Tutorial 18: Analyzing and modifying STL files from CSG modeler (Catia)

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Complete List of all Tutorials with Publishable MATLAB Files of this Solid-Geoemtries Toolbox

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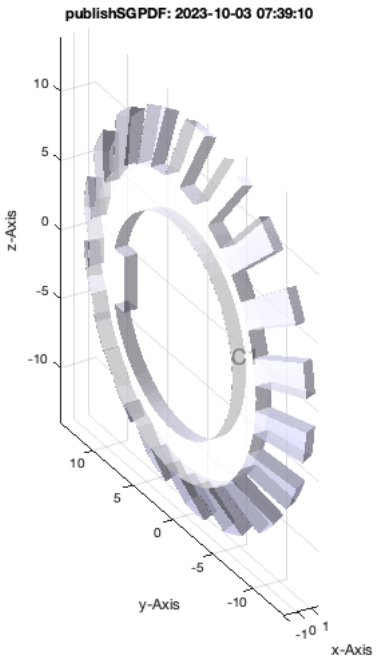
Motivation for this tutorial: (Originally SolidGeometry 3.8 required)

```
% Often CSG modelers are used for mechanism construction and the subsequent
% STL export. This tutorial will show you how to use those STL files after reading
% them in as SG
```

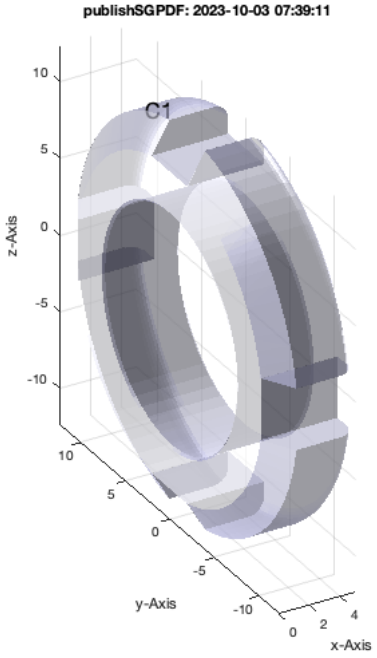
The mat-File 'FZG_Welle.mat' contains already read STL files of the TUM FZG institute. There are 6 Solids that contain overall 18 separate surfaces of a bearing for an axle. You can either load the data from the WWW page of the Technical University of Munich or after download use the load command.

```
% loadweb ('FZG_Welle.mat',true) % load the data from the TUM Mimed Page
load ('FZG_Welle.mat'); % load the data from the matlab path
FZG={SG1,SG2,SG3,SG4,SG5,SG6};
```

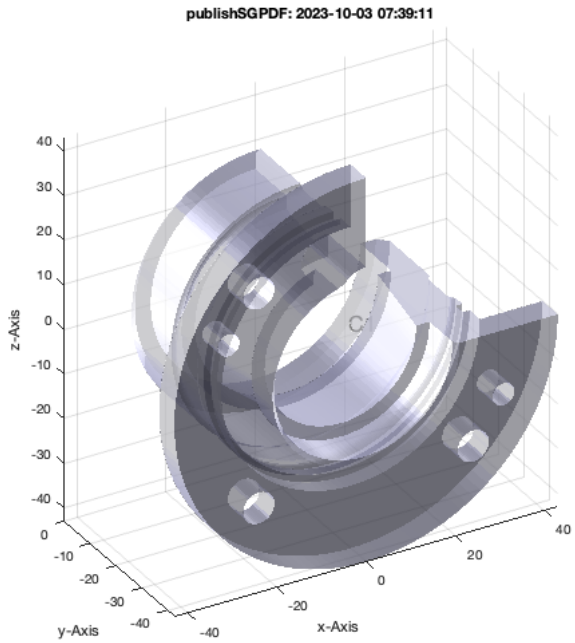
```
SGfigure; SGsurfaceplot(SG1); view(-30,30);
```



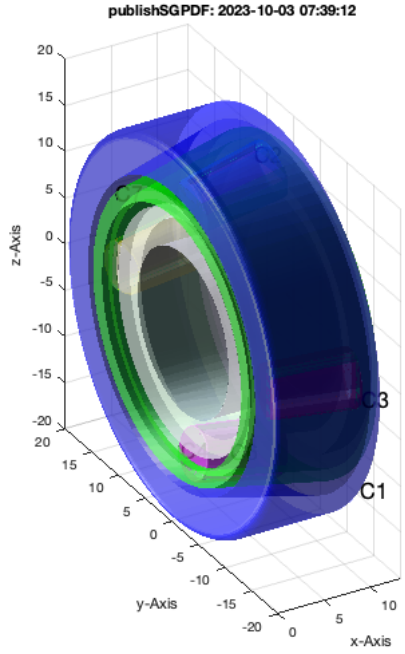

```
SGfigure; SGsurfaceplot(SG2); view(-30,30);
```



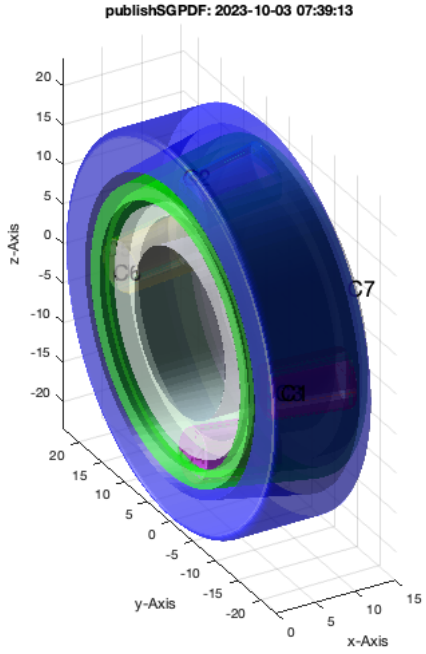

```
SGfigure; SGsurfaceplot(SG3); view(-30,30);
```



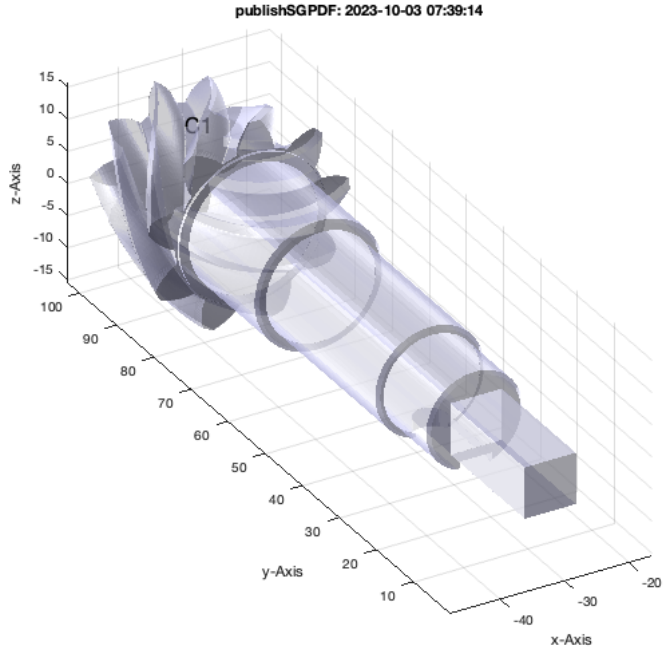

```
SGfigure; SGsurfaceplot(SG4); view(-30,30);
```




```
SGfigure; SGsurfaceplot(SG5); view(-30,30);
```

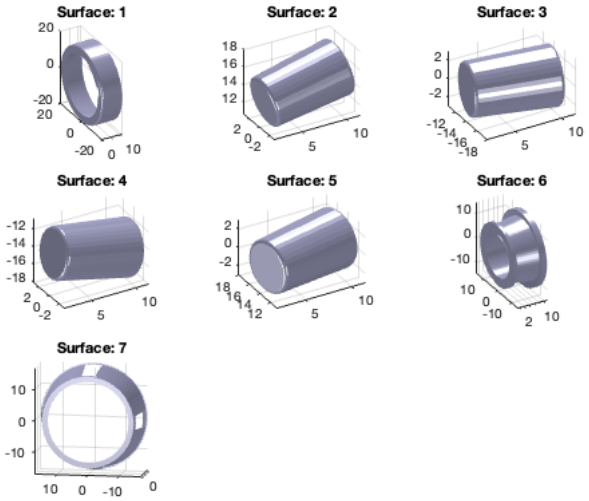



```
SGfigure; SGsurfaceplot(SG6); view(-30,30);
```



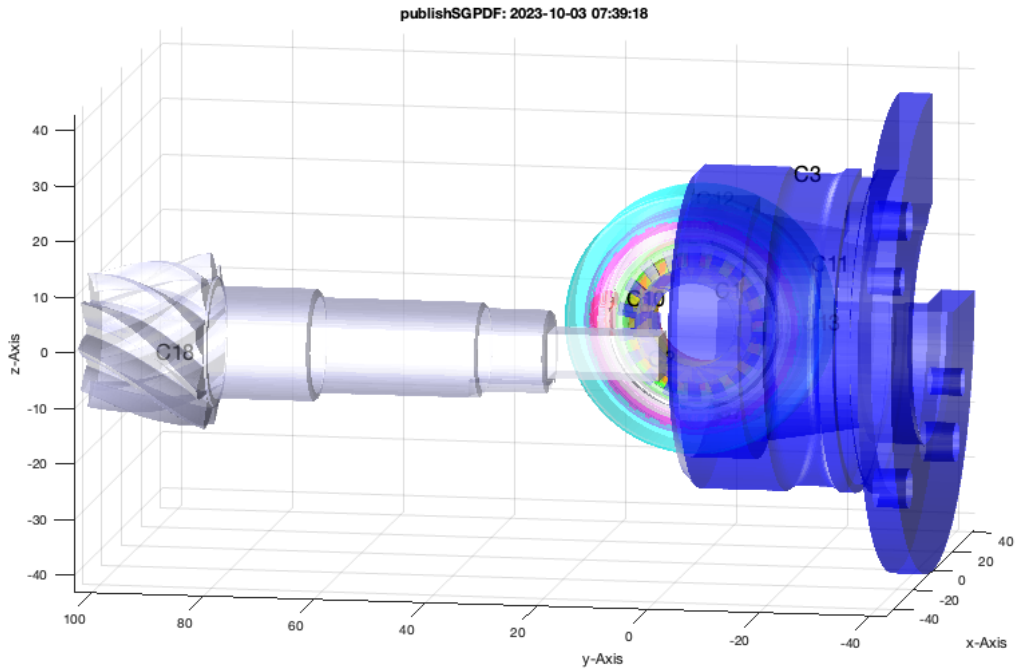
1. Show all separated surfaces that are part of a Solid

```
SGseparate(SG4); view(-80,10);
```



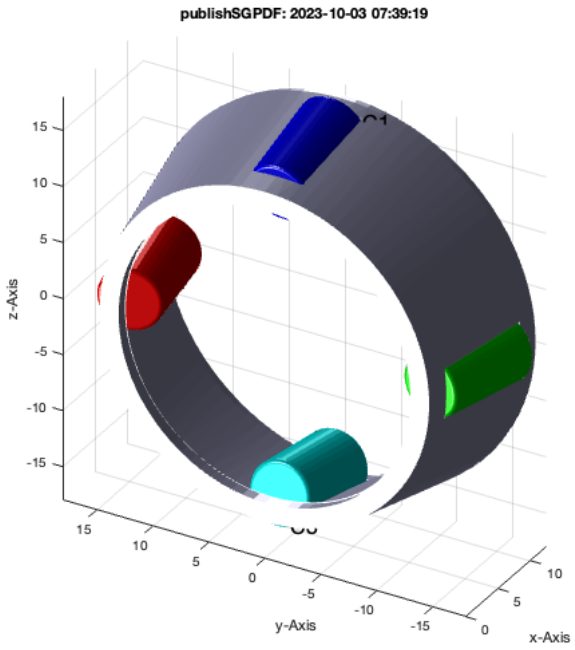
Show all surfaces in different colors

```
SGsurfaces(FZG); view(-80,10);
```



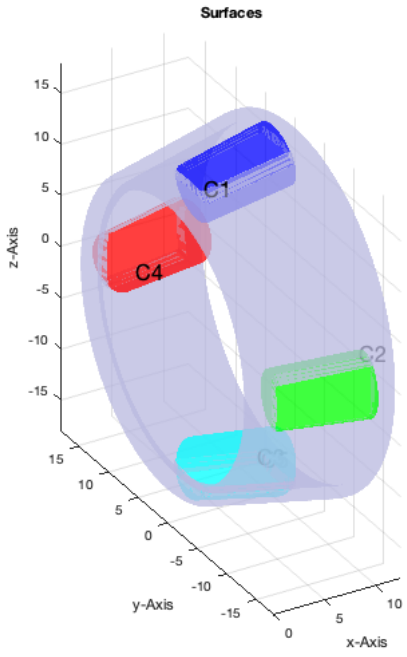
2.Select some of the surfaces

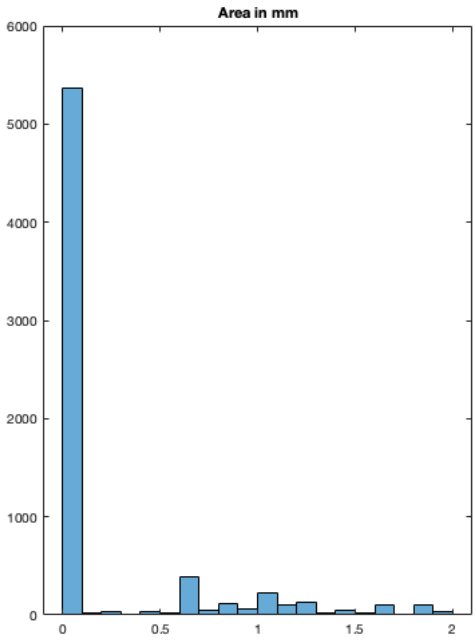
```
SGsurfaces(SG4,[2 3 4 5 7]); view(-60,30); VLFLplotlight(1,1);
```



3. Show the size of the surfaces as histogram

```
SGsurfacehistogram(SG4,[2 3 4 5 7]);
```





4. Show just a single solid

```
B=SGsurfaces(SG4)
```

```
B =
  7×1 cell array
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
```

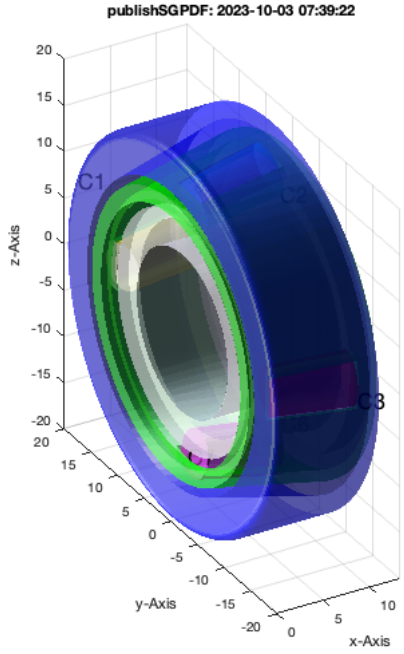
5. Shrink all convex parts

Now reduce al convex solids by 0.3 mm SG=SGreadSTL('30204-a.stl')

```
B=SGsurfaces(SG4)
for i=1:length(B)
    if SGisconvex(B{i})
        B{i}=SGgrow(B{i},-0.3);
%         B{i}=SGofVLdelaunay(B{i}.VL); % Just to show convex solids
    end
end


SGsurfaces(B);
```

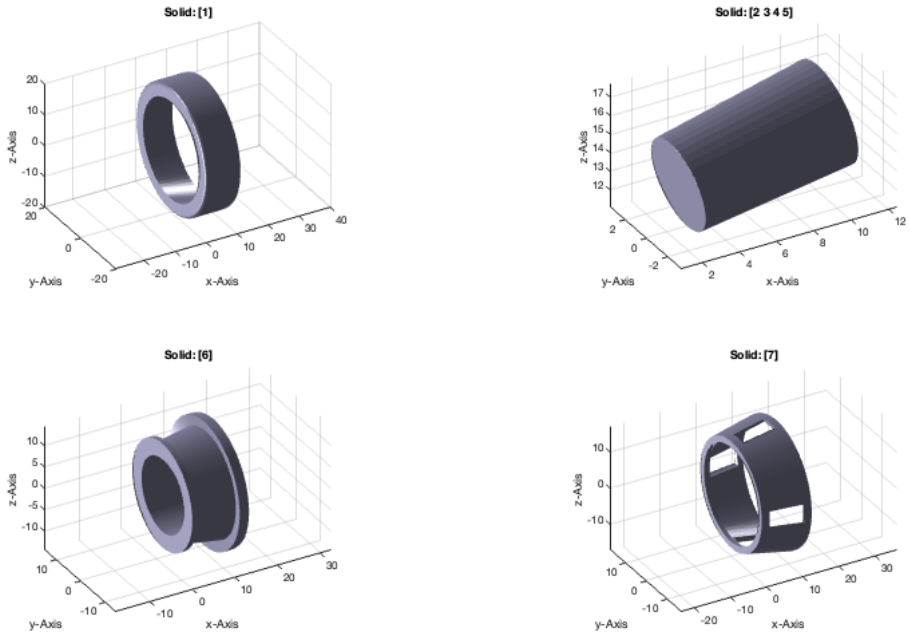
```
B =
  7×1 cell array
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
    {1×1 struct}
```



6. Print all surfaces in different STL files

```
SGwriteMultipleSTL(B)
```

```
SGwriteMultipleSTL: Writing 7 STL files in <a href = "matlab: openbydoubleclick ('/Users/timlueth/Desktop/STLmult publishSGPDF B_(2023-10-03)')">/Users
ans =
    '/Users/timlueth/Desktop/STLmult publishSGPDF B_(2023-10-03)/'
```



Show the written files on disk

```
dir ([desktopdir expname])  %
```

```
'/Users/timlueth/Desktop/EXP-2023-10-03' not found. Check the path or file permissions.
```

Final remarks on toolbox version and execution date

```
VLFLlicense
```

```
This VLFL-Lib, Rel.  (2023-Oct-03), is for limited non commercial educational use only!
Licensee: Tim Lueth (Development Version)!
Please contact Tim Lueth, Professor at TU Munich, Germany!
WARNING: This VLFL-Lib (Rel. ) license will exceed at 06-Jul-2078 07:39:28!
Executed 03-Oct-2023 07:39:30 by 'timlueth' on a MACI64 using Mac OSX 13.6 | R2023a Update 5 | SG-Lib 5.4
======================================== Used Matlab products: ========================================
distrib_computing_toolbox
map_toolbox
matlab
================================================================================================
```

- *Tim Lueth, tested and compiled on OSX 10.11.6 with Matlab 2016b on 2017-03-29*

- _____, executed and published on 64 Bit PC using Windows with Matlab 2015a on 2015-xx-xx_

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