



Convexify shapes

QUICKCARD – v1.0 – 25 FEB 2015

1. Overview

Convexify is a standalone script which decomposes arbitrary shapes into Convex shapes. This can be useful for exporting to some applications which only works well on convex shapes.

Convexify is launched on a **selection** or on the **whole active model** if there is no current selection.

Convexify operates in 3 steps:

- 1) **Parameters**, mainly whether you wish to generate the convex shapes on a specific layer or replace the original shapes, as well as the tolerance for concavity.
- 2) **Calculation of Convex shapes**, including alignment of face orientations
- 3) **Post-view to Visual Inspection**. This step allows examining the generated shapes.

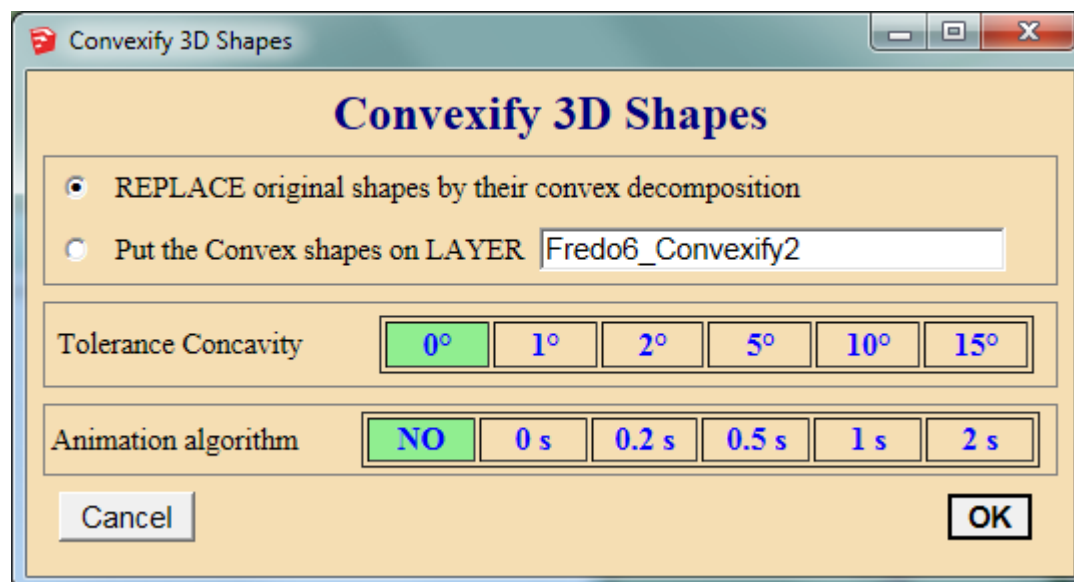
Convexify is part of **FredoTools v2.6** and above. See FredoTools installation.

2. Pre-Selection

Convexify operates on the Selection. If there is no selection, then a message asks confirmation for processing the whole active model.

3. Parameters

The following dialog box is displayed when you launch **Convexify**:



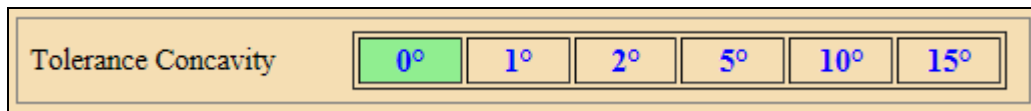
Layer Management

- Either **replace the original shapes** by their convex decomposition
- Or **generate the convex shapes on a specific layer**, leaving the original shapes unchanged. All generated shapes are enclosed within a master group.

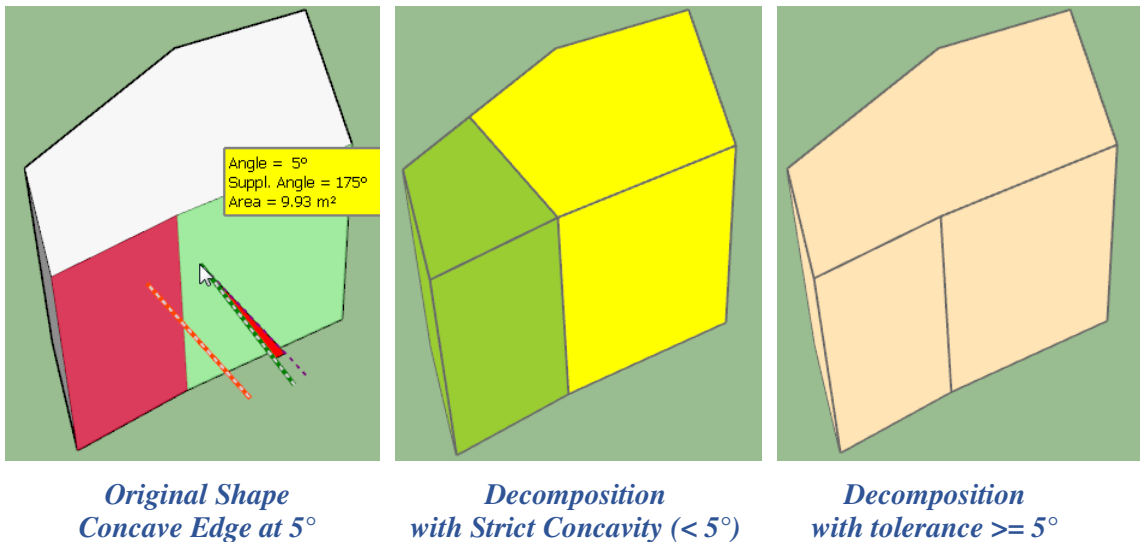
Note: the hierarchy of groups / components is preserved in both cases.

Tolerance Concavity

You can adjust this parameter to ignore edges which are barely concave. The parameter corresponds to the deviation from the flat junction. 0° corresponds to strict concavity.



For instance, the shape below has an edge which is concave with a deviation of 5° . With strict concavity (i.e. 0°), it will be decomposed into two convex shapes.



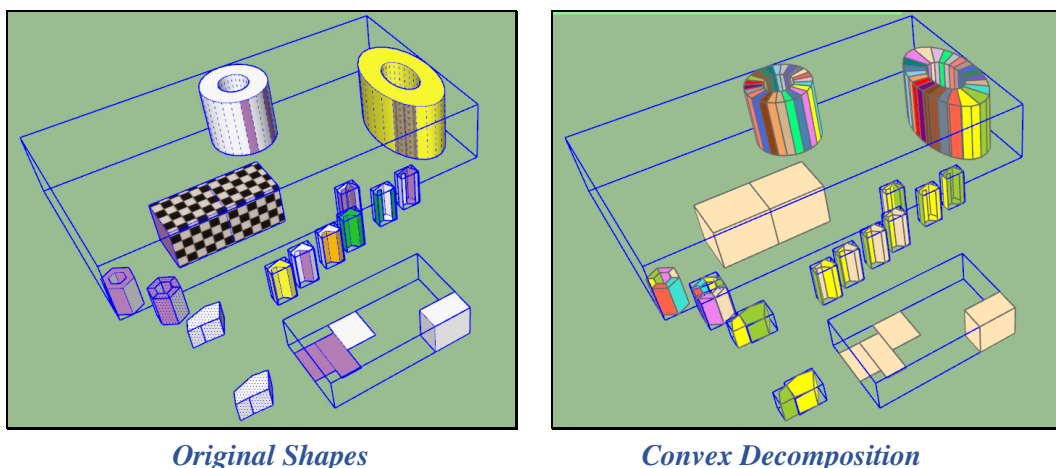
Animation Algorithm

The algorithm is based on an iterative process where shapes are successively cut along their concave edges. By setting a small delay (in second), you can visualize the progression of the algorithm. Note that this makes the total processing time longer, indeed.

4. Post-View for Visual Inspection

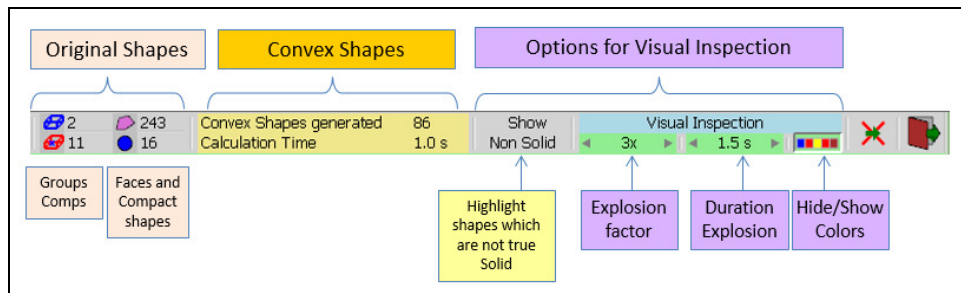
After the calculation is made, which can take some time if the model is complex, **Convexify** displays an interactive environment for the visual inspection of the result.

By default the convex solids are painted with colors to separate them visually. Shapes which were initially convex are shown in a light beige color. These colors are just 'painting' in the interactive view, that is, face and edge materials are not affected and are transferred from the original shapes to the convex shapes.



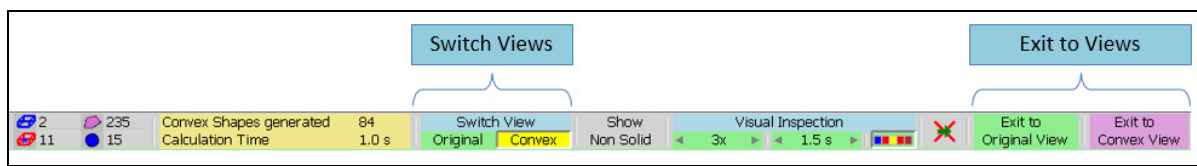
Palette in Mode 'Replace original'

The button palette is as follows:



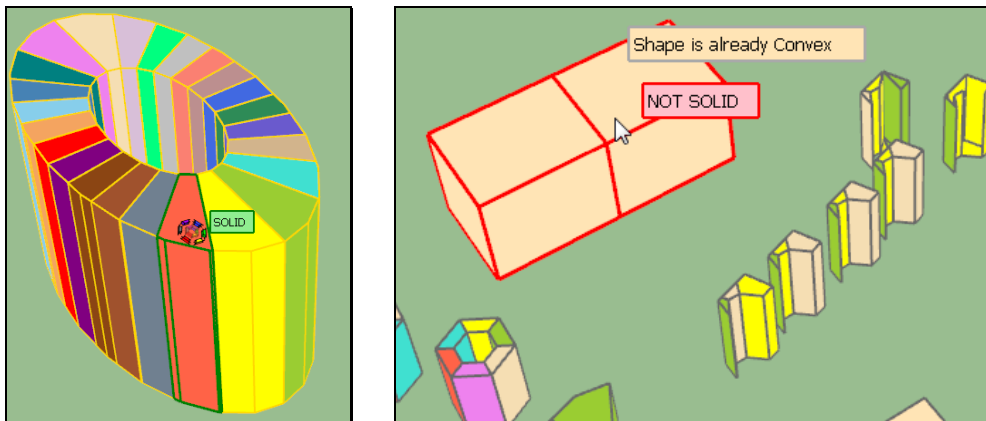
Palette in Mode 'Generate on Specific Layer'

The palette is complemented with buttons related to the **Original and Convex** views. The 'Convex view' only shows the specified Convex Layer where the convex shapes are generated.



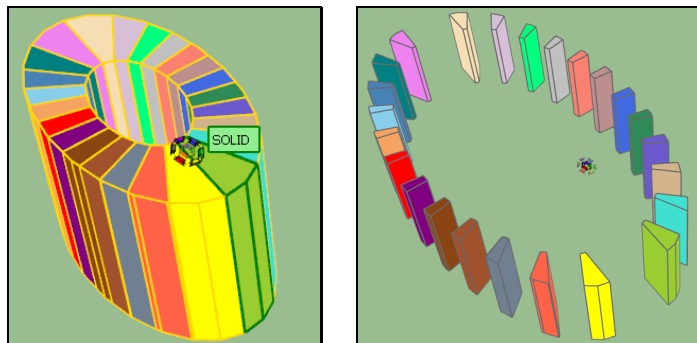
Inspecting the Convex decomposition

Whatever the view, you can inspect the convex decomposition by **hovering and clicking on shapes**. Convexify also displays the information whether the shape under the cursor is or not a True Solid, as well as whether the shape was already convex and therefore not decomposed.



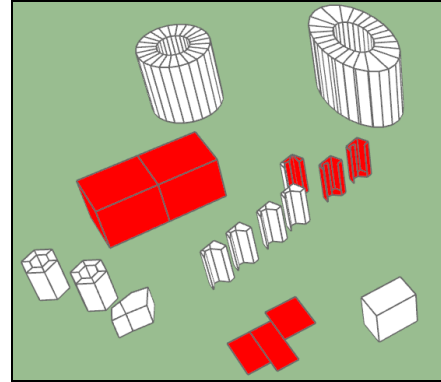
Exploding the Decomposition

Click on the shape to see the convex decomposition. The original shape is **exploded** to show its convex shapes. For convenience, the explosion is animated. You can adjust the duration of the animation as well as the explosion factor in the palette. If you double-click, the explosion is instantaneous. Click or Double-click again to implode the shapes.



Showing the NON-SOLID shapes

Click on the button “Show Non Solid”. The shapes which are **not solid** will be highlighted in **Red**, and all others in White.



Note: true solid shapes are those where all their edges have exactly 2 adjacent faces. Non solid shapes would be those for which face borders are open, or which have internal partition faces.