

Tutorial 37: Dimensioning of STL Files and Surface Data

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Contents

- [Complete List of all Tutorials with Publishable MATLAB Files of this Solid-Geometries Toolbox](#)
- [Motivation for this tutorial: \(Originally SolidGeometry 4.0 required\)](#)
- [1. Basic functions for dimensioning](#)
- [2. Classifying 3D Contours](#)
- [3. Finding Surfaces and Contours for Dimensioning](#)
- [4. Interactive specifying faces and coordinate systems](#)
- [5. Dimensioning of border of surfaces: SGdimensioning](#)
- [6. Creating of standard dimensioning using view angles: SGdimensioning](#)
- [7. Creating of standard dimensioning using view angles and cross cuts](#)
- [8. Using frames for dimensioning](#)
- [Final Remarks](#)

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

The following topics are covered and 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 Lightweight-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

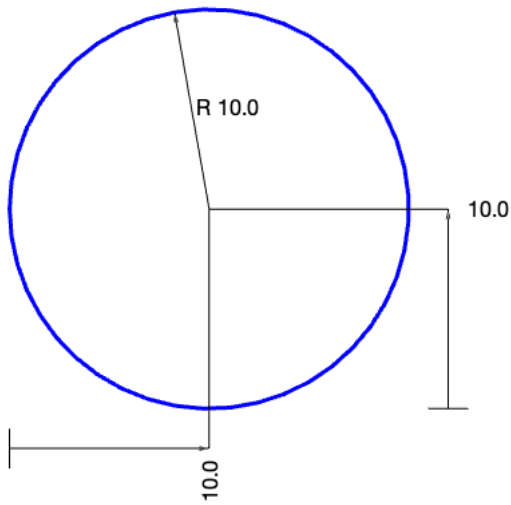
Motivation for this tutorial: (Originally SolidGeometry 4.0 required)

If you use an STL file from the third page, then certain dimensions have been used which have an influence on a constructions. In this tutorial you will find the function to analyze STL files and to draw technical drawings for these surfaces.

1. Basic functions for dimensioning

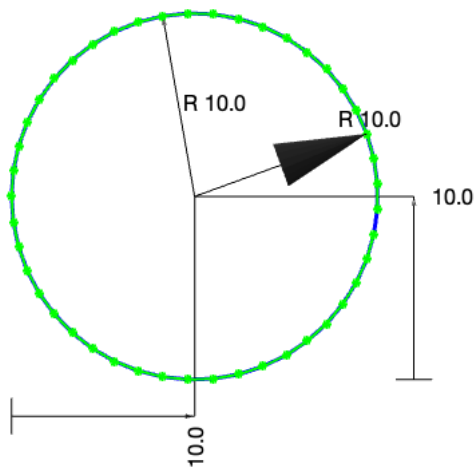
PLdimensioning creates complete drawings for a single Point list. it should be used as a drawing function

```
PL=PLcircle(10);
PLdimensioning(PL);
```



CVLdimclassifier is an auxiliary function that creates results for PLdimensioning. It should be used for calculating features and supports CVL in 3D too. It returns points that are not part of a circle/ellipse and a list of circles and a list which vertices belong to circles and the normal vectors for the circles

```
CVLdimclassifier(PL); axis normal; axis equal;
```



```
[DVL,RL,RIL,Rnv]=CVLdimclassifier(PL)
```

```
DVL =
0x3 empty double matrix
RL =
Columns 1 through 7
    0    0    0  45.0000  360.0000  10.0000  7.1934
Columns 8 through 9
    6.9466    0
RIL =
1
1
1
1
1
1
1
1
1
1
1
```

```

1
1
1
1
1
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1
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1
1
1
1
1
1
1
1
1
1
1
1
1
1
Rnv =
0      0     -1

```

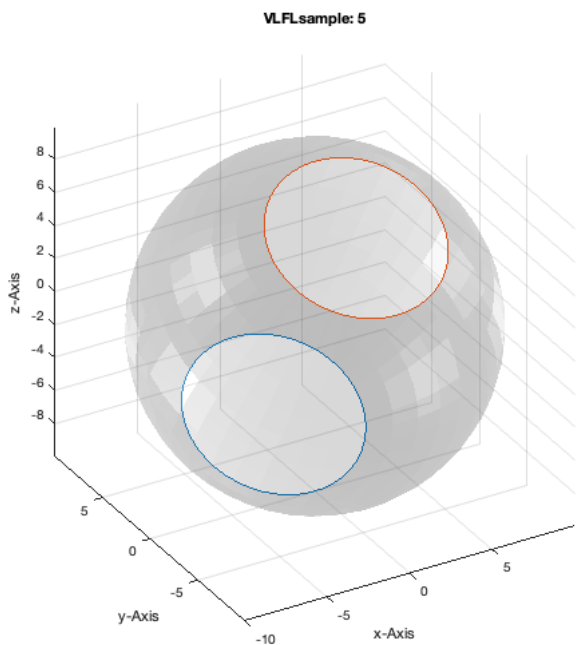
2. Classifying 3D Contours

`% *CVLdimclassifier*` is able to classify several independent contours in 3D space as CVL.

```

VFLsample(5); VFLplotlight (1,0.2);
[~,~,~,CVL]=VFLsample(5);
CVLplot(CVL, '-');

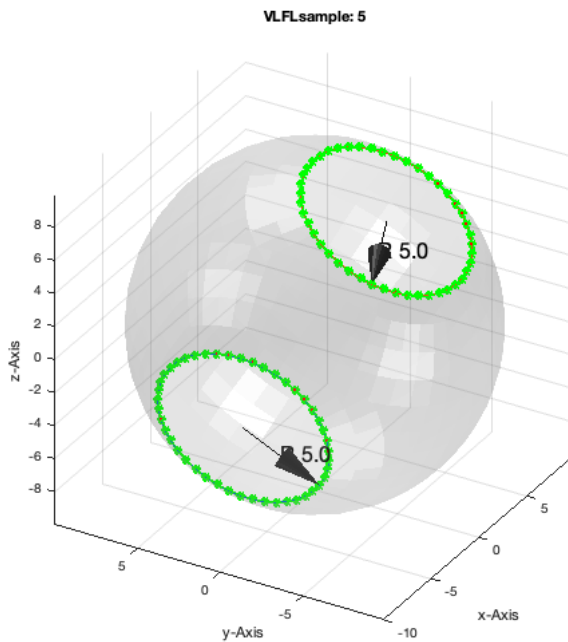
```



```

CVLdimclassifier(CVL); view(-60,30);

```

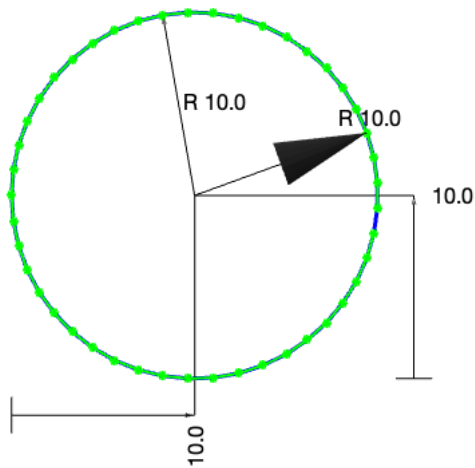


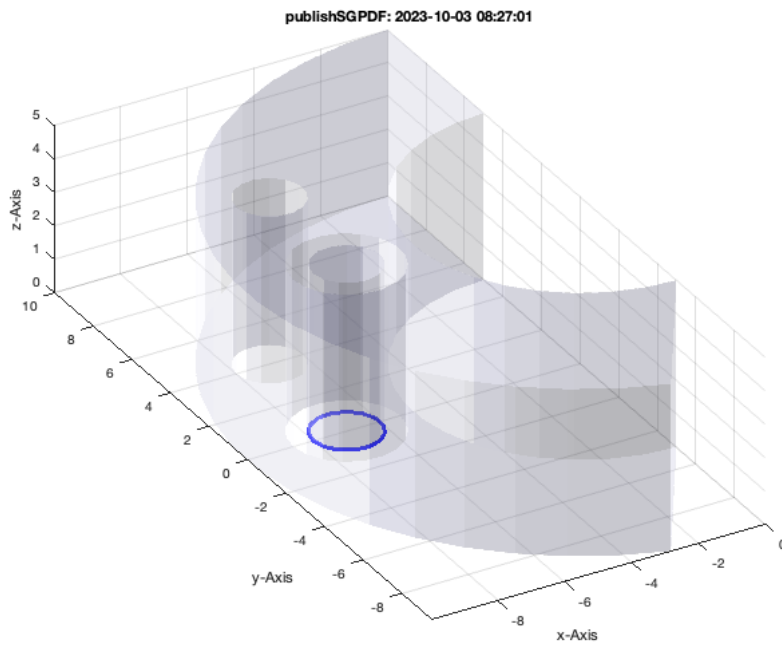
3. Finding Surfaces and Contours for Dimensioning

There are not several functions that help to define surfaces for dimensioning similar to featureedges we see feature surfaces to separate surfaces if a solid

- **TR3mountingfaces** - finds connected surfaces starting from one or more faces
- **MLOfSG** is a similiar function for a complete solid
- **surfacesofSG** - generates features surfaces of ONE closed solid
- **TR3neighborsAngle** and **neighborsAngleSurface** - find feature surfaces
- **FSofSG** supports also cells of solids

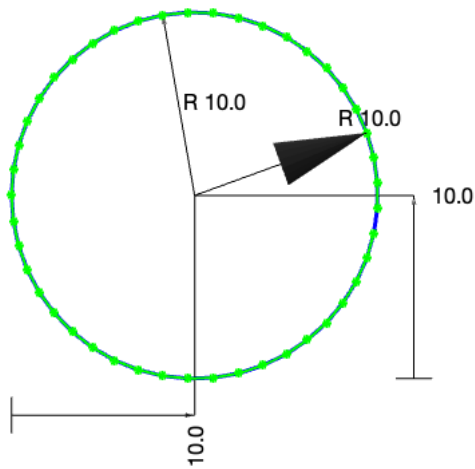
```
TR3mountingfaces(SGsample(25),1); % facets, normals, neighbors, radial list, CVL of ONE surface
```

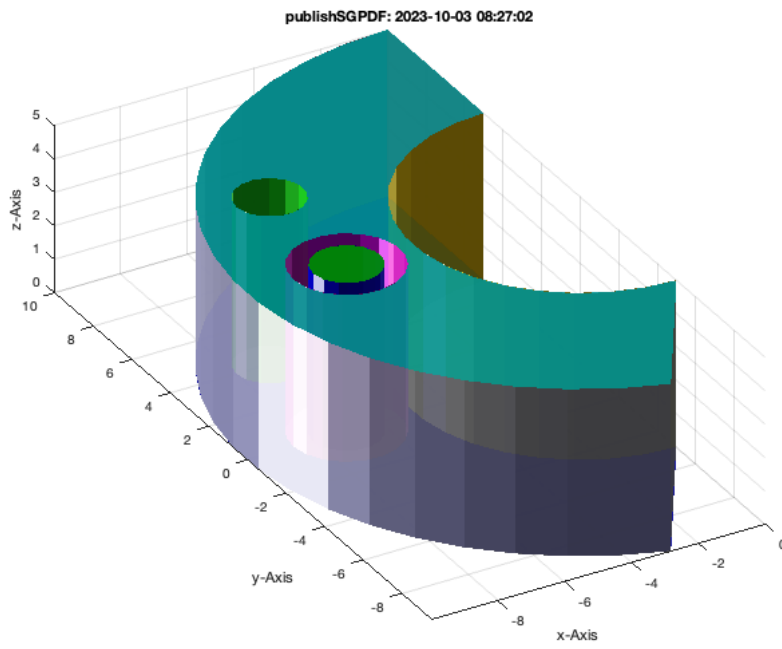




```
surfacesofSG(SGsample(25)); % facet index, normals, angles, neighbors, area
```

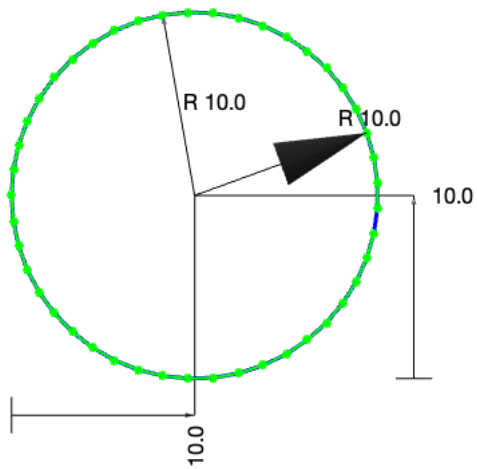
11 Feature Surfaces found! Only the largest 99% (0..143mm²), i.e. 11 of 11 are shown.

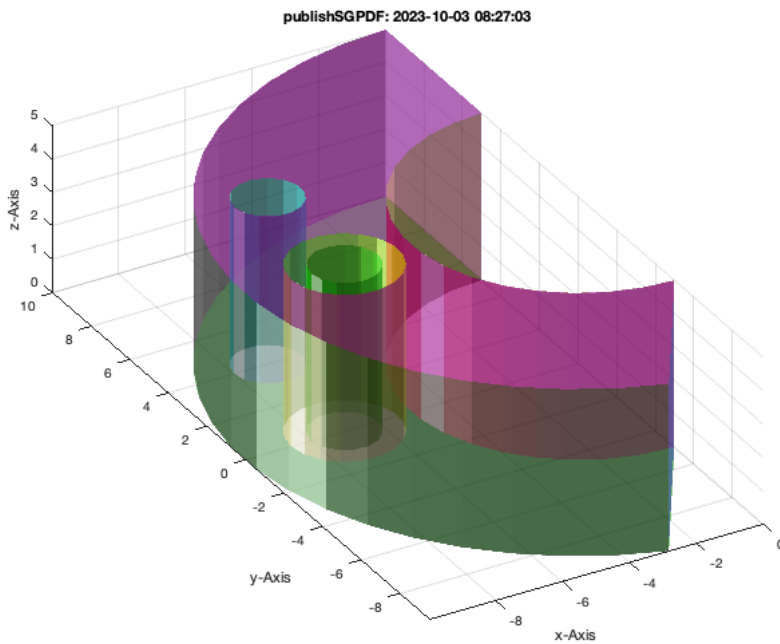




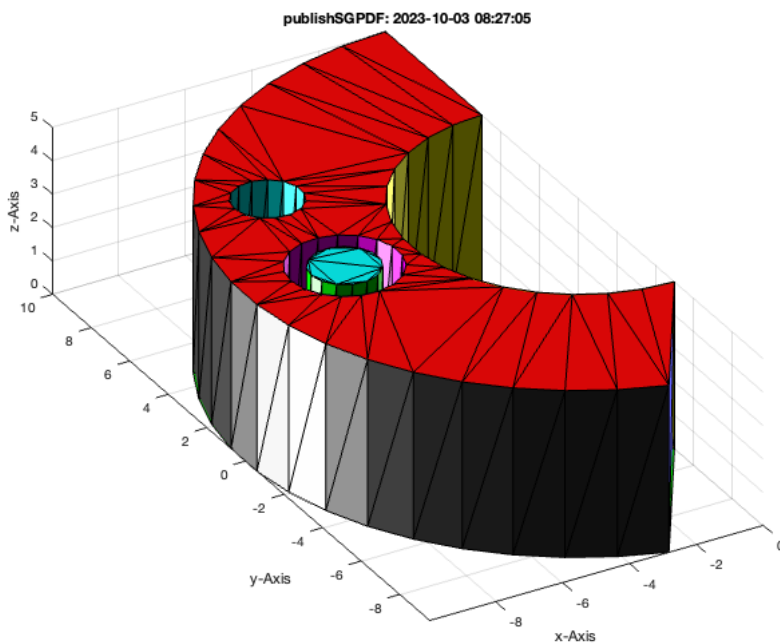
```
FSofSG(SGsample(25)); % surface index list
```

FSofSG: Only 9/11 feature surfaces larger than Amin=10mm are shown! The returned surface list is always complete!





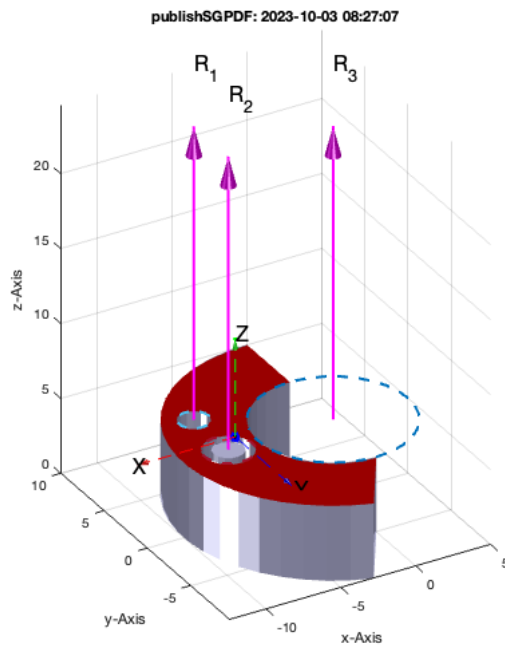
```
MLOfSG(SGsample(25));
```



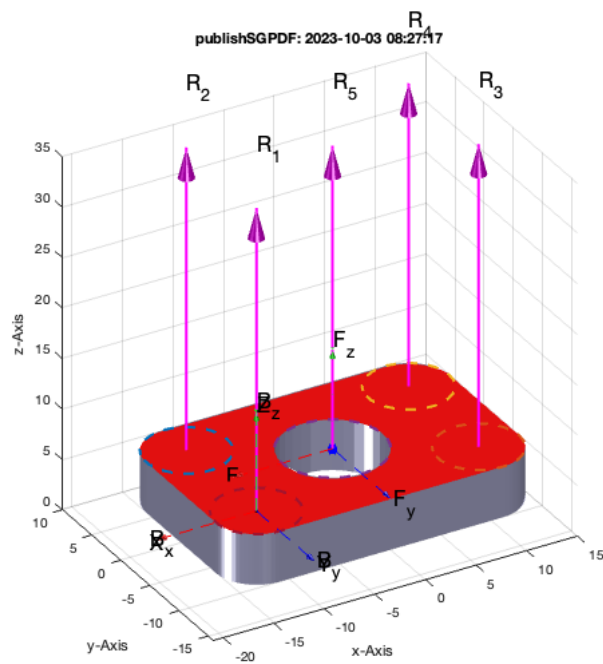
4. Interactive specifying faces and coordinate systems

We already used in a nearlier tutorial(VLFL_EXP11) the function SGTui to specify coordinate system for planar surfaces or edges. By using the third parameter if SGTui, it is possible to make a feature surface search. A common value is 1 rad ~ 60 degree. The function is able to detect radial structures using CVLdimclassifier and allow to address other coordinate systems too.

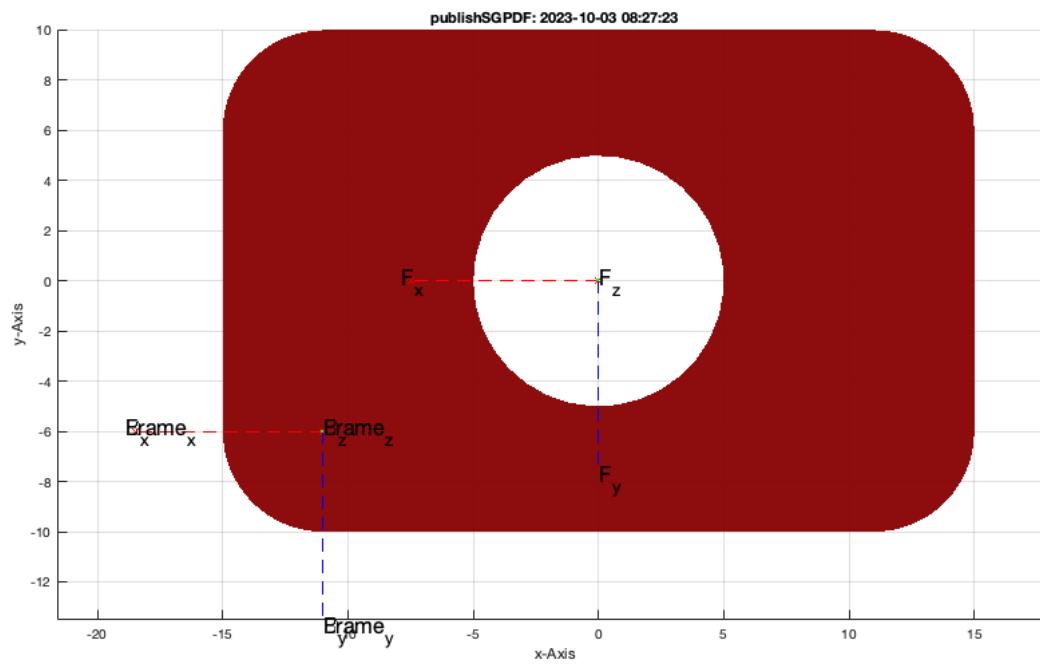
```
SGTui(SGsample(25), 'Frame', 1);
```



```
SG=SGTui(SGsample(27), 'Frame', 1, 'R1');
```



```
SGfigure; SGTplot(SG);
```

5. Dimensioning of border of surfaces: SGdimensioning

```
SGTdimensioning(SG, 'Frame');
```