

Profile Combine Plugin for CamBam

[Version 1.0.3]

Purpose

This plugin allows two surfaces to be combined to form a single surface as result of computing the result of:

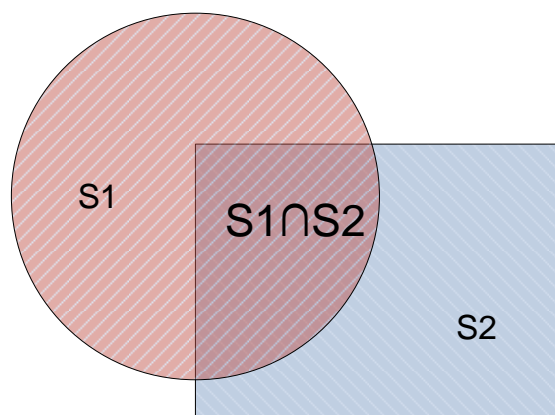
- Adding the Z-values of the two surfaces together
- Subtracting the Z-value of one surface from the other
- Multiplying the Z-value of one surface by the value of the other.
- Dividing the Z-Value of one surface by the value of the other.

The resulting surface has extents matching the union of the two surfaces, or if preferred the extent of one surface or only the strict intersection of both surfaces. The Z-Values are, of course the Cartesian Z-values, not any normal values.

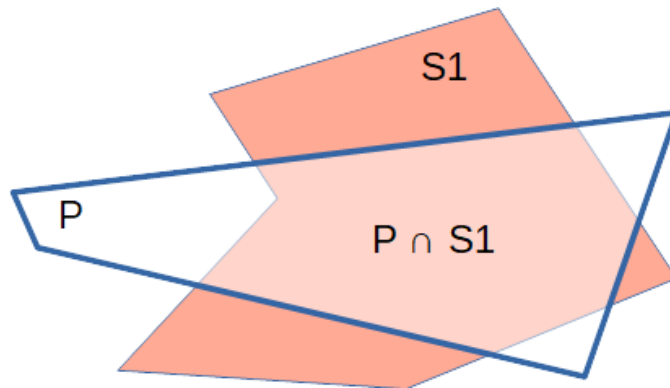
From version 1.0.3 it is also possible to clip a single surface by a Polyline shape in the X,Y plane. The shape can be a Polyline; or a PolyRectangle or a Circle which are first converted to a Polyline. The shape needs to be placed in the X,Y plane, preferable at Z=0.

In particular the Z-value of the combined surface is computers as follows:

- For any point that is contained in the intersection of S1 and S2, the Z-value is computer as per the selected operator.
- For any point only inside S1, the Z-Value is taken as the Z of S1 at that point if requested.
- For any point only inside S2, the Z-Value is taken as the Z-Value of S2 at that point if requested.



- When a bounding clip shape (as a Polyline) is specified with one surface then it is just the logical AND of this shape and the surface that is created, like this:



The resulting surface is then just a subset of the selected surface (S1), no mathematical operations are performed.

It should be noted that if the union of S1 and S2 is non-convex then the combined surface may have surface triangles spanning the non-convex regions. Such regions may be clipped by defining a suitable boundary shape that is used to form the 3D carving MOP.

It would be usual, therefore to ensure that the boundaries of the two surfaces should match exactly, or have one surface totally contained within the other.

The source surfaces can be created in CamBam, or loaded from external files (e.g. image files or STL files). The required positioning, and scaling of each surface (including the Z-values) should be done using the CamBam facilities before running this plugin. The result of the combination is also saved as an STL file, for permanent reference and reuse.

Installation

The ProfileCombine.dll file must be placed inside the CamBam plugins folder, and CamBam restarted. The ProfileCombine option will then appear in the CamBam <Plugins> menu.

Operation

When two (and only two) Surface type items are selected before launching the plugin, the dialog looks like this with the two surfaces listed:

Profile Combine Plugin

Selected Surfaces: Surface (4)
Surface (11)

Selected Shape:

STL File: C:\Users\geoff\CNC-Models\Profiles\Test1.stl

Grid-X: 1 Grid-Y: 1

Progress:

☒ Import into CamBam

Number of Triangles:

Primary: ☒ Include All: ☐
☐

Operation: ☒ + ☐ - ☐ x ☐ /

Run Cancel Close About

When one Surface item and one Polyline (or a PolyRectangle, or a Circle) are selected the dialog looks like this, with the selected clipping boundary shape listed as the Selected Shape.

Profile Combine Plugin

Selected Surfaces: Surface (4)

Selected Shape: Polyline (9)

STL File: C:\Users\geoff\CNC-Models\Profiles\Test1.stl

Grid-X: 1 Grid-Y: 1

Progress:

☒ Import into CamBam

Number of Triangles:

Primary: ☒ Include All: ☐
☐

Operation: ☒ + ☐ - ☐ x ☐ /

Run Cancel Close About

The Fields/Options are:

- **Selected Surfaces** text boxes: contain the names of the two selected surface objects.
- **Selected Shape** text box: contains the name of the selected clipping shape.
- **Primary** radio buttons: chooses the primary (first) surface in the operation (only required for subtract and divide operations).
- **Include All** checkboxes: If checked, the full extent of that surface is included in the resulting surface, otherwise only the strict intersection with the other surface is included.

- **Operation** radio button: selected the required operation:
 - **+**: to add
 - **-**: to subtract (primary – secondary)
 - **X**: multiply
 - **/**: divide (primary/secondary)
- **STL File** text box: the name of the created, and saved STL file (the STL file is always saved).
- **Grid-X and Grid-Y** text boxes: to set the grid spacing in current units for the new surface. A finer grid may give a more accurate result, but at the expense of computational times.
- **Progress Bar**: shows current progress in two phases: creating grid and creating triangular surface patches.
- **Browse** button: to browse to the required STL file.
- **Run** button: runs the task.
- **Cancel** button: will cancel the currently running task, and remove the newly created surface.
- **Number of Triangles**: the number of triangular surface patches created.
- **Import into CamBam** checkbox: if checked the computed surface will be imported into CamBam into a new layer.

Notes

1. Any required poisoning or scaling of either surface should be done first so that the Z-values are as required. Any implied (from CamBam) transformations will be applied to the two surfaces before the combination value is computed.
2. For multiplication and divide operators the range of Z-values need to be carefully chosen to give a meaningful result.
3. For the divide option; if the divisor Z-value is zero, the resulting Z-value is taken as that of the dividend. If the divisor Z-Value is close to zero, the results may be rather distorted.
4. For the clipping operation, the surface is not modified mathematically, just clipped in the X,Y plane.

Profile Combine Plugin Versions

Version	Date	Notes
1.0.0	10/8/2018	First version for feedback and comment.
1.0.1	18/12/2018	Error on triangulation if a surface was completely flat – not fixed.
1.0.2	21/12/2018	Now fixed.
1.0.3	29/3/2020	Option added to allow a surface to be clipped in the X,Y plane by an closed Polyline.

