

Tutorial 38: Some more solid geometry modelling function

2017-07-24: Tim C. Lueth, MIMED - Technische Universität München, Germany (URL: <http://www.mimed.de>) - Last Change: 2017-07-25

Contents

- [Complete List of all Tutorials with Publishable MATLAB Files of this Solid-Geoemtries Toolbox](#)
- [Motivation for this tutorial: \(Originally SolidGeometry 4.0 required\)](#)
- [1. Some elements of medical equipemnt in the operating room](#)
- [or select a c-arm device](#)
- [2. Creating solids as links with spheres at the end](#)
- [3. Creating Solids by connecting two CPLs with enclosed contours](#)
- [4. Creating Solids by connecting two planar CPLs of different strucure](#)
- [5. Creating branches between two contour](#)
- [6. Chamfer the edges of a solid](#)
- [7. Creating a drawing temmplate](#)
- [8. Separating an solid into peaces](#)
- [9. create a solid surface from an open surface](#)
- [Final Remarks](#)

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

The following topics are covered an explained in the specific tutorials:

- Tutorial 01: First Steps Using the VLFL-Toolbox for Solid Object Design
- Tutorial 02: Using the VLFL-Toolbox for STL-File Export and Import
- Tutorial 03: Closed 2D Contours and Boolean Operations in 2D
- Tutorial 04: 2½D Design Using Boolean Operators on Closed Polygon Lists (CPL)
- Tutorial 05: Creation, Relative Positioning and Merging of Solid Geometries (SG)
- Tutorial 06: Relative Positioning and Alignment of Solid Geometries (SG)
- Tutorial 07: Rotation of Closed Polygon Lists for Solid Geometry Design
- Tutorial 08: Slicing, Closing, Cutting and Separation of Solid Geometries
- Tutorial 09: Boolean Operations with Solid Geometries
- Tutorial 10: Packaging of Sets of Solid Geometries (SG)
- Tutorial 11: Attaching Coordinates Frames to Create Kinematik Models
- Tutorial 12: Define Robot Kinematics and Detect Collisions
- Tutorial 13: Mounting Faces and Conversion of Blocks into Leightweight-structures
- Tutorial 14: Manipulation Functions for Closed Polygons and Laser Cutting (SVG)
- Tutorial 15: Create a Solid by 2 Closed Polygons
- Tutorial 16: Create Tube-Style Solids by Succeeding Polygons
- Tutorial 17: Filling and Bending of Polygons and Solids
- Tutorial 18: Analyzing and modifying STL files from CSG modeler (Catia)
- Tutorial 19: Creating drawing templates and dimensioning from polygon lines
- Tutorial 20: Programmatically Interface to SimMechanics Multi-Body Toolbox
- Tutorial 21: Programmatically Convert Joints into Drives (SimMechanics)
- Tutorial 22: Adding Simulink Signals to Record Frame Movements
- Tutorial 23: Automatic Creation of a Missing Link and 3D Print of a Complete Model
- Tutorial 24: Automatic Creation of a Joint Limitations
- Tutorial 25: Automatic Creation of Video Titels, Endtitels and Textpages
- Tutorial 26: Create Mechanisms using Universal Planar Links
- Tutorial 27: Fourbar-Linkage: 2 Pose Syntheses and Linkage Export for 3D Printing
- Tutorial 28: Fourbar-Linkage: 3 Pose Syntheses and Linkage Export for 3D Printing
- Tutorial 29: Create a multi body simulation using several mass points
- Tutorial 30: Creating graphical drawings using point, lines, surfaces, frames etc.
- Tutorial 31: Importing 3D Medical DICOM Image Data and converting into 3D Solids
- Tutorial 32: Exchanging Data with a FileMaker Database
- Tutorial 33: Using a Round-Robin realtime multi-tasking system
- Tutorial 34: 2D Projection Images and Camera Coordinate System Reconstruction

- Tutorial 35: Creation of Kinematic Chains and Robot Structures
- Tutorial 36: Creating a Patient-Individual Arm-Skin Protector-Shell
- Tutorial 37: Dimensioning of STL Files and Surface Data
- Tutorial 38: Some more solid geometry modelling function

Motivation for this tutorial: (Originally SolidGeometry 4.0 required)

```
function VLFL_EXP38
```

1. Some elements of medical equipemnt in the operating room

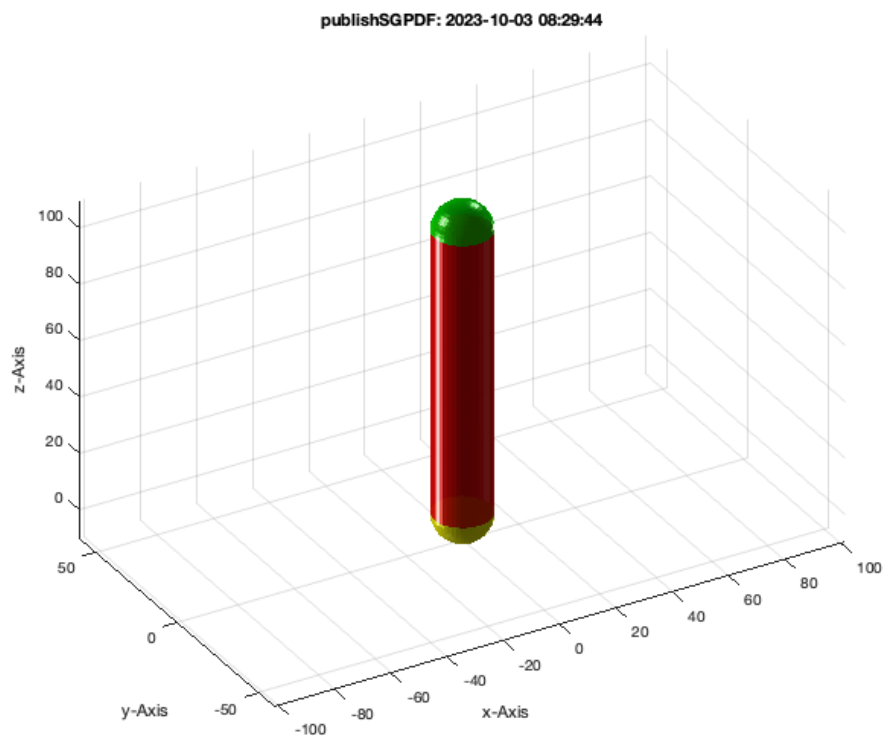
```
SGmodelOR;
```

or select a c-arm device

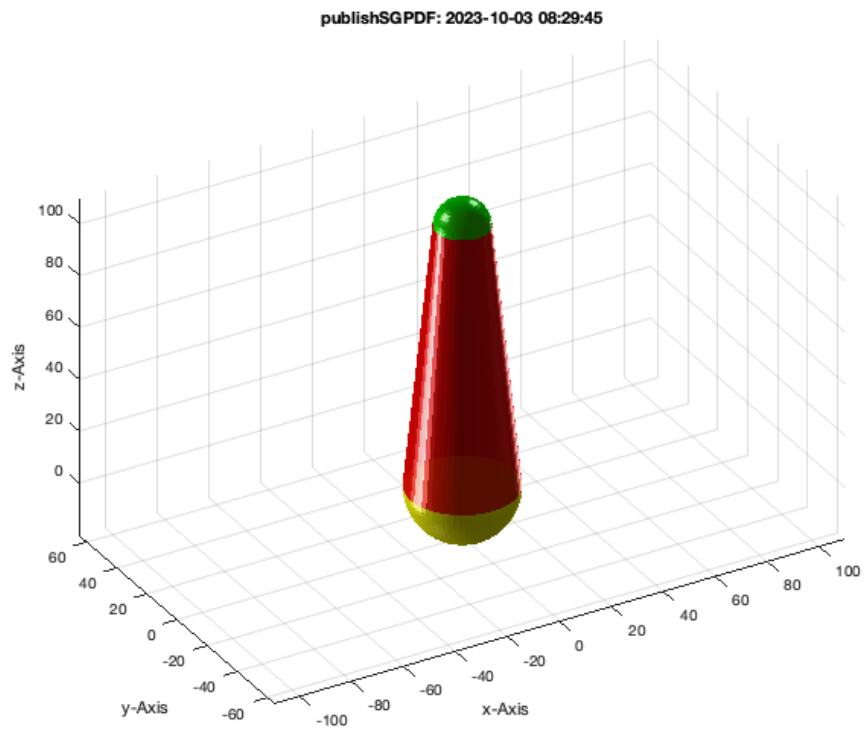
```
SGmodelOR(3)
```

2. Creating solids as links with spheres at the end

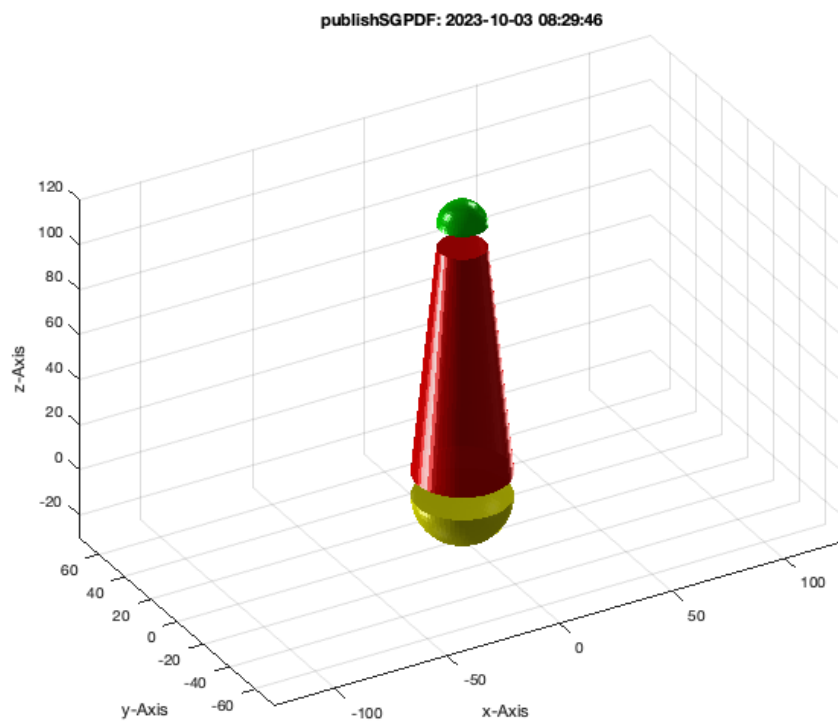
```
SGsphereLink (100,10);
```



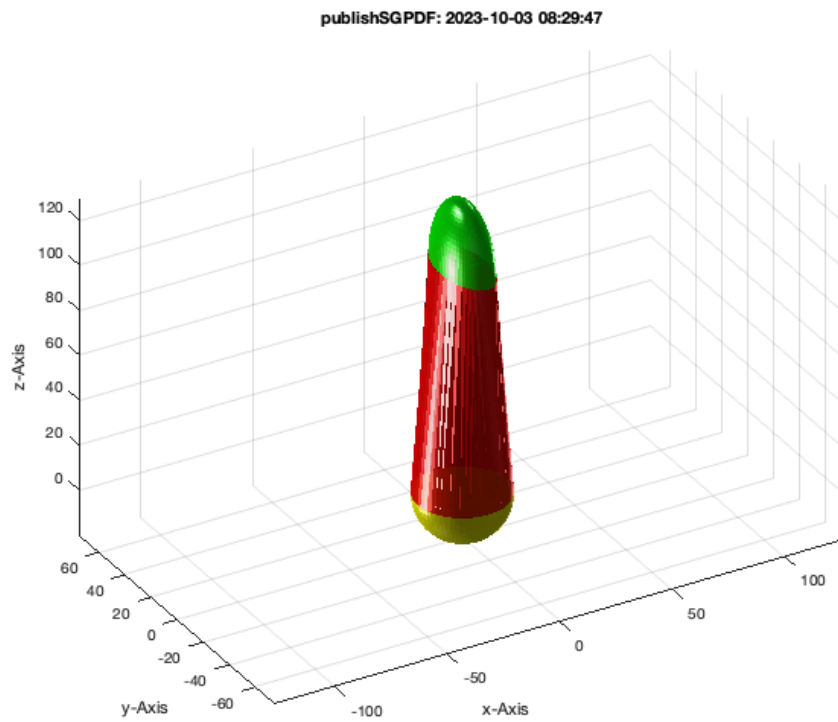
```
SGsphereLink (100,10,20);
```



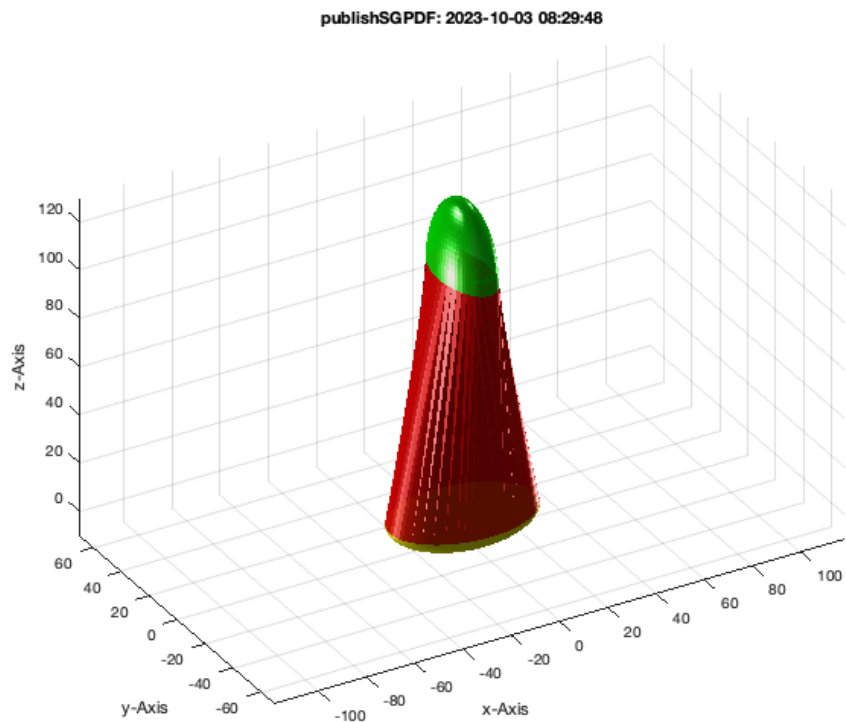
```
SGsphereLink (100,10,20,-10);
```



```
SGsphereLink (100,[10,20,30],20);
```

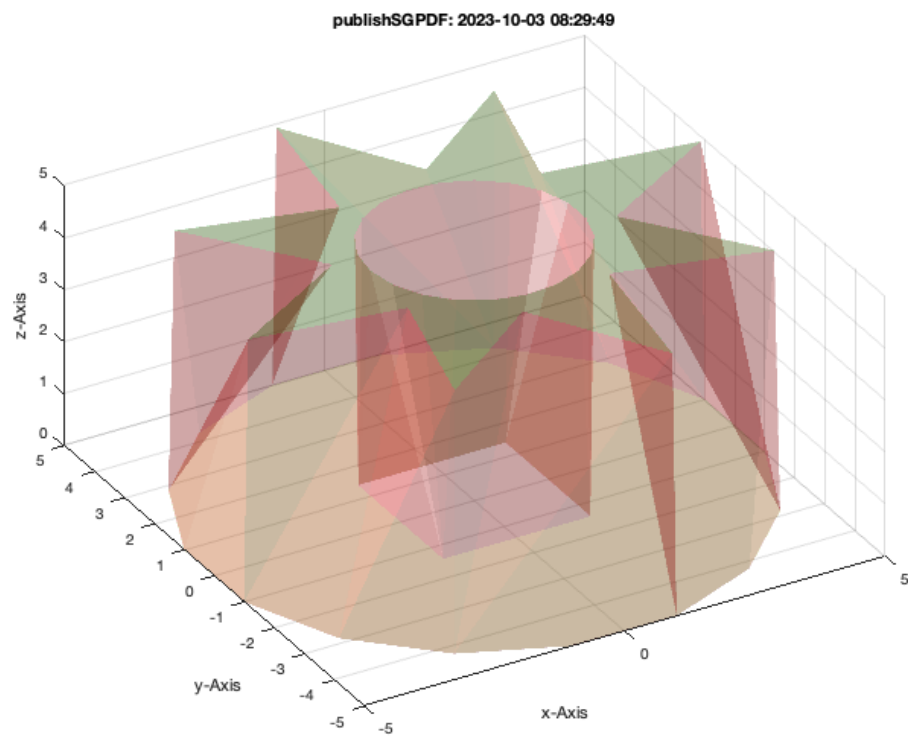


```
SGsphereLink (100,[10,20,30],[30,20,10]);
```



3. Creating Solids by connecting two CPLs with enclosed contours

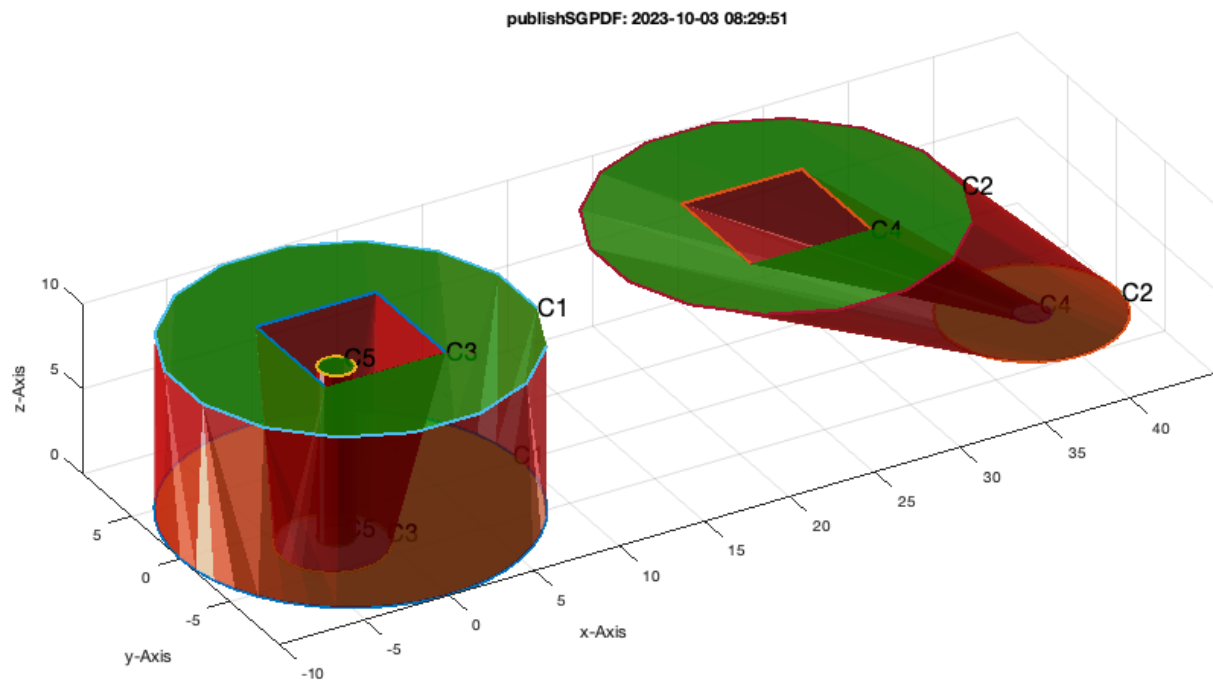
```
CPA=[PLcircle(5.1,16);NaN NaN; PLcircle(2,4)];  
CPB=[PLstar(5,16,[],[],[],0.5);NaN NaN; PLcircle(2)];  
SGof2CPLsz(CPA,CPB,5); VLFLplotlight(1,0.2);
```



4. Creating Solids by connecting two planar CPLs of different structure

```
SGof2CPLzheurist(CPLsample(26),CPLsample(27),10)
```

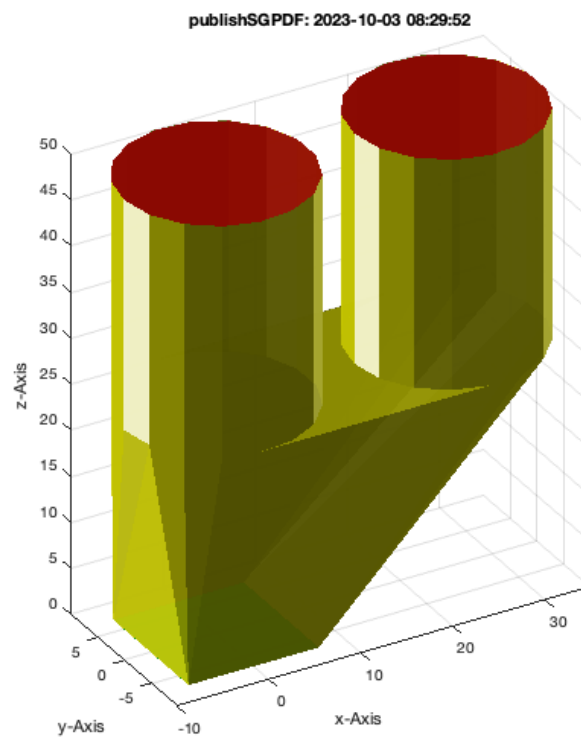
```
ans =  
  struct with fields:  
  
    VL: [188x3 double]  
    FL: [372x3 double]  
    col: 'w'  
    alpha: 0.9000
```



5. Creating branches between two contour

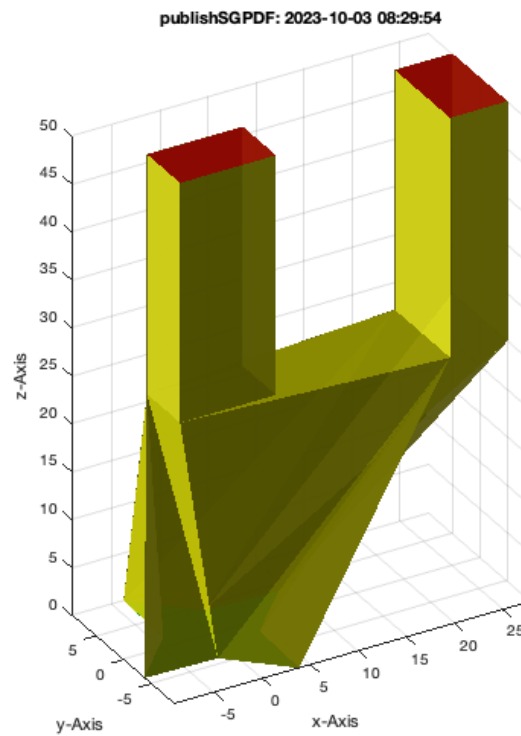
```
SGof2CPLzbranch(CPLsample(2), CPLsample(9),50)
```

```
ans =  
struct with fields:  
  
VL: [72x3 double]  
FL: [140x3 double]
```

```
SGof2CPLzbranch(CPLsample(6), CPLsample(10),50)
```

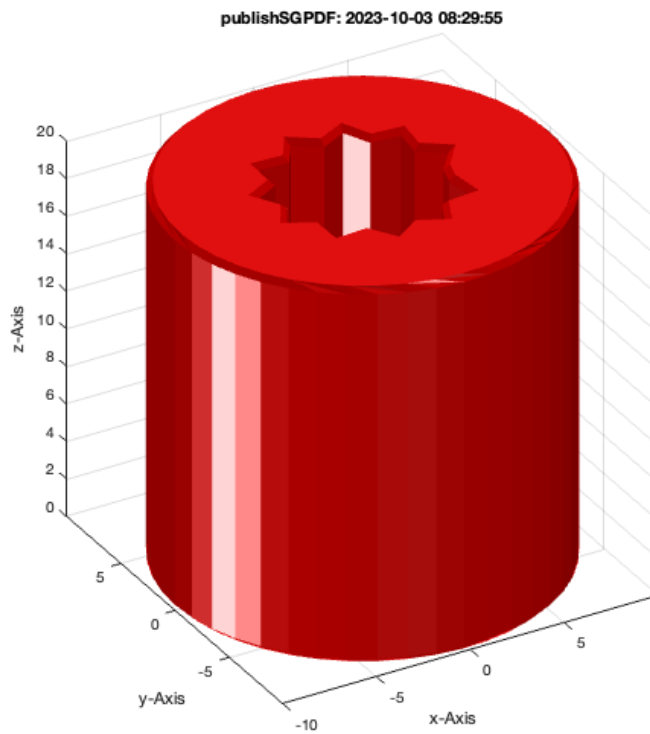
```
ans =  
struct with fields:  
  
VL: [24×3 double]  
FL: [44×3 double]
```



6. Chamfer the edges of a solid

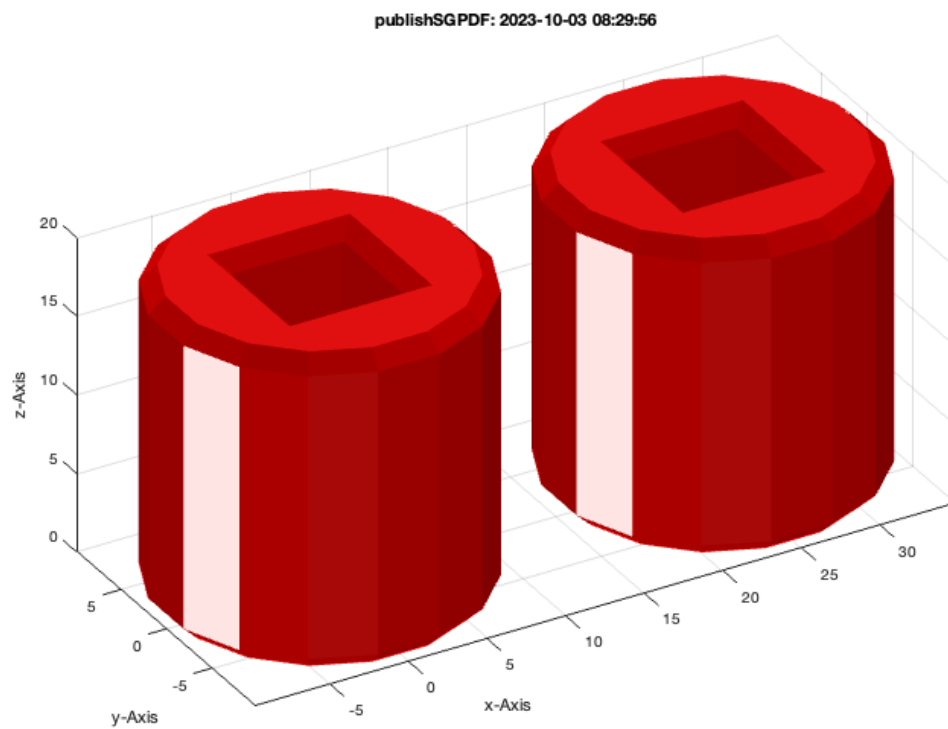
```
SGofCPLzchamfer([PLcircle(10);NaN NaN;CPLofPL(PLstar(5))],20)
```

```
ans =  
struct with fields:  
  
VL: [272×3 double]  
FL: [544×3 double]
```



```
SGofCPLzchamfer(CPLsample(12),20,1)
```

```
ans =  
1x2 cell array  
    {1x1 struct}    {1x1 struct}
```



7. Creating a drawing template

```
SGdrawingtemplateofCPL(CPLoftext('test'),'','','','','',true)
```

Drawing template is separated

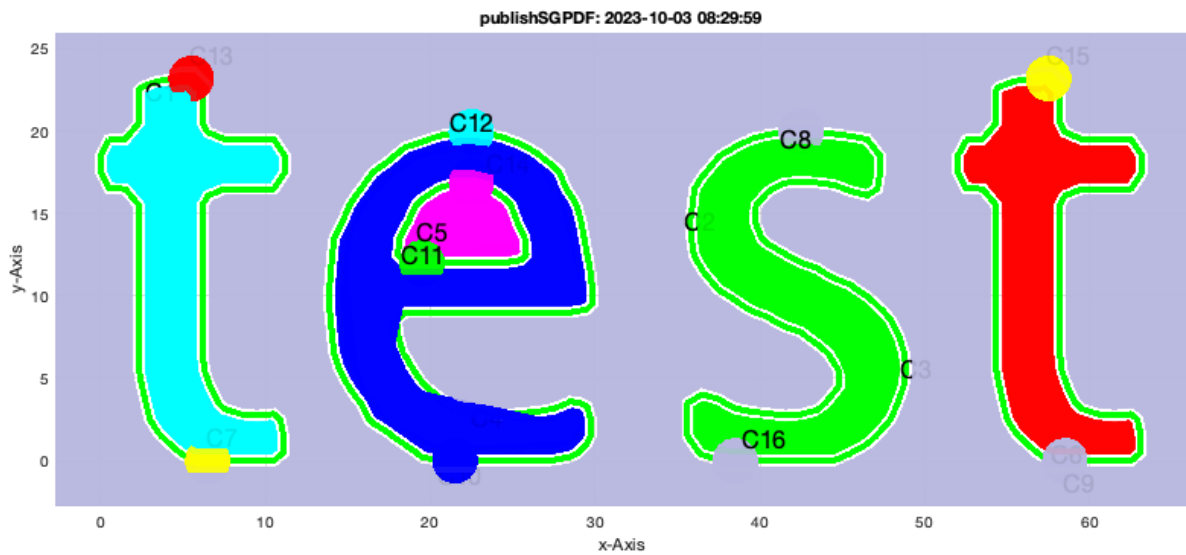
ans =

struct with fields:

VL: [1469×3 double]

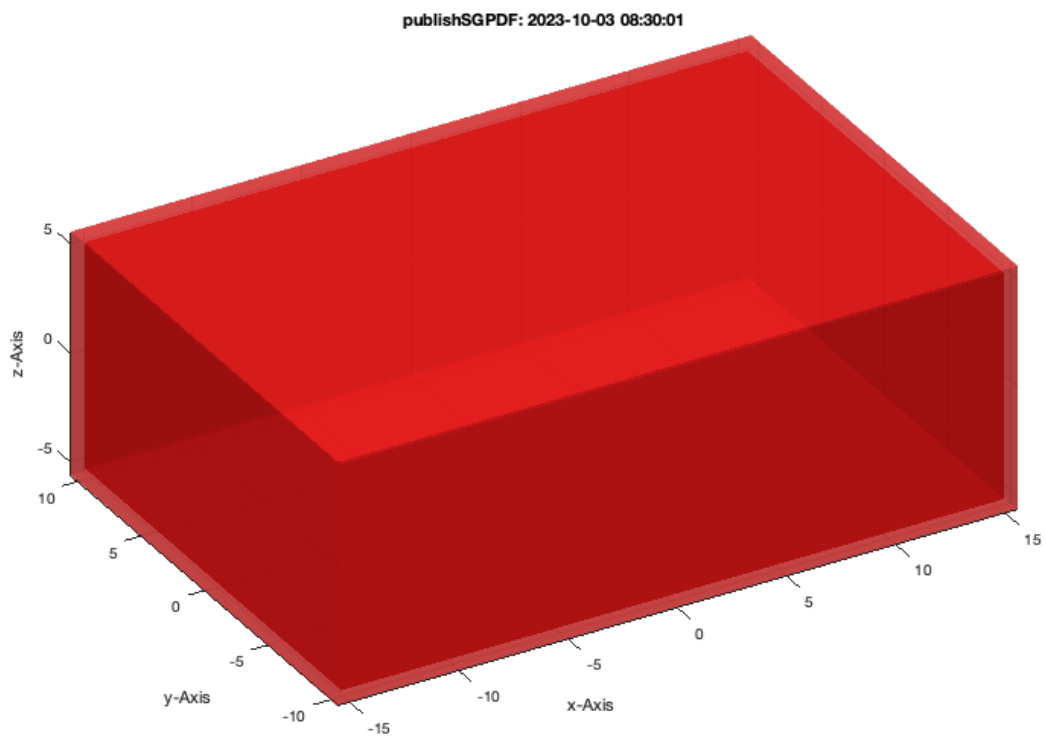
FL: [2894×3 double]

FC: [2894×3 double]



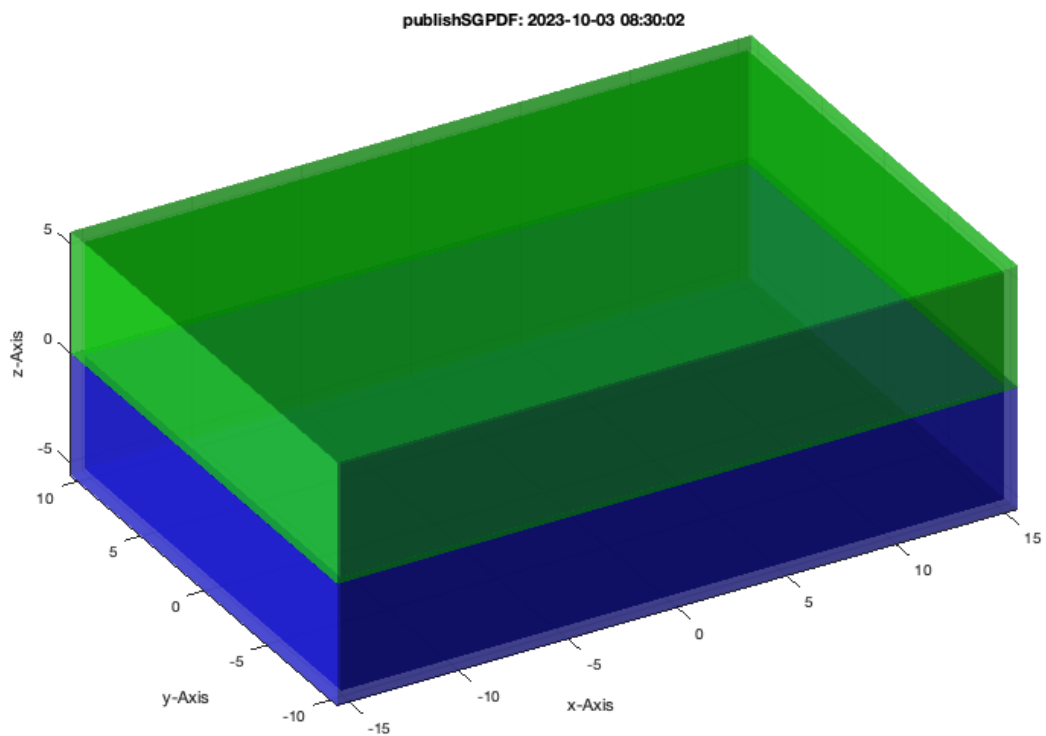
8. Separating an solid into peaces

```
SG=SGhollowsolid(SGbox([30,20,10]));
SGfigure(-30,30); SGplotalpha(SG,'',0.5);
```



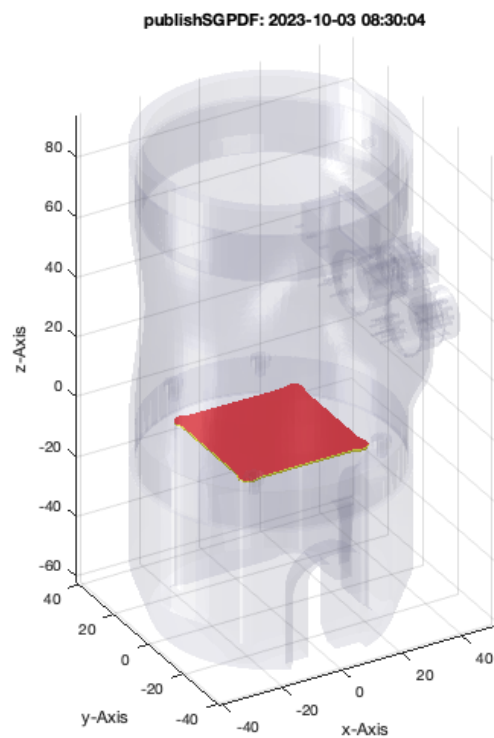
```
SGpuzzlecut3D(SG,[1 1 0.5]); VLFLplotlight(1,0.5); view(-30,30);
```

50% 100%



9. create a solid surface from an open surface

```
load JACO_robot.mat
VLFLoofSGTsurface(JC0, 'B'); SGplotalpha(JC0, 'w', 0.1);
```



Final Remarks

```
close all
VFLLicense
```

This VFL-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 VFL-Lib (Rel.) license will exceed at 06-Jul-2078 08:30:05!

Executed 03-Oct-2023 08:30:07 by 'timlueth' on a MACI64 using Mac OSX 13.6 | R2023a Update 5 | SG-Lib 5.4

===== Used Matlab products: =====

```
database_toolbox
distrib_computing_toolbox
fixed_point_toolbox
image_toolbox
```



```
map_toolbox  
matlab  
simmechanics  
simscape  
simulink
```

=====

Published with MATLAB® R2023a