

V_Direction: Option to define second direction

V_Angle: Angle value

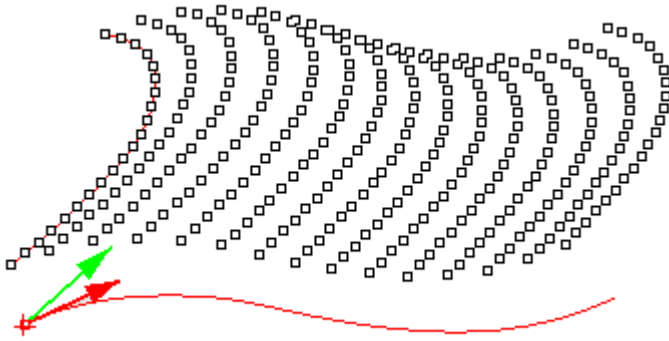
V_RotationAxis: Option to define rotation axis

Group: Option to group resulting point grid

NameOfGrid: Grid name

ptGridExtrude2

Sort of like extrude along a curve. Select 2 curves and define the divide method of each curve (by number, by distance or by direct distance).



Command Options:

U_Method (Number, ArcLength or DirectDistance) – First curve divide method.

U_NumberOfSpans: Number of divide points.

U_Length: Distance on curve.

U_Round: Option to round distances to fill the span of the curve

U_RoundingMethod: Up or down

U_Distance: Direct distance

U_AddEndPoint: Option to add end point on curve

V_Method (Number, ArcLength or DirectDistance) – First curve divide method.

V_NumberOfSpans: Number of divide points.

V_Length: Distance on curve.

V_Round: Option to round distances to fill the span of the curve

V_RoundingMethod: Up or down

V_Distance: Direct distance

V_AddEndPoint: Option to add end point on curve

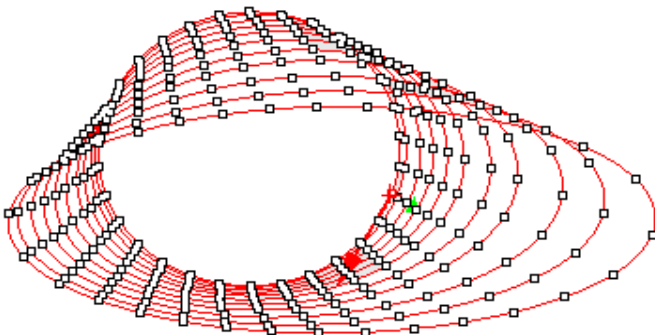
Group: Option to group resulting point grid

NameOfGrid: Grid name

SwitchCurves: Switch which of the two direction curves is rail and which is cross section.

ptGridUCurves

Divide parallel curves (or usually non-intersecting). Selection must be in the order of desired rows. The command divides those curves by selected method. It also unifies directions of curves.



Command Options:

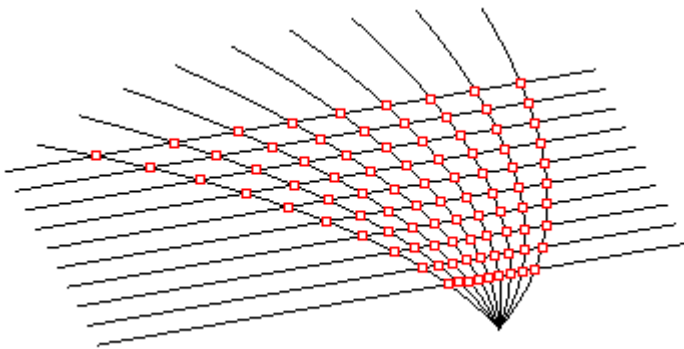
Method (Number, ArcLength or DirectDistance) – Curves divide method.
NumberOfSpans: Number of divide points.
Length: Distance on curve.
Round: Option to round distances to fill the span of the curve
RoundingMethod: Up or down
Distance: Direct distance
AddEndPoint: Option to add end point on curve

Group: Option to group resulting point grid
NameOfGrid: Grid name

ptGridUVCurves

This is for those who have all curves in both directions and would like to make a grid out of curves intersections.

Command prompts to select curves in each of the two directions to make the grid. Selection order defines order of rows and columns in the grid.



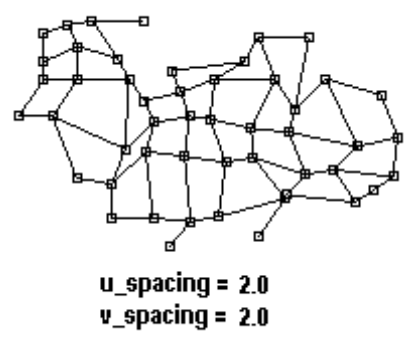
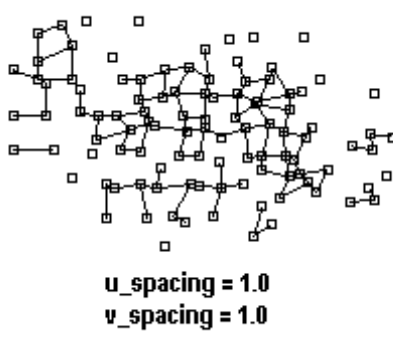
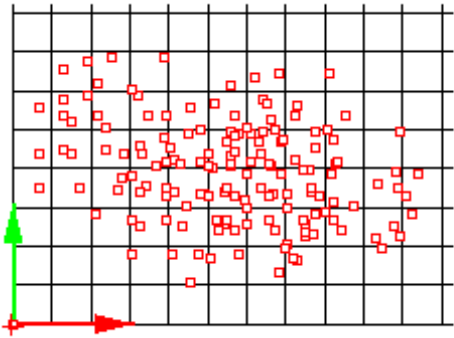
Command Options:

Group: Option to group resulting point grid
NameOfGrid: Grid name

ptGridPoints

Input grid u and v directions, base point, and u and v spacing. Using input, a base grid is created. Input points are rounded to the closest grid intersection points. This is why the result might be fewer points than the input (multiple points can be rounded to same index). For random set of points, the higher the spacing, the more successful it will be to panel these points as illustrated in the image below.

If align option is set to “Yes”, points will shift location slightly to align with the defined spacing.

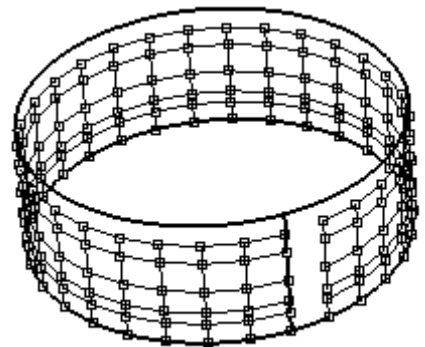
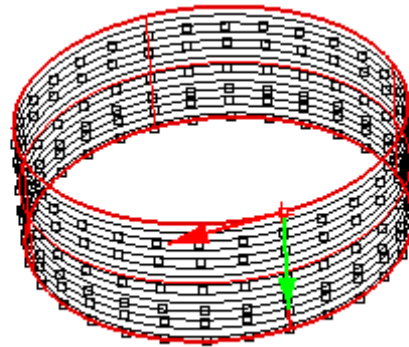
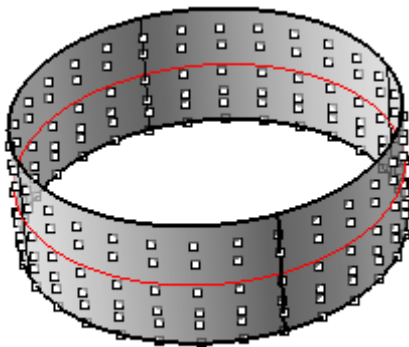


Command Options:

- U_Spacing: Reference grid spacing in the first direction.
- U_Direction: Option to set first direction
- V_Spacing: Reference grid spacing in the second direction
- V_Direction: Option to set second direction
- Group: Option to group resulting point grid
- DeleteInput: Delete input points
- AlignPoints: Align resulting points grid with reference grid
- NameOfGrid: Grid name

ptGridPointsOnSurface

Use this command to order existing points on a surface by that surface's UV.

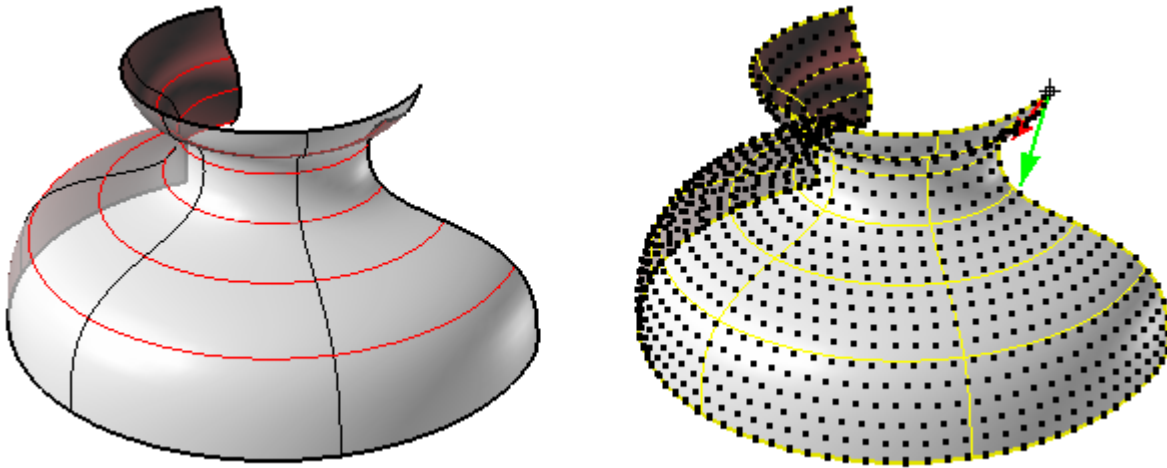


Command Options:

- Tolerance : Round points by this tolerance (reference spacing = 2*tolerance)
- Group: Option to group resulting point grid
- DeleteInput: Delete input points
- AlignPoints: Align resulting points grid with reference grid
- NameOfGrid: Grid name

ptGridSurfaceUV

Divides a surface following its U and V directions. Division can be by number, distance or a combination. Note that grid name follows surface name.



Command Options: DivideMethod (BySurfaceUV, BySurfaceDistance)

U_Method (Number, ArcLength) – First surface direction divide method.

U_NumberofSpans: Number of spans.

U_Length: Distance on base (first) iso-curve.

U_Round: Option to round distances to fill the span of the curve

U_RoundingMethod: Up or down

V_Method (Number, ArcLength) – Second surface direction divide method.

V_NumberofSpans: Number of spans.

V_Length: Distance on base (second) iso-curve.

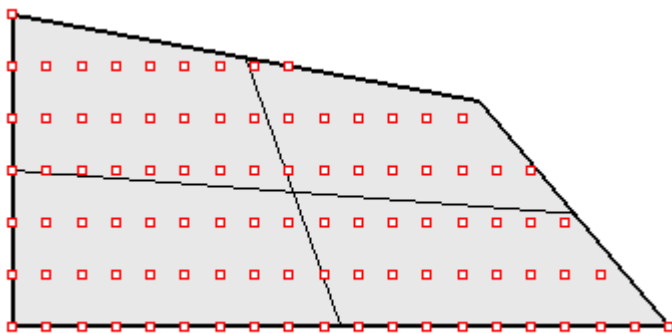
V_Round: Option to round distances to fill the span of the curve

V_RoundingMethod: Up or down

Group: Option to group resulting point grid

ptGridSurfaceDistance

Select a surface, divide by direct (spatial) distances. This command uses an algorithm where points are calculated incrementally (every new point depends on previously created points). This is why it might not give complete coverage. Note that grid name follows surface name. The command allows to select a point on surface to use as base.



Command Options:

U_Distance: Distance in first direction

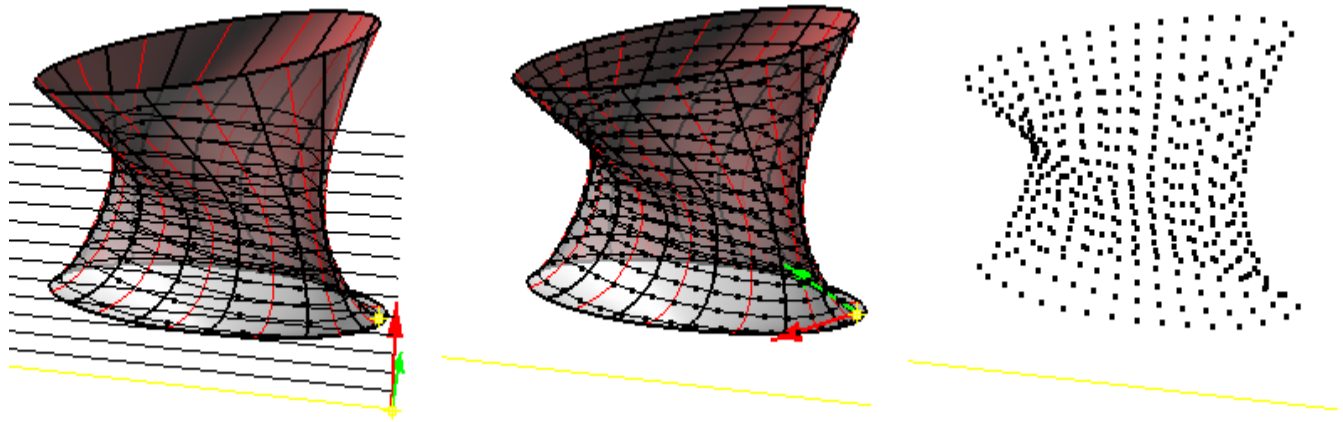
V_Distance: Distance in second direction

Extend: Option to extend surface when calculating the grid (get better converge)

Group: Option to group resulting point grid

ptGridCurve

Generate a grid based on an object and direction curve. Curve can be open or closed.



Command Options:

Line: Option to define direction curve with two points

CurveOptions

NumberOfCuts: Number of curves to be projected to object

Spacing/Angle: Distance between curves

ExtrudeMethod=Parallel/Polar

ExtrudeDirection: Extrusion direction (for parallel)

ProjectionDirection: Projection direction

GridOptions

Method (Number, ArcLength) – curve divide method.

NumberOfSpans: Number of spans.

Length: Distance on base (first) iso-curve.

Round: Option to round distances to fill the span of the curve

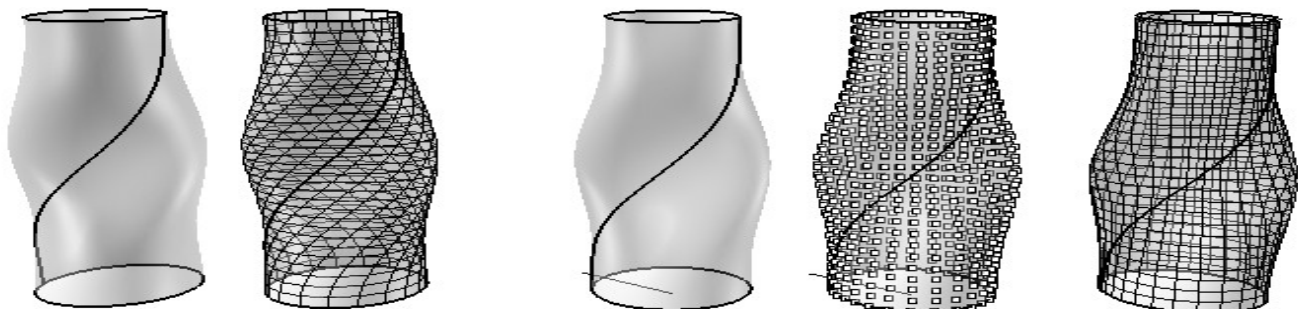
RoundingMethod: Up or down

Group: Option to group resulting point grid

NameOfGrid: Grid name

ptGridCurve2

Generate a grid based on an object and 2 direction curves. Curves can be repeated in parallel or polar direction.



twisted surface seam

ptPanelCurve2 - Polar in dir1 and Parallel in dir2

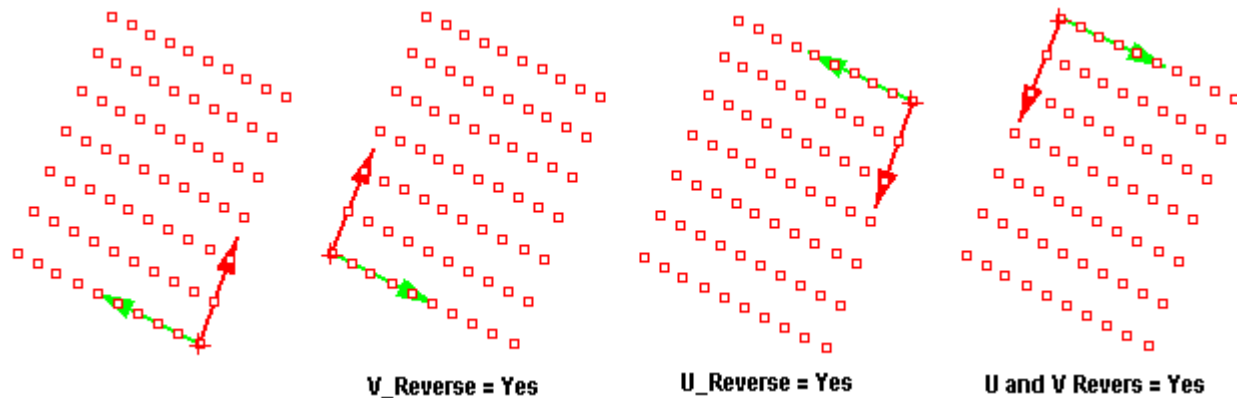
Command Options:

Line: Option to define direction curve with two points
FirstDirCurveOptions (same for SecondDirCurveOptions)
 NumberOfCuts: Number of curves to be projected to object
 Spacing/Angle: Distance between curves
 ExtrudeMethod=Parallel/Polar
 ExtrudeDirection: Extrusion direction (for parallel)
 ProjectionDirection: Projection direction
GridOptions
Method (Number, ArcLength) – curve divide method.
 NumberOfSpans: Number of spans.
 Length: Distance on base (first) iso-curve.
 Round: Option to round distances to fill the span of the curve
 RoundingMethod: Up or down

Group: Option to group resulting point grid
NameOfGrid: Grid name

ptDirection

Flip U and V directions of the grid. This changes the names of point in the grid.

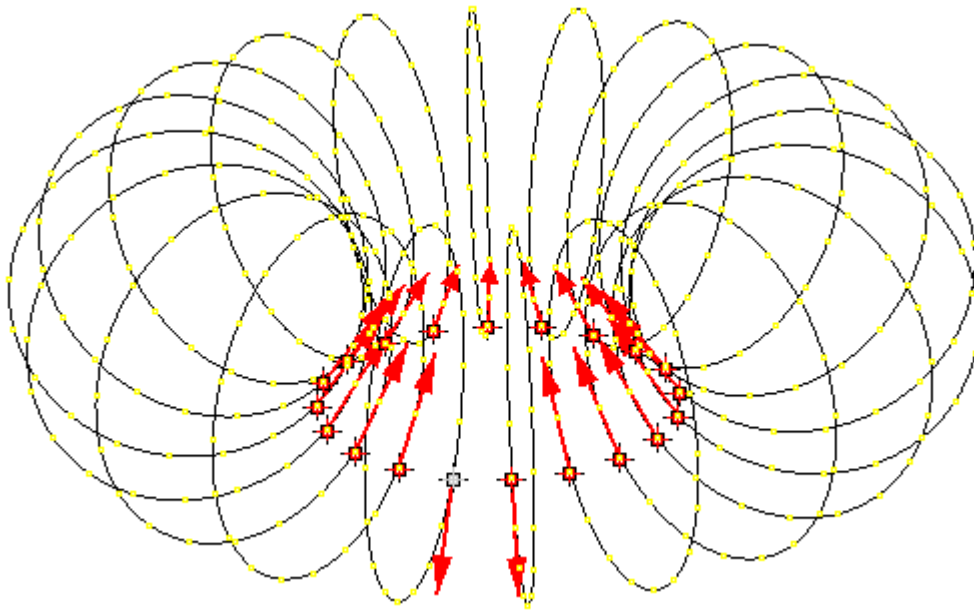


Command Options:

Degree: Number of subdividing steps.
Method: All/SubsOnly/MainOnly. Different methods of sub-paneling as in the image.
PanelShape: Straight or Pull

ptRowsDirection

Reverse row directions in a grid.



ptCompactGrid

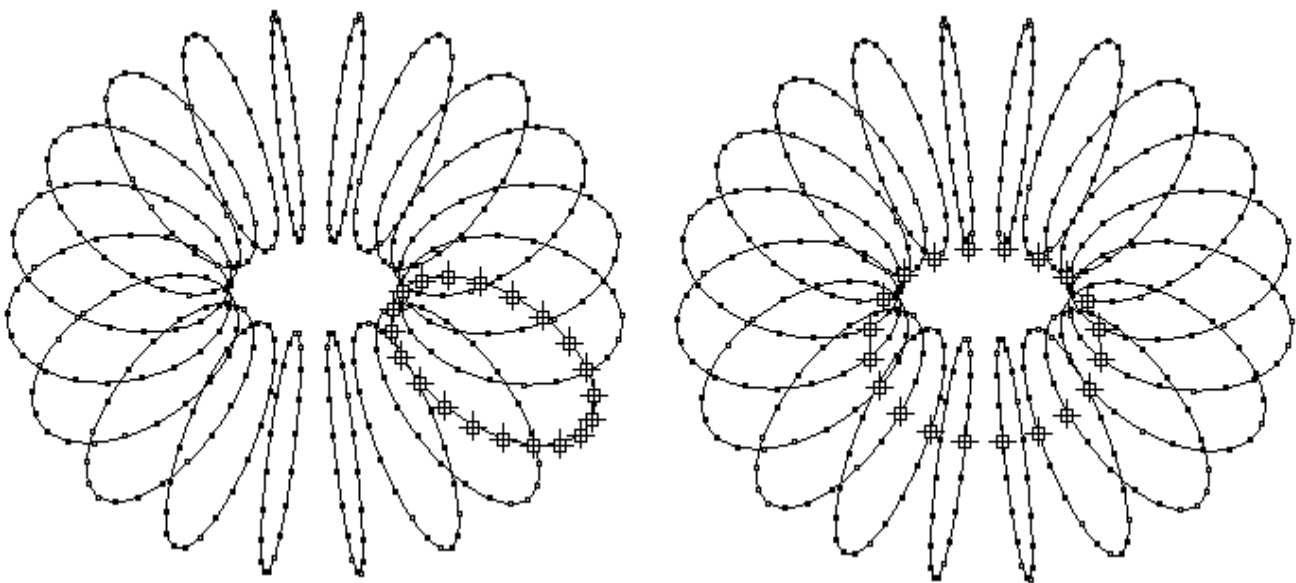
Remove holes in the selected grid.

ptCloseGrid

Close selected grid in U or V direction.

ptGridSeam

Change grid seam. The selected grid must be closed.



ptRemoveOverlap

Remove overlapped points in a grid.

ptShiftGrid

Shift the index of selected grid pointed by specified amount. Helps space out a grid and create holes.

Command Options:

RowShift: shift in u direction
ColShift: shift in direction

ptOffsetPoints

Offset points on surface or polysurface by specified amount.

Command Options:

OffsetAmount: Offset distance
Group: option to group points

ptTagObjects

Tag objects with thier names.



Command Options:

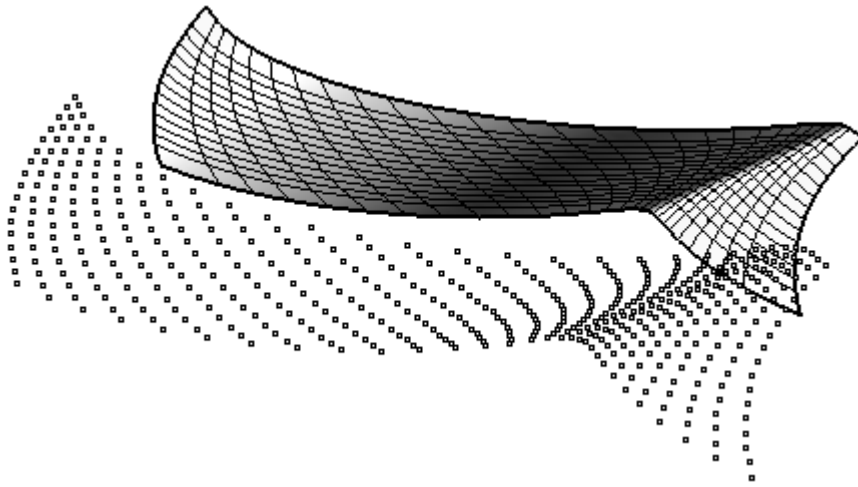
TagMode (Dot, Text)
Height: Text height

ptUnifyCurvesDirection

Unify the direction of curves to point in the same general direction.

ptSurfaceFromGridOfEditPoints

Create a NURBS surface using grid as edit points.



ptSurfaceFromGridOfControlPoints

Create a NURBS surface using a point grid as surface control points.

