Exercise 12: Define Robot Kinematics and Detect Collisions

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1. Summary of the already explained aspects of the VLFL-Toolbox

In examples 1-11 we've learned about:

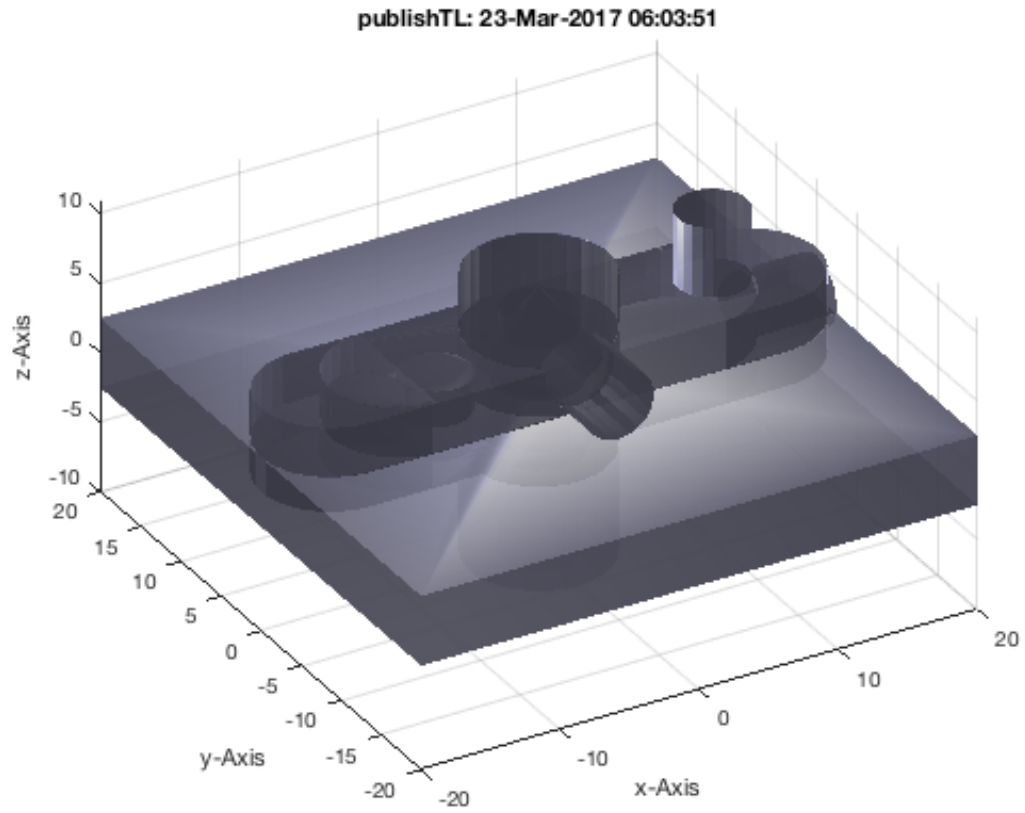
- *Point lists* (PL), *Vertex lists* (VL), *Facet lists* (VL), *Edge lists* (EL)
- Functions to import, check, and export of *STL-File* data
- Functions for generating text strings as solid volumes
- *Closed polygon lists* (CPL) for boolesche operations of contours
- 2.5D extrusion of closed polyogon list (CPL) to *Solid Geometries* (SG)
- Spatial transformation and merging of solid geometry sets
- Relative positioning of solids geometries and boolean operations on solids
- Packaging and boxing of several parts into a complete assemble kit
- Attaching coordinates frames for creation of Kinematik Models

2. Loading the 5 components of a 4DoF robot solid model as last time

Before explaining how to create the parts of a robot kinematik we just load such components in. The command line load AIM_robot

```
function VLFL_EXP12
```

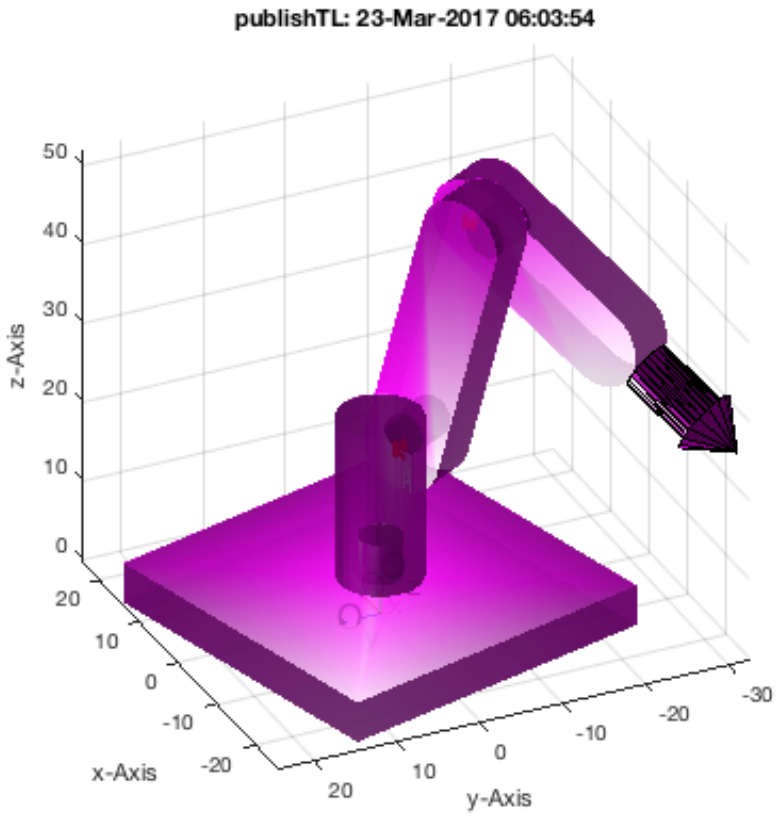
```
close all; SGfigure;
load ('AIM_SGrobot')
SG0=SGfixerrors(SG0,1e-3); SGchecker(SG0);
SG1=SGfixerrors(SG1,1e-3); SGchecker(SG1);
SG2=SGfixerrors(SG2,1e-3); SGchecker(SG2);
SG3=SGfixerrors(SG3,1e-3); SGchecker(SG3);
SG4=SGfixerrors(SG4,1e-3); SGchecker(SG4);
% save ('AIM_SGrobot','SG0','SG1','SG2','SG3','SG4','SGrobot');
VLFLplotlight(1,0.8);
```



3. Automatic creation of a the robot

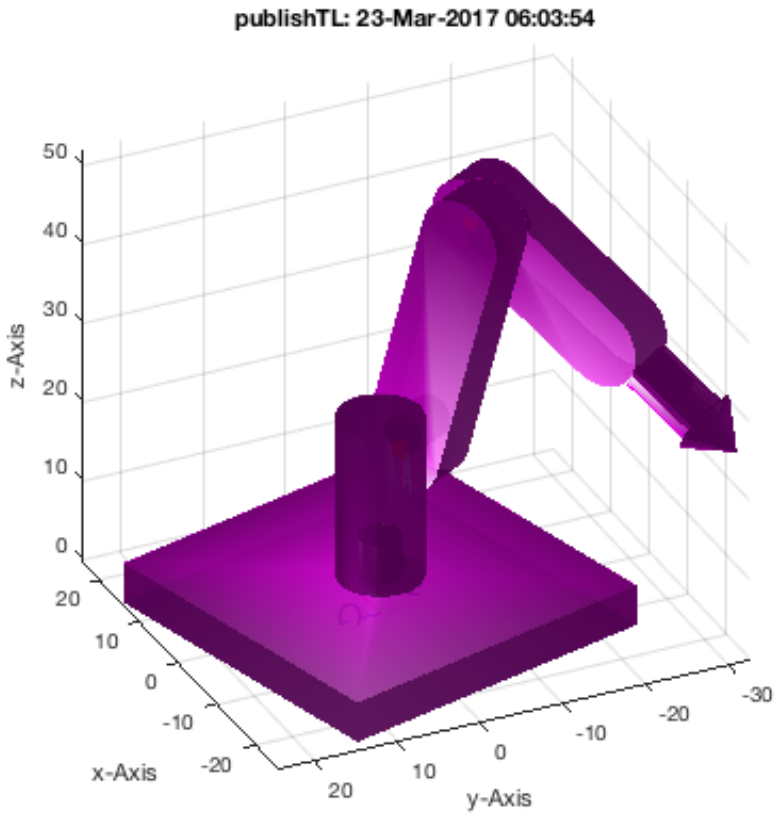
```
KMofSGs({SG0,SG1,SG2,SG3,SG4});
```

```
Warning in KMofSGs: 20 collisions found for tolerance: 0.10
```



3. Collision in the joint by the resolution of the surfaces

```
[KM,XVL]=KMofSGs({SG0,SG1,SG2,SG3,SG4},[],0.05);
KMplot(KM,'m'); VLFLplotlight (1,0.9);
```

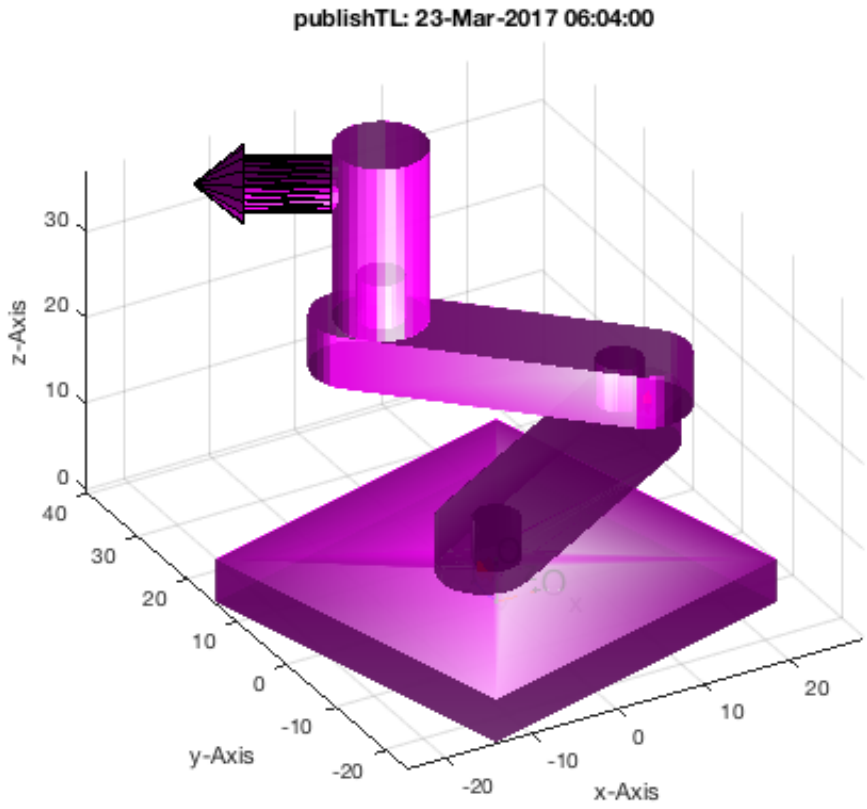



```
if ~isempty(XVL); zoompatch(XVL); VLplot(XVL,'k*',10);  end;
```

4. Showing a different robot

```
KMofSGs({SG0,SG2,SG2,SG1,SG4});
view(-30,30);
```

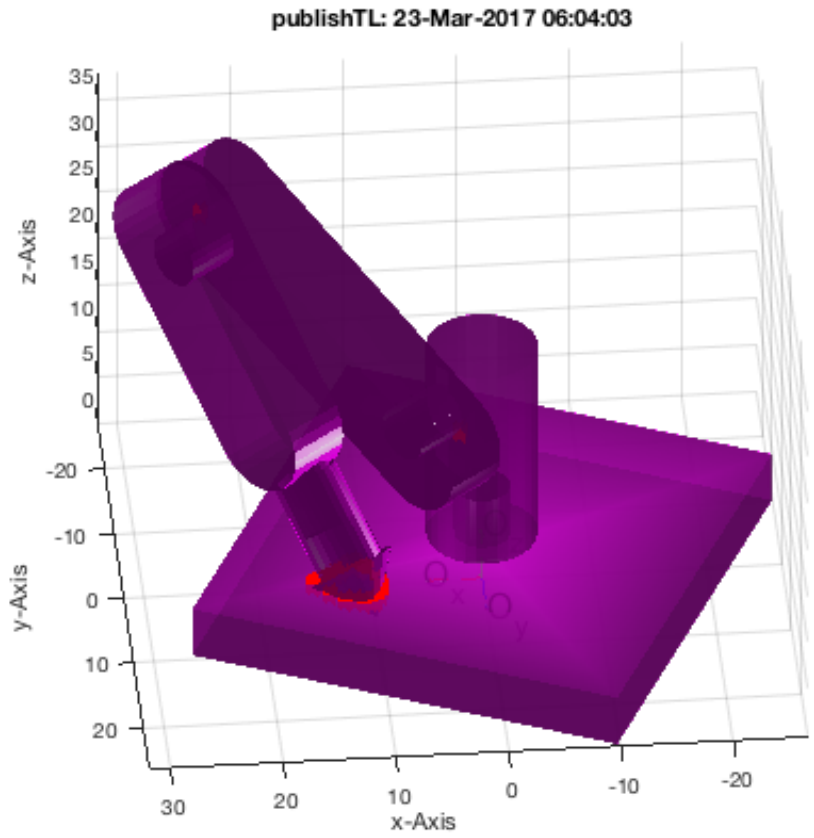
```
Warning in KMofSGs: 20 collisions found for tolerance: 0.10
```



5. Showing a self collision of a robot

```
KMofSGs({SG0,SG1,SG2,SG3,SG4},155);
view(-185,35); VLFLplotlight(1,0.8);
```

```
Warning in KMofSGs: 125 collisions found for tolerance: 0.10
```



Final remarks on toolbox version and execution date

```
VLFLlicense
```

```
This VLFL-Lib, Rel. 3.6 (2017-Mar-23), 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. 3.6) license will exceed at 25-Dec-2071 06:04:04!
Executed 23-Mar-2017 06:04:06 by 'lueth' using Matlab 9.1.0.441655 (R2016b) on a MACI64
======================================== Used Matlab products: ============================
==========
image_toolbox
map_toolbox
matlab
simmechanics
simscape
simulink
================================================================================================
==========
```

- *Tim Lueth, tested and compiled on OSX 10.7.5 with Matlab 2014b on 2015-06-08*
- _____, executed and published on 64 Bit PC using Windows with Matlab 2015a on 2015-xx-xx_

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