

CURVIZARD

Operations on sequences of Edges and Curves

VERSION 1.4 – 15 SEP 13

by Fredo6

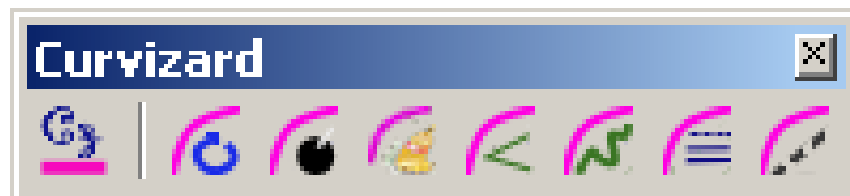
1. Overview

Curvizard is a suite of interactive tools operating on sequences of edges and Sketchup curves. The common characteristics of Curvizard tools are:

- **Pre-selection mode**, with launch from toolbar, main menu, and contextual menu
- **Interactive selection mode**, where edges can be selected across the boundaries of components and groups (edge picking method is similar to Curviloft's)
- **Non-destructive approach** for most tools. When edges are connected to faces, Curvizard tools try to preserve the faces and their texturing.
- **Most operations can apply to several curves or sequence of edges in one shot**
- **Full support of Undo / Redo**
- **Functional enhancements for some tools** versus existing scripts (details sections below)
- **Quick Launcher**

In the current version, Curvizard supports the following functions:

- **Make Curve** (i.e. weld)
- **Explode Curves** (multiple edges)
- **Cleanup Contour** (collinear edges and small spikes)
- **Simplify Contour** (by angle)
- **Smooth Contour** (by splines with average angle)
- **Modify Edge Properties** (soft, smooth, hidden, cast shadows)
- **Convert to Guides**: convert a sequence of edges to a sequence of construction lines



2. Installation






- **Sketchup Versions: 6 and above** (Free and Pro). Works better with v8 M2 and above.
- **Platforms:** Windows XP, Vista, 7 and Mac OSX all versions
- **IMPORTANT:** Curvizard requires the Shared Library **LibFredo6 v5.2 or higher**.

Since SU8 M2 and SU 2013, there are now several ways to install a plugin.

- **SCF Plugin Store**, recommended method
- **EWB** (when published)
- SU Extension Manager to install a **.rbz file**
- Unzipping into the SU Plugins directory from a .zip file (see details below)

All installations however will end up with the following **footprint** in the SketchUp Plugins directory:

- **one script file** *Fredo6_Curvizard.rb*
- **one subfolder** **Fredo6_Curvizard**. This subfolder contains the library files, the icons, cursor files, language files (please do not alter, rename or move files there).

Name	Type
 <i>SU Plugins root directory</i>	Plugins Root Folder
 Fredo6_Curvizard	Folder
 Fredo6_Curvizard.rb	Ruby file
 Fredo6_!LibFredo6	Folder
 Fredo6_!LibFredo6.rb	Ruby file

The Sketchup standard Plugins directory is:

On Windows, SketchUp 8.0

`C:\program files\google\google Sketchup 8\plugins\`

On Windows, SketchUp 2013

`C:\program files\SketchUp\SketchUp 2013\Plugins\`

On Mac OSX, SketchUp 8.0

`Macintosh HD/Library/Application Support/Google SketchUp 8/SketchUp/Plugins`

On Mac OSX, SketchUp 2013

`~/Library/Application Support/ SketchUp 2013/SketchUp/Plugins`

ZIP archive: To install on Windows

- 1) Open the Zip archive on Sketchucation
- 2) Select All files
- 3) Press the Extract button and select the Sketchup Plugin folder as the destination
- 4) Answer YES to overwrite existing files if any

ZIP Archive: To install on Mac OSX

- 1) Click on the Zip archive on Sketchucation
- 2) This should open the Download box with highlight on the folder CURVIZARD_Dir_10
- 3) Copy this folder to the Sketchup Plugins directory

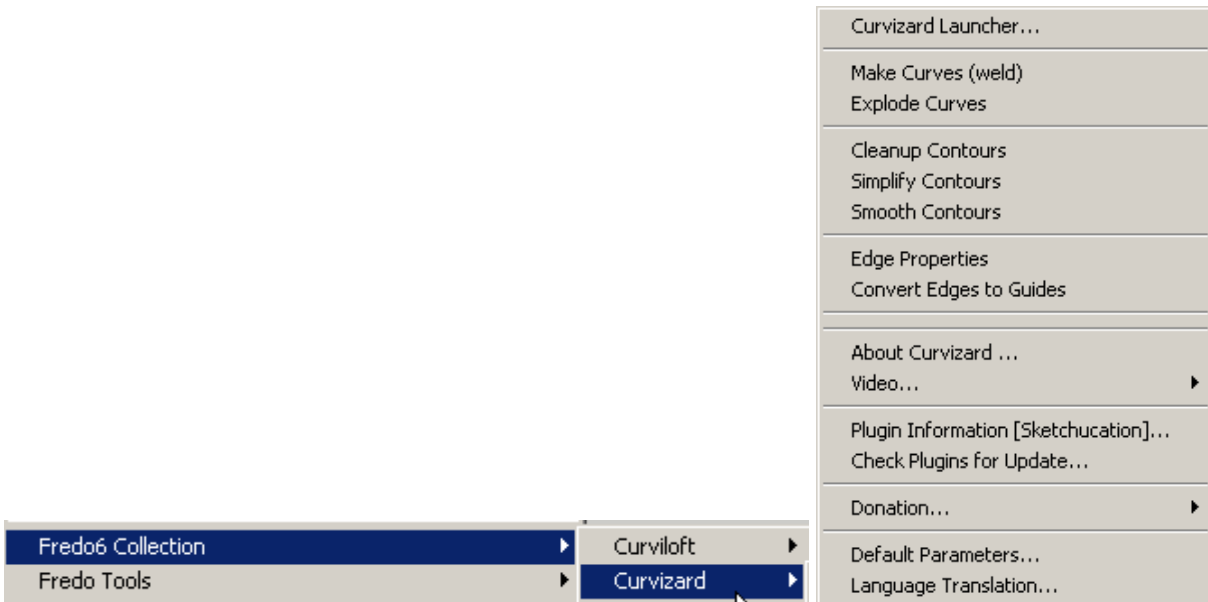
CAUTION: NEVER rename or move files from their folders. If you are unsure of your unzip operation, do it in a neutral folder and check that you reconstruct the right footprint. Then transfer the folders and files to the SU Plugins Directory.

Note: you can select an alternative plugin directory (see **AdditionalPluginFolders** at <http://sketchucation.com/forums/viewtopic.php?f=323&t=39073#p345150>).

3. Menus, Toolbar and Configuration

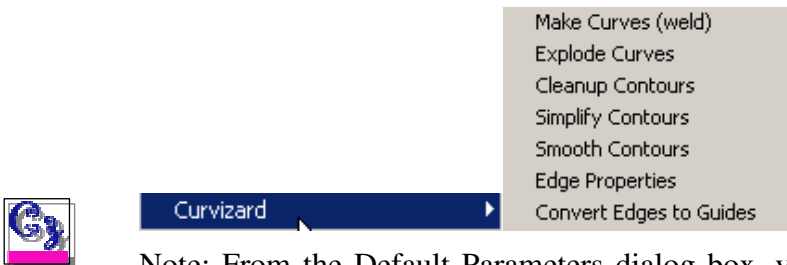
Main menu:

By default in *Tools > Fredo6 Collection > Curvizard*. All functions are available in this menu, whether shown or not in the toolbar.



Contextual menu

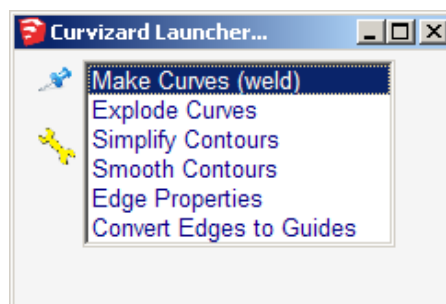
Whenever the selection includes an edge, the contextual menu shows an entry for Curvizard:



Note: From the Default Parameters dialog box, you can configure which commands are shown in the contextual menu (you can even remove them all).

Quick Launcher

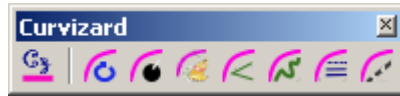
This is a small floating window which displays all Curvizard tools in a list. It can be invoked from the menu or the toolbar icon:



Optionally you can pin the Quick Launcher window on your viewport for subsequent use. By default the window closes when you launch a command.

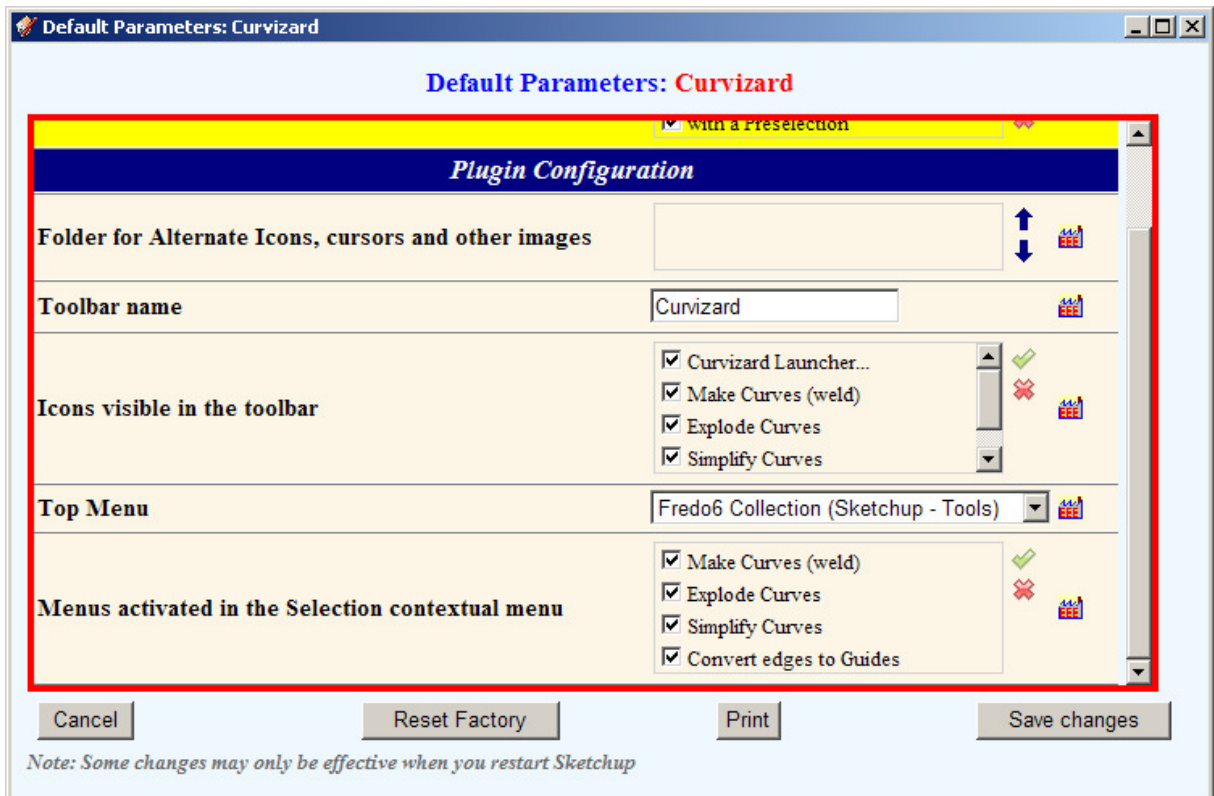
Toolbar

Toolbar name is *Curvizard* by default (you can change it).



In order to preserve real estate in your toolbars, Curvizard has the following strategy

- 1) At first installation, only the Quick Launcher icon is shown
- 2) You can then enable the icons for each Curvizard tool from the Default Parameters dialog box:



Buttons Palette

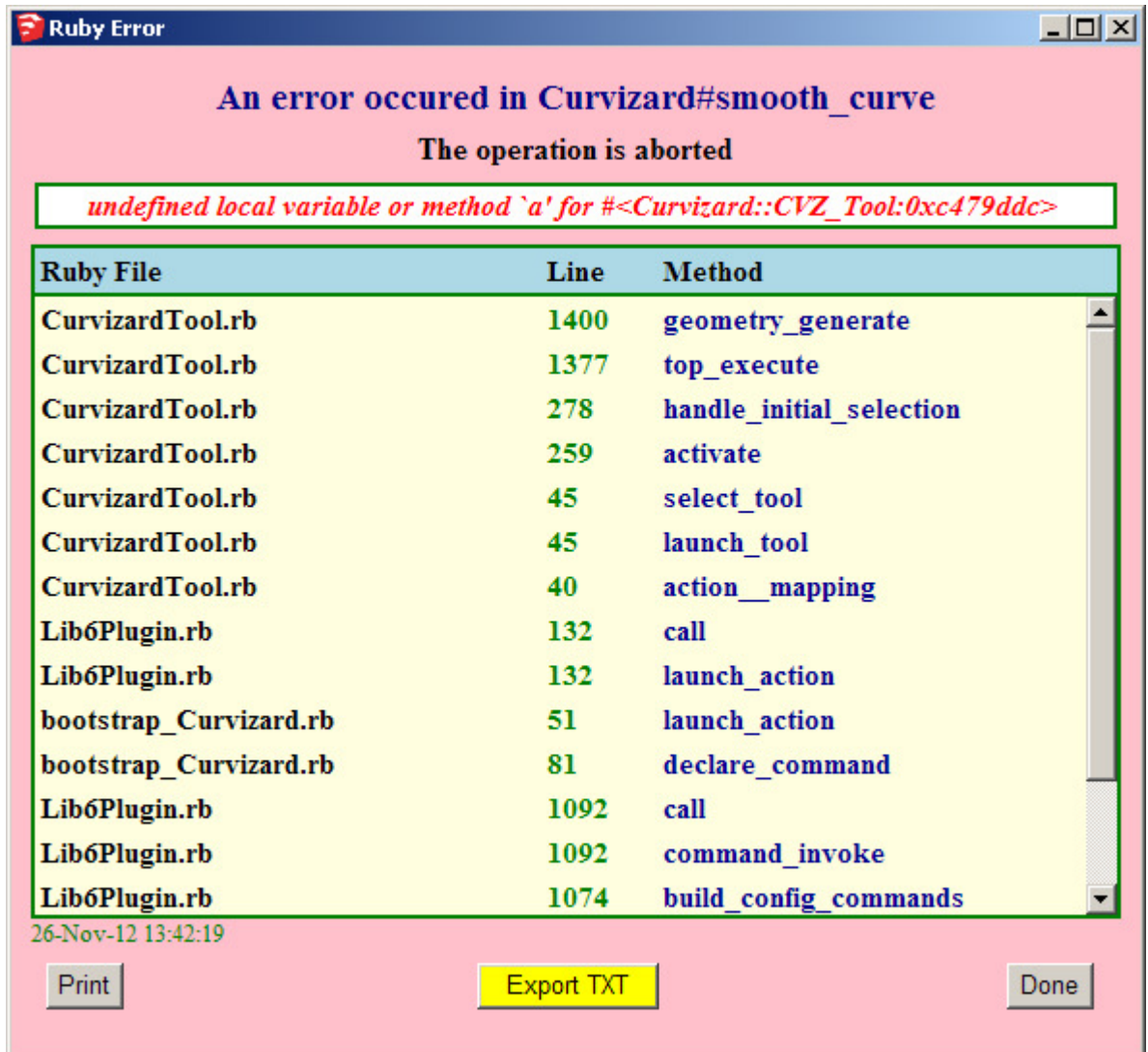
The buttons palette is organized in 4 zones. The first 3 zones are shown for all tools. The last zone (“options for current tool”) is dependent on the tool and can be present or absent.



Error Handling

In some circumstances, Curvizard may be unable to perform the operation, either because the contours are not compliant or simply because there are still bugs in the script.

If this happens, you may get an error message shown as the dialog box below:



Although this is purely technical information related to the Ruby script, it can be useful for the author to trace the cause of error. For instance, exporting as txt file (or simply copy / paste) and posting on Sketchucation.

4. Common workflow

Curvizard works with several modes in sequence:

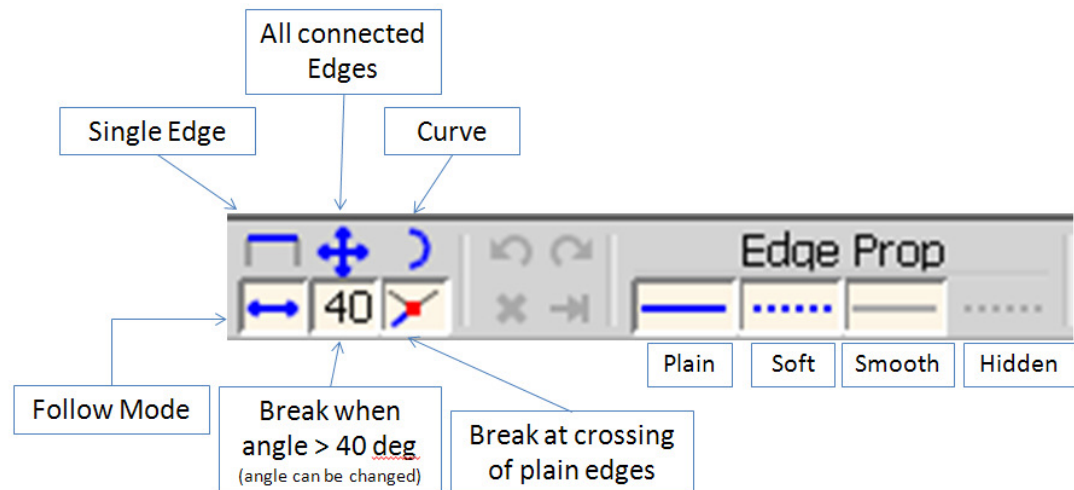
- 1) **Edge Selection mode** – This step is bypassed when you invoke Curvizard with a valid pre-selection
- 2) **Preview mode** – this mode only applies to some tools that require pre-visualizing the geometry and setting parameters before doing the actual generation of geometry.
- 3) **Execution** – the geometry is just generated. You can however still change some parameters, or click other edges for a new selection.

Curvizard provides a rollback button to navigate back between these 3 modes.

1) Interactive Edge Selection

Curvizard allows selecting edges by:

- **Clicking on an edge:** one or several edges in sequences will be selected depending on the active *Extension mode* and *Edge Property filter*:



- **Clicking on a face:** This selects the edges bordering the face (but not the holes)
- **Clicking on a vertex:** this selects the edges connected to the vertex
- **Double-clicking on an edge or a face** will select all connected edges
- **Click and drag will enter the Rectangle selection mode:**
 - Dragging *left to right* only selects edges fully with the rectangle.
 - Dragging *right to left* selects edges which cross the rectangle

The edge property buttons allows filtering the edges to be selected.

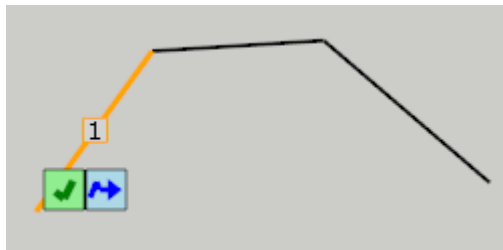
To unselect edges, the same rules apply, that is:

- Clicking on a selected edge will deselect the edge and neighbors according to the active Extension mode.
- Clicking on a face will deselect its bordering edges
- Double Clicking will deselect all selected edges which are connected.

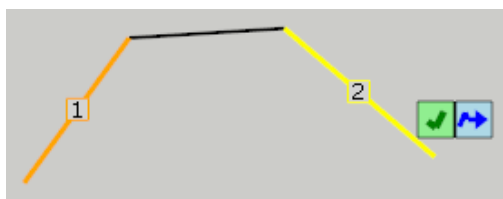
2) Defining Sequences of edges (Contours)

Curvizard automatically groups connected edges which are in sequence. This allows defining Contours on which to perform the requested operation. Contours are visually shown with a small number. Different Contours are displayed with different colors.

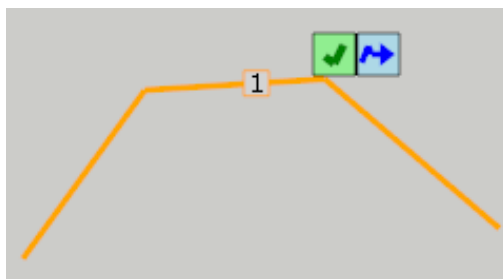
When 2 edges or sequences of edges are not connected, you have 2 Contours. They will merge into one single Contour if you click on an edge that connects them.



Clicking on the leftmost edge create Contour #1

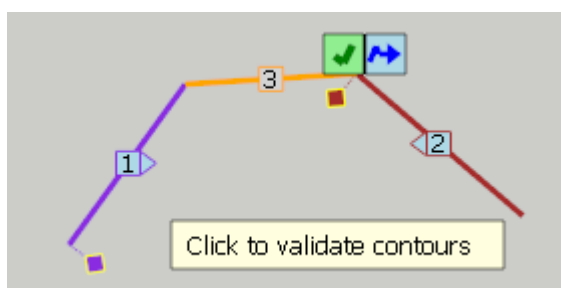
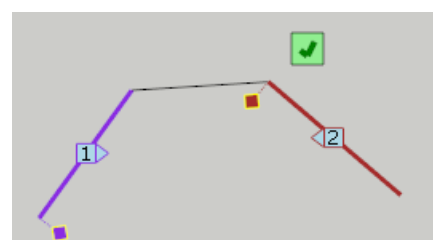
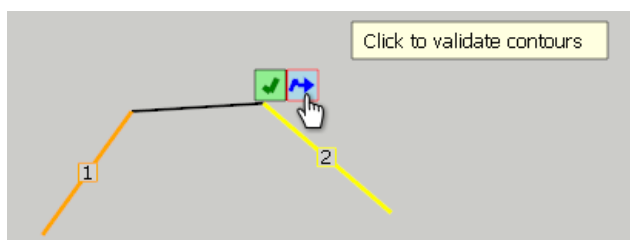


Clicking on the rightmost edge create a second Contour #2



Clicking on the middle edge will merge Contours #1 and #2 into a single Contour

However, you may want to define two or more Contours from a single sequence of connected edges. **To freeze Contours** with the current edge selection, click on the Blue arrow (or press Enter). Frozen Contours are show with a small diamond label.



The middle edge will now be part of a 3rd Contour, leaving Contours #1 and #2 frozen.

There are several ways to Freeze Contours

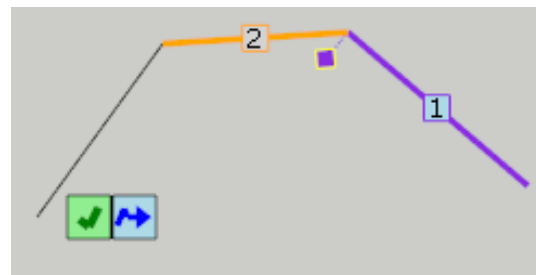
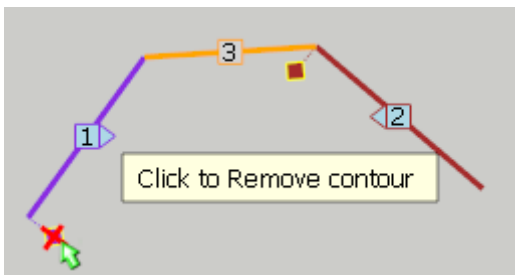


- Click on the small blue arrow near the cursor
- Click on the same blue arrow in the main palette
- Click anywhere in the empty space
- Press Enter
- Via the contextual menu

Note: If you start a Curvizard tool with a pre-selection, Contours will be defined based on the edges connected in the pre-selection.

3) *Unselecting Contours*

Just mouse over the diamond label of a Contour. A small cross appears. If you click, the Contours will be deselected.

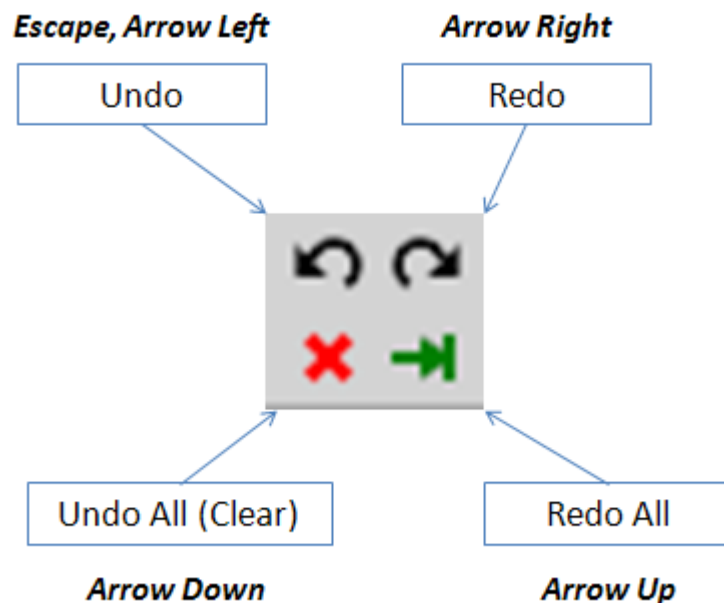


4) *Undo and History navigation*

All steps of the selection are recorded.

You can **Undo in sequence** by pressing Escape or Ctrl-Z¹.

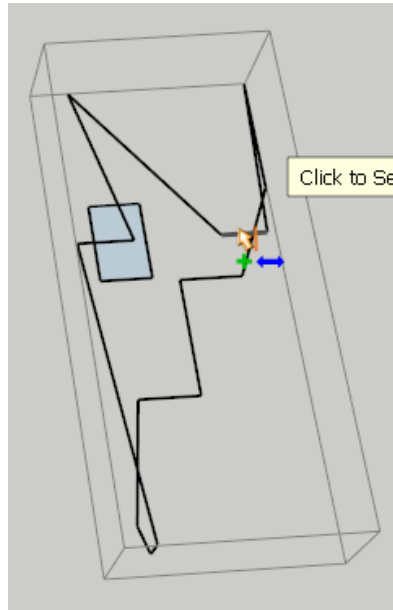
You can also use the History navigation buttons in the main palette. For convenience, the history navigation commands are mapped on Arrow keys:



¹ In Edge selection mode, the Sketchup Undo is disabled

5) Selecting Edges within Components and Groups

There is no difference, except that when you mouse over edges which are located within a component or a group (at any level), **its bounding box is shown in pale gray**.



Note: edges which are located in different groups or components cannot be put in sequence and therefore always belong to different Contours

6) Validating Contours

When you are done with the Contour selection, **you can go to the next step, which is either Preview mode or Execution mode.**

You can validate by one of the following ways:



- Click on the small green check mark near the cursor
- Click on the same green checkmark in the main palette
- Click anywhere in the empty space
- Press Enter
- Entry in the contextual menu

7) Rollback

When you have validated the contours and performed the operation, you can still undo it and go back to the selection mode



- Click on the orange arrow in the main palette
- Press Escape
- Press Ctrl Z
- Via the contextual menu

In most cases, the previous Contour selection will be restored. You can then change it and revalidate.

8) Changing the Active Tool

You can change the **current active tool** from within Curvizard by clicking on the buttons in the main palette.



1. **In Edge selection mode**, the new tool is just activated.
2. **In Execution mode**, Curvizard will pre-select the result of the current operation and use it for the next tool. You just need to validate to perform the new operation. So if you Simplify a sequence of edges, then you can simply weld it with Make Curve by switching to this tool.

You can also change the current tool from the main toolbar when you are within Curvizard. In this case, Curvizard puts the result of the current operation in the selection so that it will be used by the next tool activated. Note that this works even if the edges are located within components or groups.

9) Exiting Curvizard

You can **exit Curvizard** by one of the following ways:



- a) Click on the small Exit icon near the cursor which appears once you have executed an operation
- b) Click on the Exit icon in the main palette
- c) Click anywhere in the empty space (or press Enter) when there is NO edge selection



You can also **abort the current operation and exit Curvizard** by clicking on the following icon:

10) Auto Exit option: launching Curvizard with Selection and Exit

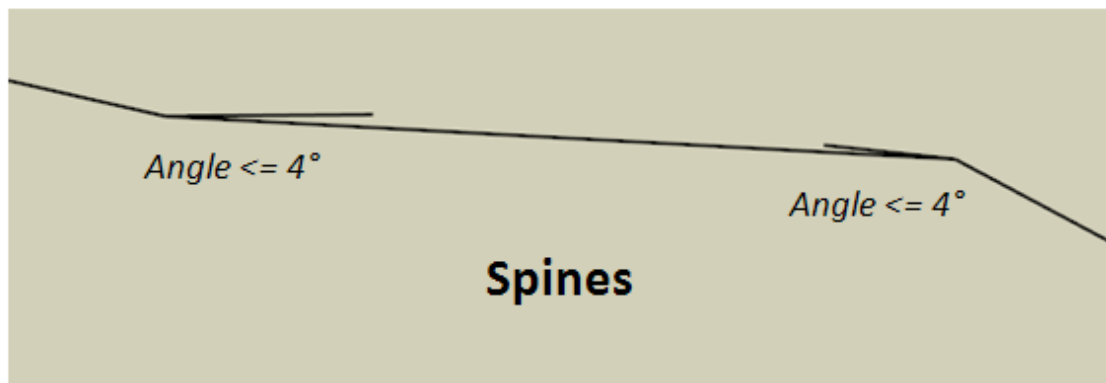
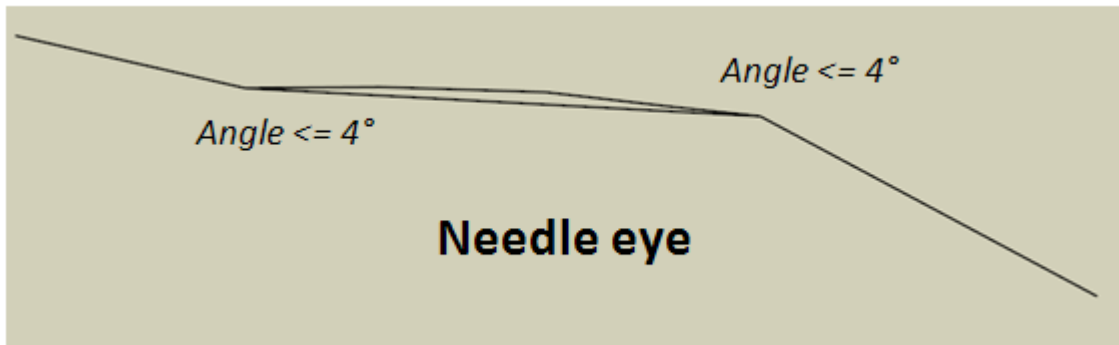
Curvizard includes an option allowing launching a tool on a pre-selection of edges and then automatically exiting. Two options are configurable from the **Default Parameters** dialog box:



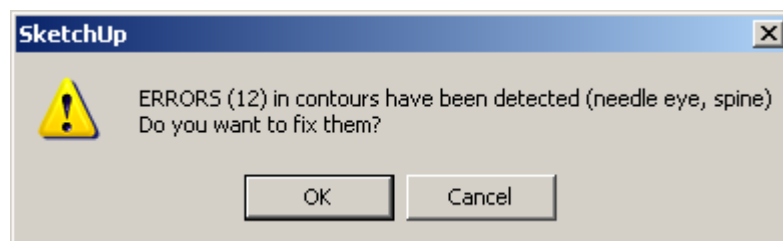
11) Error detection in Contours

Curvizard performs a rudimentary analysis of the selected contours (pre-selection or interactive selection) to detect:

- a) Needle eyes
- b) Spines



When errors are detected, you get a Confirmation box:

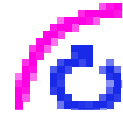


If you press OK, **errors will be fixed** and the Curvizard operation will be processed.

If you press Cancel, then the faulty contours will be unselected.

Note that this type of bad configuration would very likely provoke an error in Curvizard tools if they are not fixed. This is why the choice is only given between “fix” or “unselect”.

5. Make Curve



PURPOSE: Transforms sequences of edges into Sketchup Curves.

It is in essence equivalent to **Weld** (by *Rick Wilson*), **Recurve** (by *Diggsey*) or the Polyline tool of **BezierSpline** with a few differences:

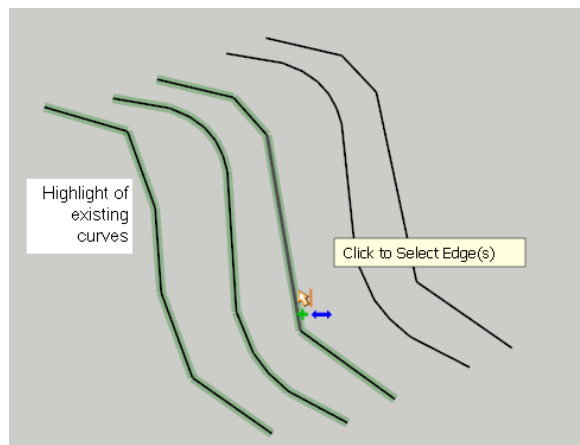
- 1) It can generate curves on multiple sequences of edges in one shot,
- 2) It forces the creation of a Sketchup Curve to map the sequence of edges even if they cross other plain edges.

1) **Launching Make Curve**

Make Curve works on **pre-selection** or in **interactive edge selection mode**. You can select more than one Contour.

There is NO additional option for the tool.

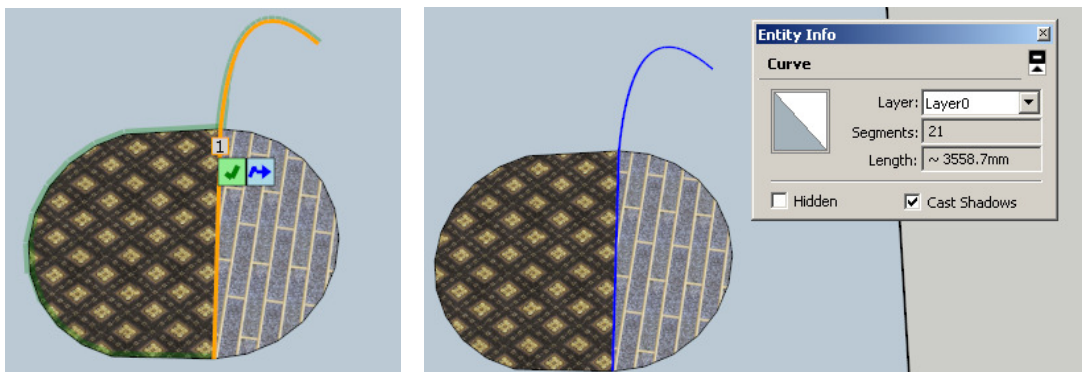
When you mouse over edges, the tool highlights in pale green the existing curves connected to these edges in the same context (top-level active model, group, or component).



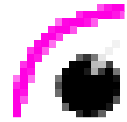
2) **Generating curves**

Generated curves are briefly highlighted in **red**. You can then continue selecting edges.

Note: Make Curve forces the sequence of edges to be generated as a Sketchup Curve even if it crosses other plain edges.



6. Explode Curve



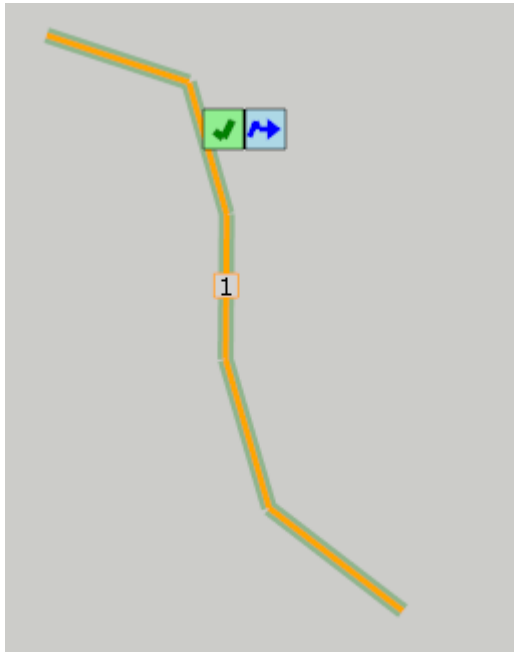
PURPOSE: Explode Curves from their edges

This tool just explodes curves when you select one of their edges.

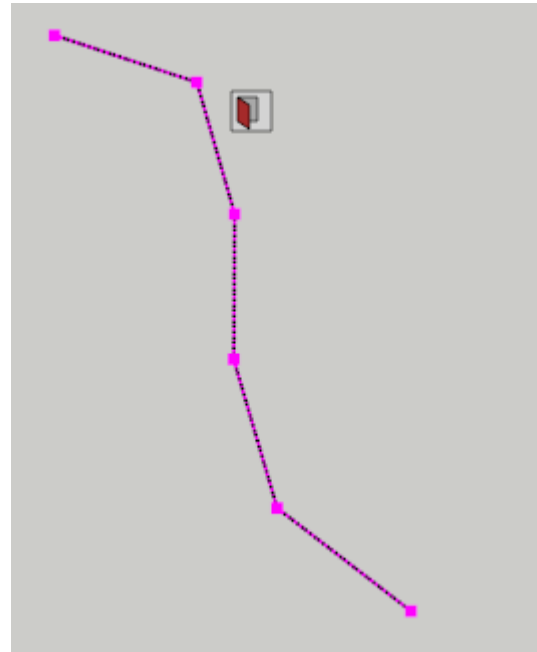
It is there for convenience as this is a native function of Sketchup. However, remember that it works across the boundary of components and groups, unlike its native cousin.

There is NO additional option for the tool.

When you execute the exploded curves are briefly highlighted in dash line.



Original Curve



Exploded Curve

7. Cleanup Contour



PURPOSE: Perform some cleanup operations on contours

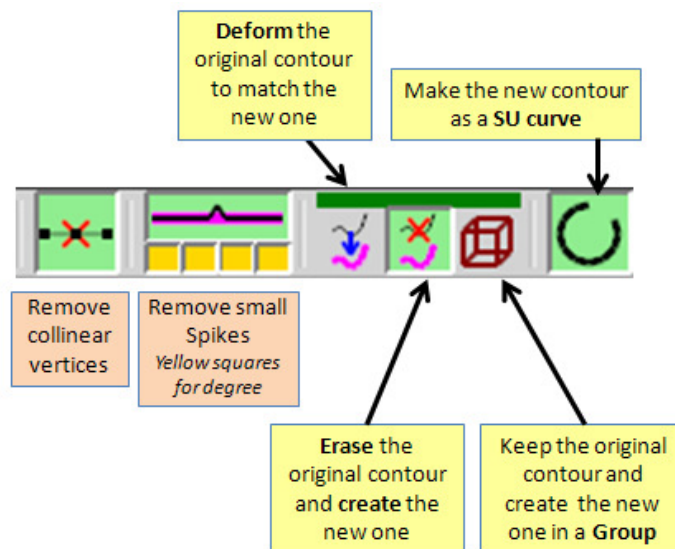
This tool provides currently two types of operations:

- 1) Remove collinear vertices
- 2) Remove small spikes

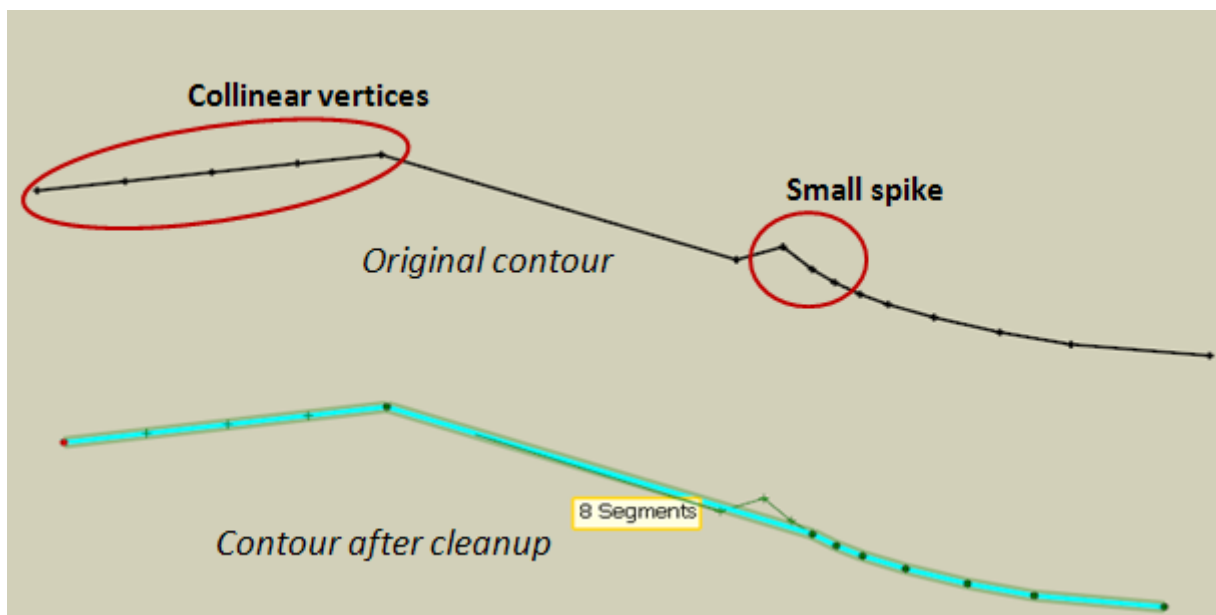
As for other transformation tools, you can generate the cleaned-up contour:

- By deformation (non-destructive)
- By creating the new contour and erasing the original one
- In a group

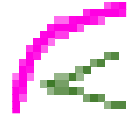
You can also make the new contour as a Sketchup Curve.



Here is an example of what the Cleanup Contour function can do:

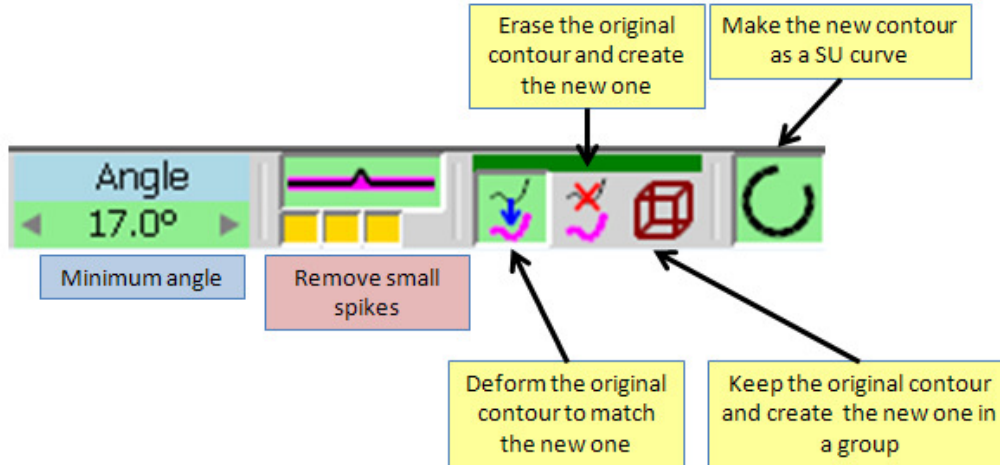


8. Simplify Contour



PURPOSE: Simplify a Contour with control of a minimum Angle

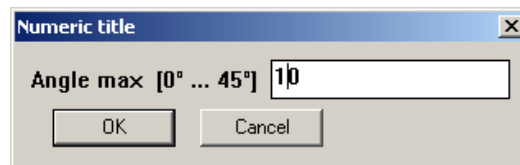
This tool is similar to the original Simply Contours script by @last Software. The main parameter is a **minimum Angle** under which vertices are removed from the Contour. Other options are about the generation of the contour as described below:



Note that the first option of generation (by deformation) is non-destructive (*see more detailed explanations in the Smooth Contour section below*). When faces are connected to the edges of the original contour, their vertices are simply moved along. If some of the vertices are connected to other edges they are not erased. However, the tool removes collinear edges if any.

You can set the value of the minimum angle by:

- Clicking on the small arrows** of the palette button to increment or decrement the angle by 2 degrees.
- Clicking the value button.** A dialog box will appear to enter the new value

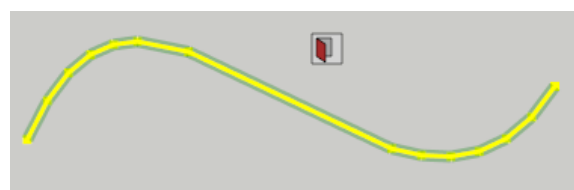


- Type in the VCB**
 - Either the angle in degree (ex: 10)
 - Or the angle with a unit, degree, grade, slope, radians (ex: 10d, 15g, 0.3%, 0.05r)

When the value is changed the new simplified contour is updated.



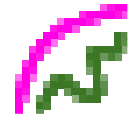
Original Contour



Simplified Contour

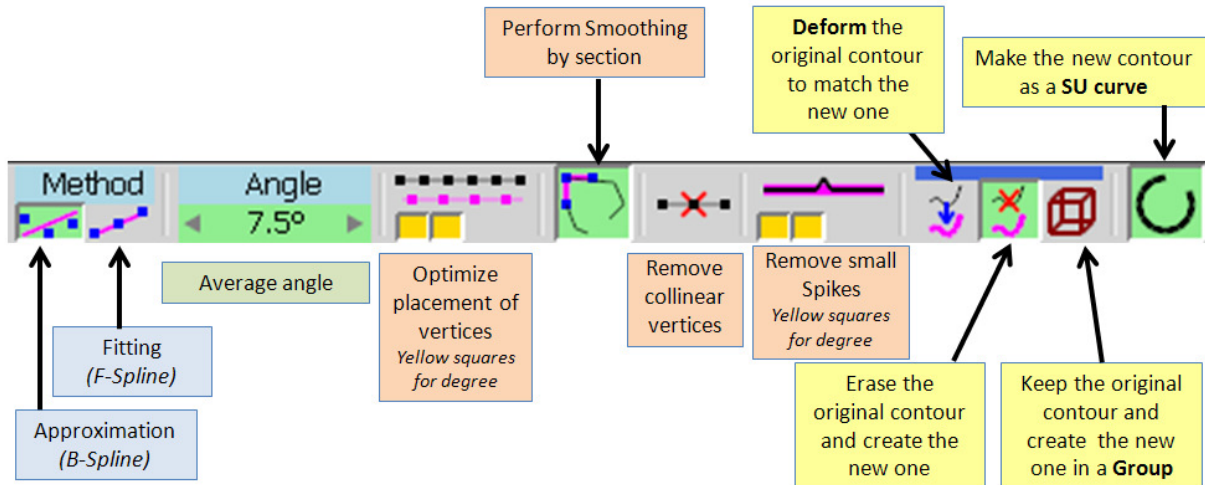
9. Smooth Contour

PURPOSE: Smoothen Contour by splines with control of average angle



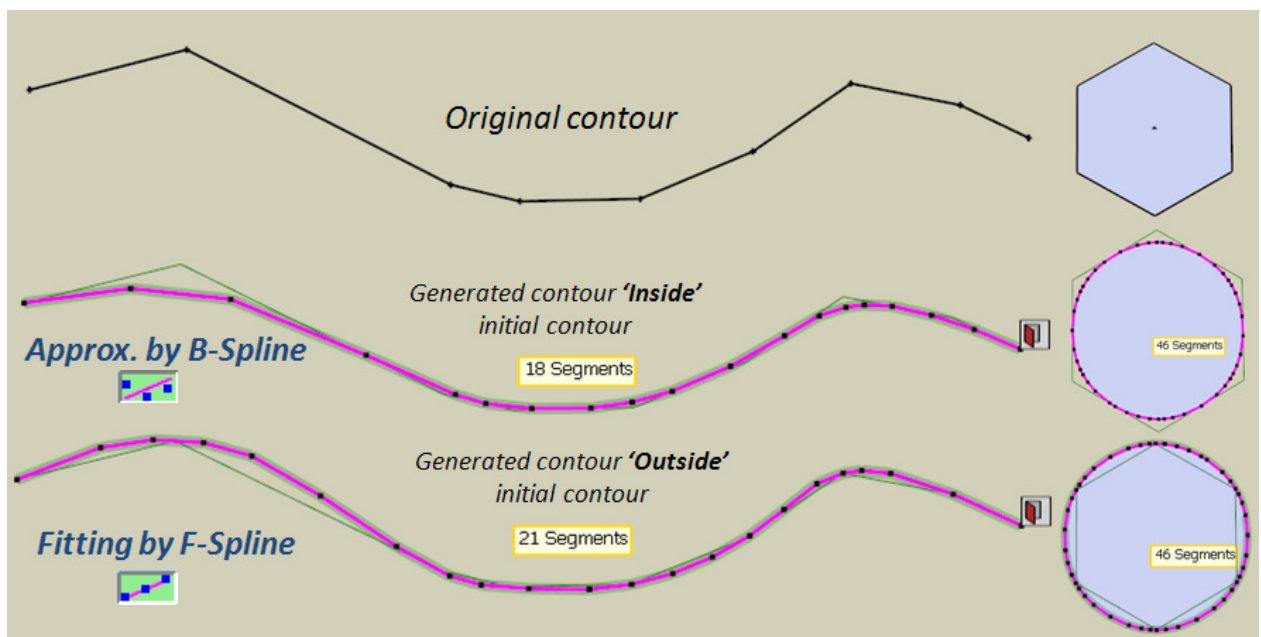
The purpose of the tool is to smooth the selected contours so that the average angle between edges is under a specified value. Smooth Contour takes several parameters shown in the button palette:

- **Method of smoothing:** Approximation or fitting
- **Average angle**, defining the smoothness factor
- **Correction options** (placement of vertices, smoothing by section, spikes)
- **Generation options:** non-destructive, destructive, in a group, and SU curve



Smoothing Method

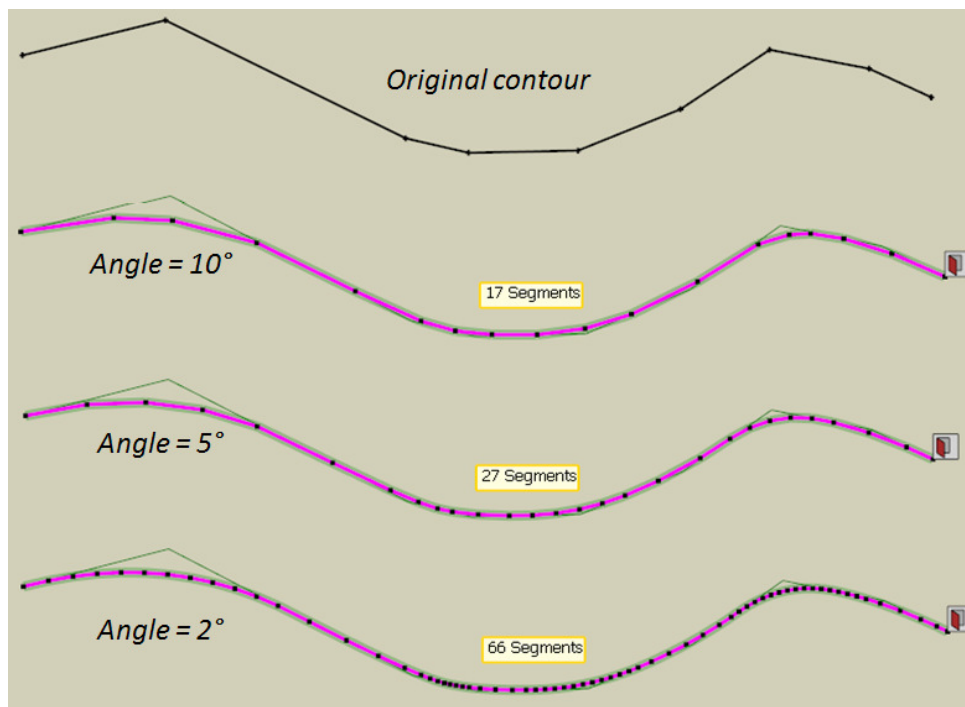
- 1) **Uniform B-Splines**, which is an approximation method. The generated contour is usually within the original contour polygon
- 2) **Fit-Spline**, which is a quasi-fitting method. The generated curve is trying to go through the points of the original contour. It usually spans outside of its polygon.



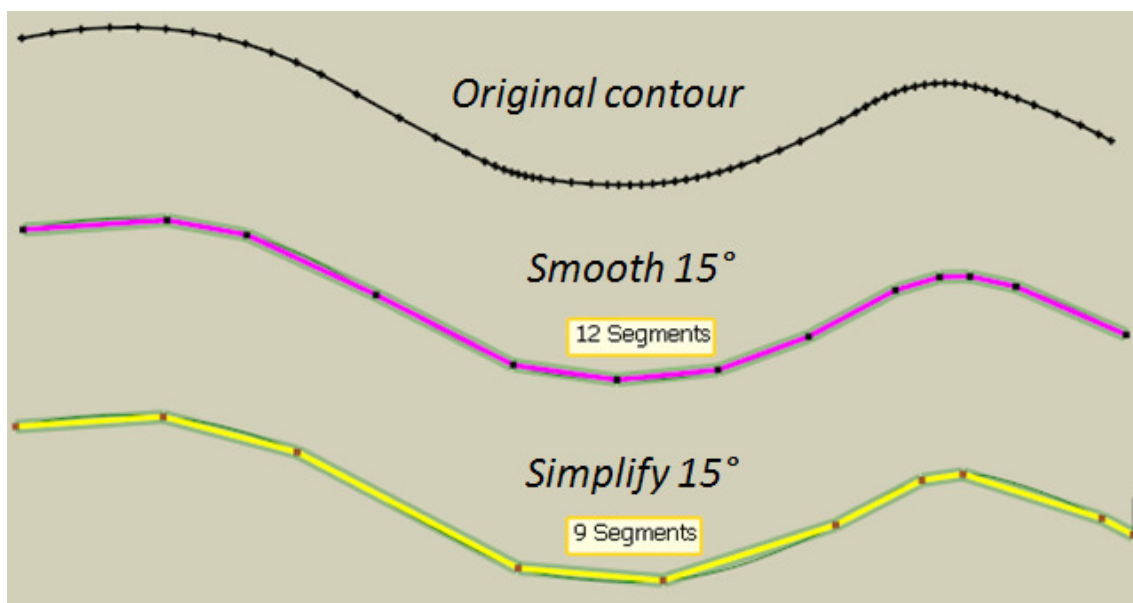
Average Angle

The **average angle** characterizes the overall smoothness of the generated contour. It therefore determines the number of vertices of the resulting contour. The value of the average angle can be set via the palette (small arrows or click on value) or by typing the value in the VCB, as for Simplify curve (just the value, or with a suffix indicating the unit (ex: 10d, 15g, 0.3%, 0.05r)).

In most situations, an average angle **between 8 and 10 degrees** gives a sufficient smoothness to the contour.

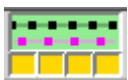
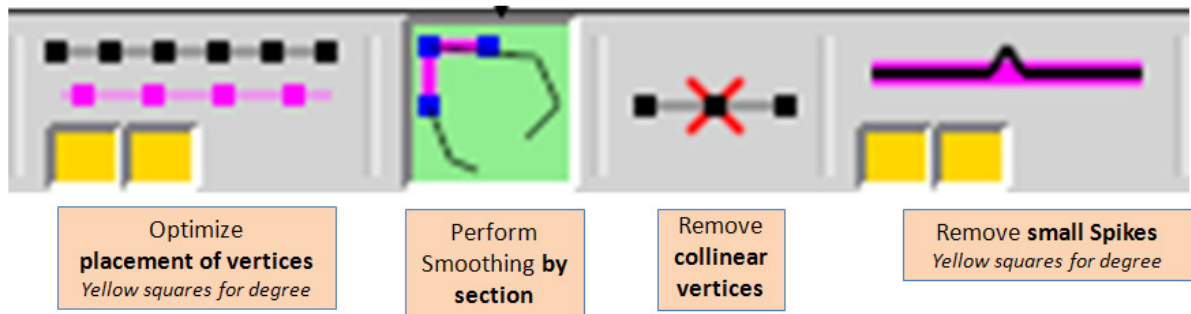


Smooth Contour can also be used to **simplify a curve**, by entering higher value of the average angle. It may even give more consistent results than Simply Contour on preserving the geometric shape.



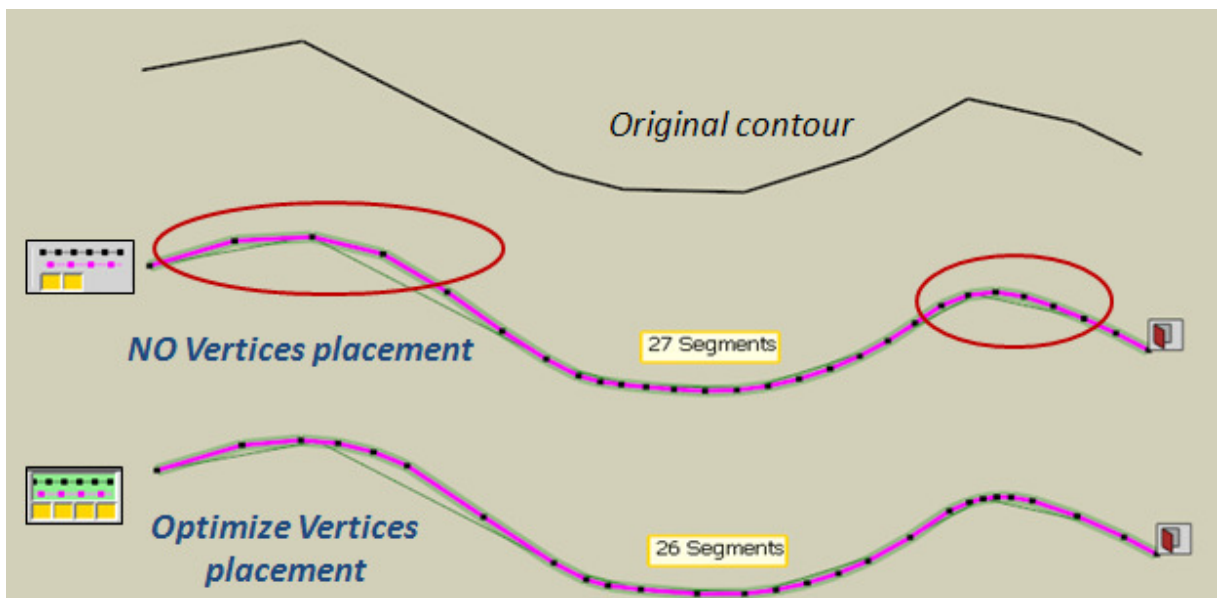
Corrections options

The generation of smooth contours may require some corrections. There is no general rule as it depends on the shape of the original contour and the result expected. So these options are left to the user's choice.



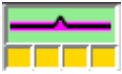
Optimize Placements of vertices

When the original contour is composed of segments with significant difference in length, the smoothing may not be well balanced. Areas with sharp angles may be under-smoothed, and areas of flat angles over-represented with many vertices. This option tries to correct this situation.



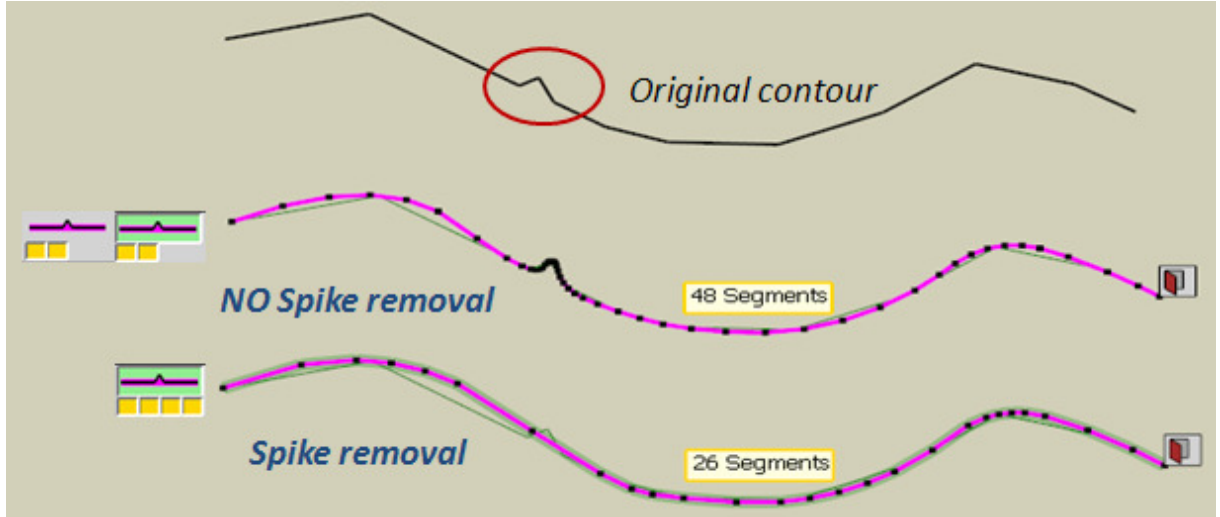
For convenience, there is a power meter to tune the strength of the correction, with the yellow square.

Note: one of the drawbacks of this option is that it may lead to uneven spacing of vertices in contours which have a regular shape

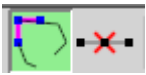


Remove small spikes

This ignores small spikes and glitches in the original contour. These artifacts may come from importing from external applications or from contours generated by intersection.



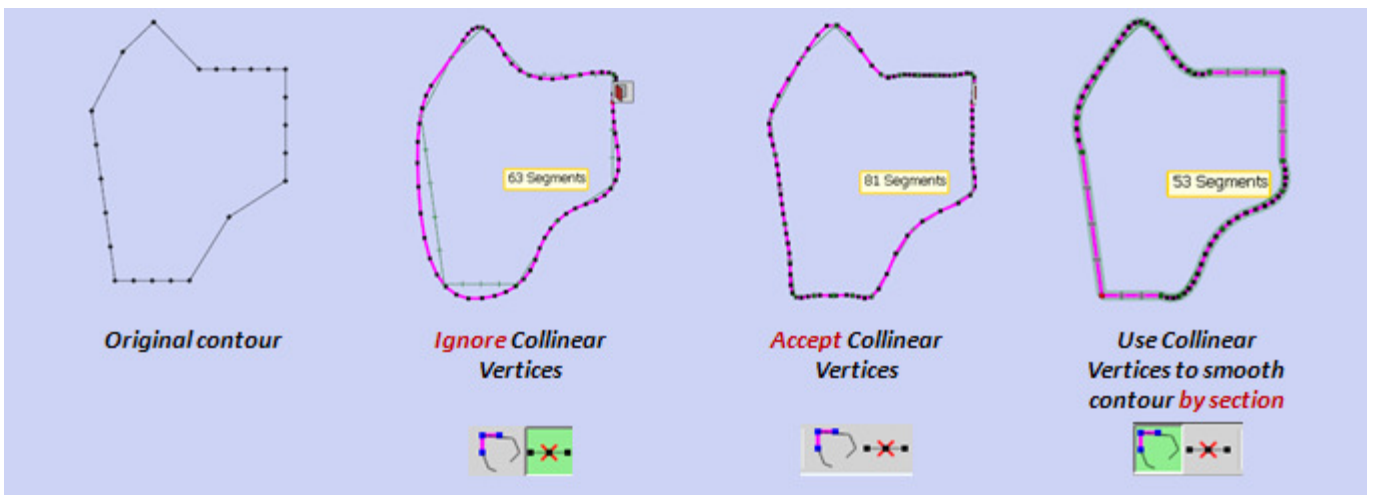
The identification of “small spikes” is based on evaluating the angles and lengths of the spike versus the average of the contour. For convenience, there is a kind of power meter, materialized by the 4 levels shown with yellow squares to tune the strength of the spikes detection. To toggle the option, click on the top button. To increase or decrease the detection strength, click on the bottom area. The yellow squares will indicate the degree of detection (from 1 to 4).



Smooth by Section and Ignore Collinear Vertices

Collinear vertices have an influence on smoothing by splines. So, you can:

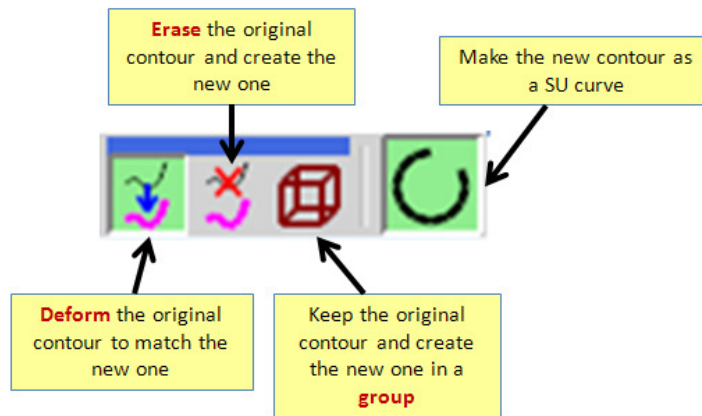
- 1) **Ignore collinear vertices**
- 2) **Keep collinear vertices to influence smoothing** and make the smooth contour closer to the original collinear edges
- 3) **Use collinear vertices to delimit sections** you do not want to smooth. If an angle is surrounded by collinear vertices, then it is not smoothed.



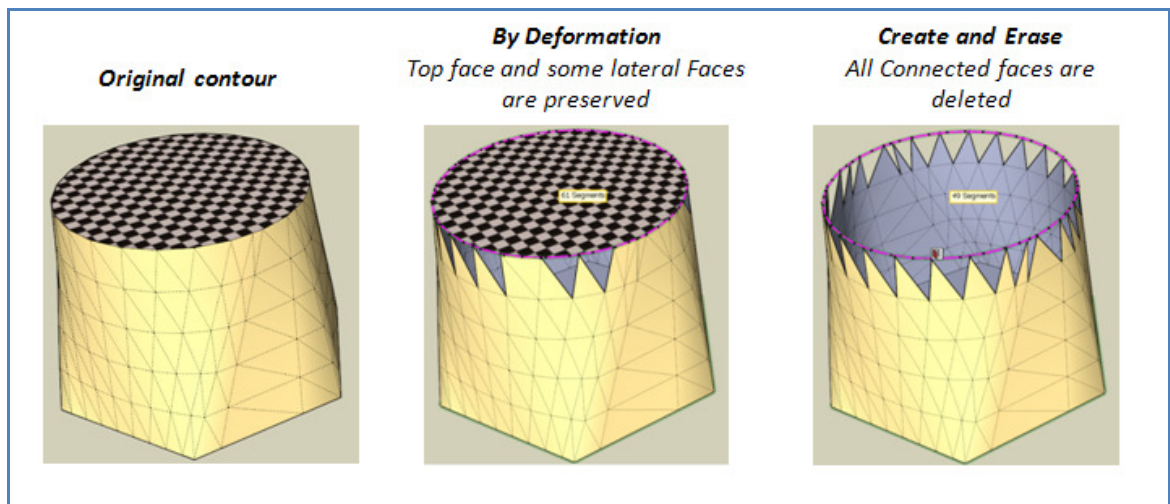
Contour Generation options

The new contours can be generated in 3 ways:

- 1) **By deformation** of the original contour
- 2) **By creation** of the new contour and **erasing** the original contour
- 3) **In a Group**, without altering the original contour



The first option (deformation) is useful when the original contour is already connected to other edges and faces. It is normally non-destructive if the connected faces are within the same plane. Otherwise, due to the limits of the Auto-fold feature in Sketchup, Curvizard may have to erase some connected faces.

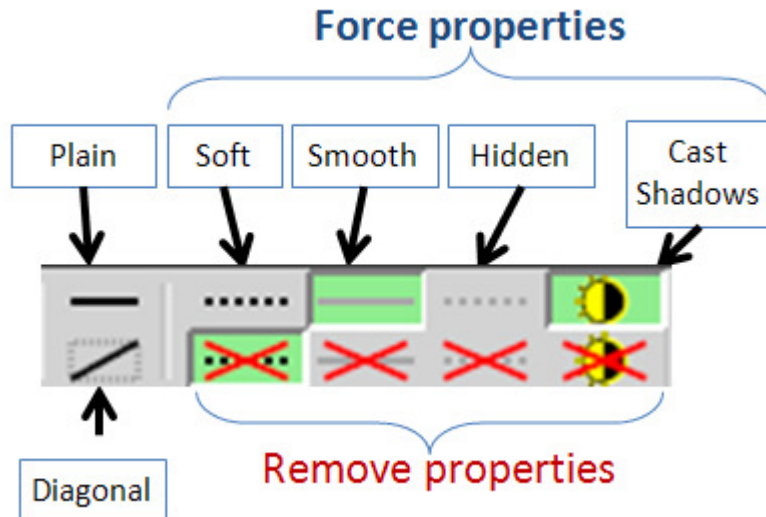


10. Edge Properties



PURPOSE: Assign properties to Edges: soft, Smooth, Hidden, Cast Shadows

This tool allows changing the properties of selected edges.





The buttons in the palette are organized in 2 rows:

- Upper row: if a button is selected, the corresponding property is forced
- Lower row: if a button is selected, the corresponding property is removed
- If no button is selected in the upper and lower row, the property of edges is left unchanged

In the above example, the properties of all selected edges will be changed as follow:

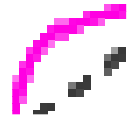
- Soft property will be set to False
- Smooth property will be set to True
- Hidden property will not be changed and remain at its current value for each edge
- Cast Shadows will be forced to True

For convenience, there are **2 preset configurations**:

Plain Edge		Soft, Smooth, Hidden = False Cast Shadows = True
Quad Diagonal		Cast Shadows = False Other properties left as-is (based on Thomthom's convention)

Note: in order to see edges regardless of their properties, the tool will automatically switch on the SU option “View > Hidden geometry”, and then restore it to its previous state when leaving the tool.

11. Convert to Guide

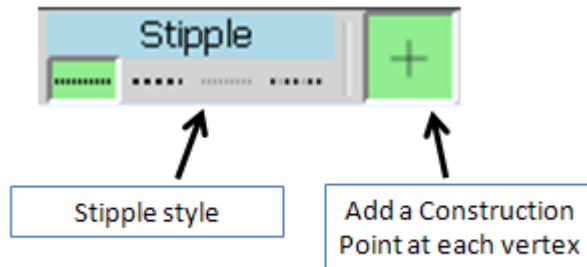


PURPOSE: Convert a Contour to a Construction Line (Guide)

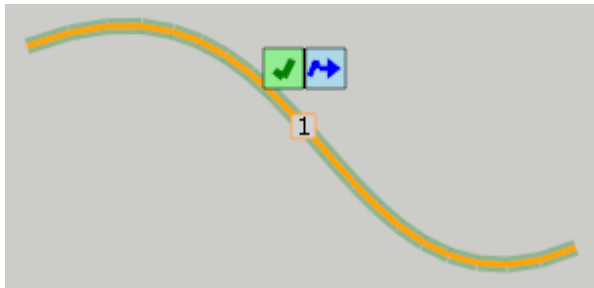
This tool just transforms a Contour into a sequence of construction lines

- Optionally you can add a **Construction Point** at each vertex of the Contour
- You can also set the **stipple** style (not sure this is useful, as in Sketchup, it is difficult to visually see the difference between stipple styles)
- For simpler manipulation of the construction lines, there are created in a group (one for each contour).

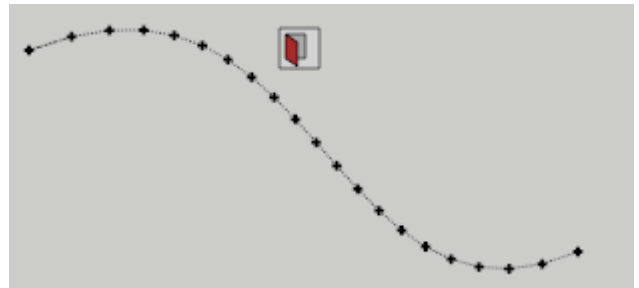
Convert to Guide takes two parameters, the stipple and the option for placing a Construction Point at each vertex:



For instance, with the option Construction Point enabled:



Original Contour



Transformation to Construction Lines and Points