How to export a URDF file from SolidWorks and import it as a rigidbodytree in MATLAB

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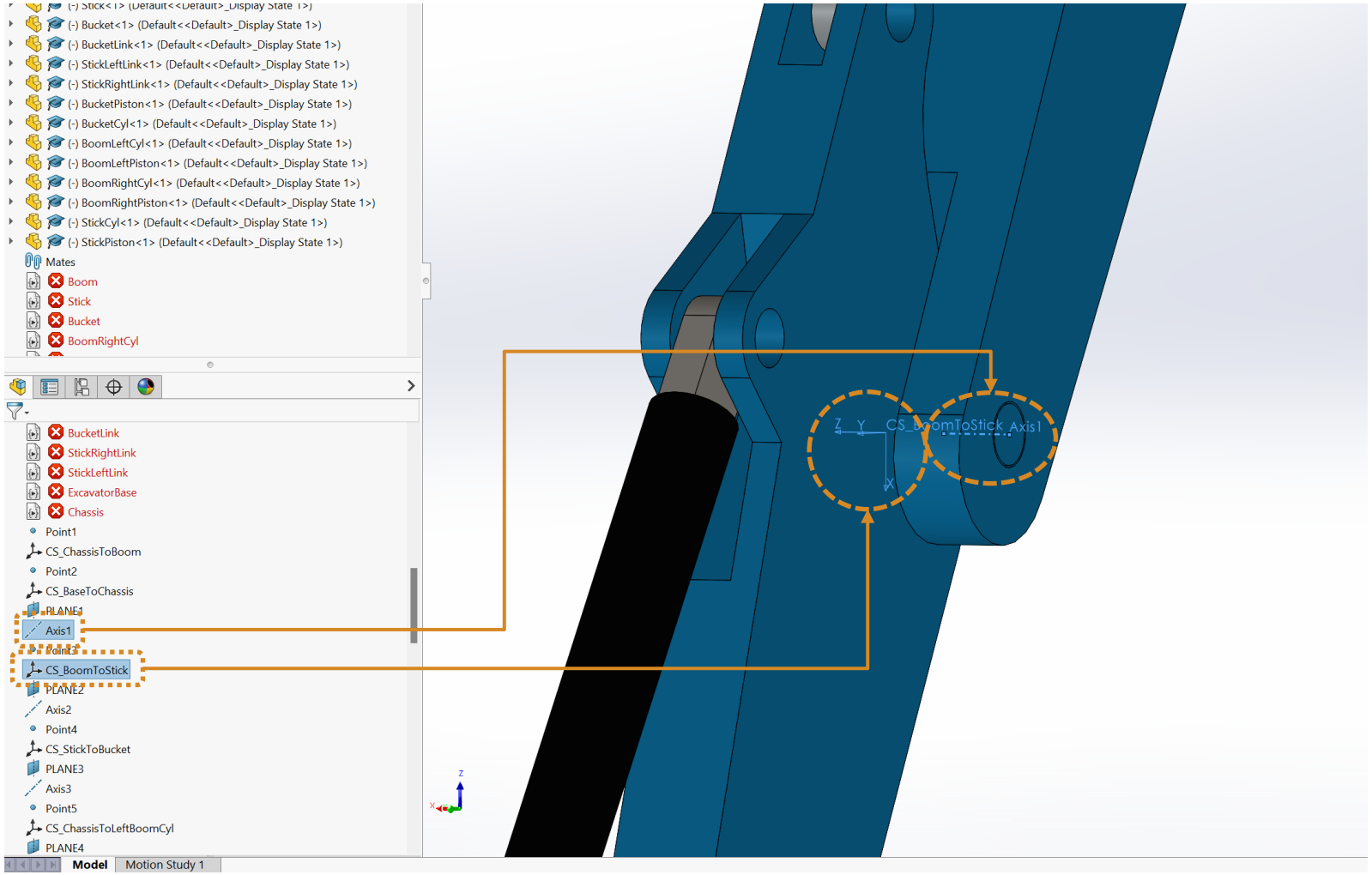
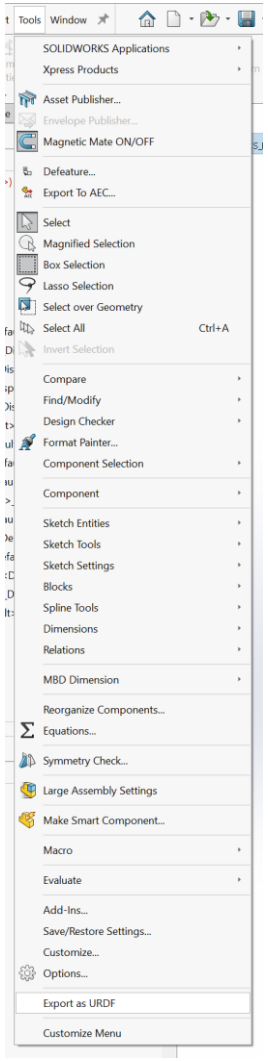
Prerequisites

- You must have a fully defined CAD model for your kinematic chain(s).
- Closed kinematic chains are not supported my URDF.
- The idea is to create a kinematic chain of rigid bodies which are connected by joints.
- There should be defined coordinate systems at the joint locations between the bodies.
- There should be defined axes for movement and rotation axes.
- The SolidWorks URDF exporter must be installed (sw_urdf_exporter - ROS Wiki).

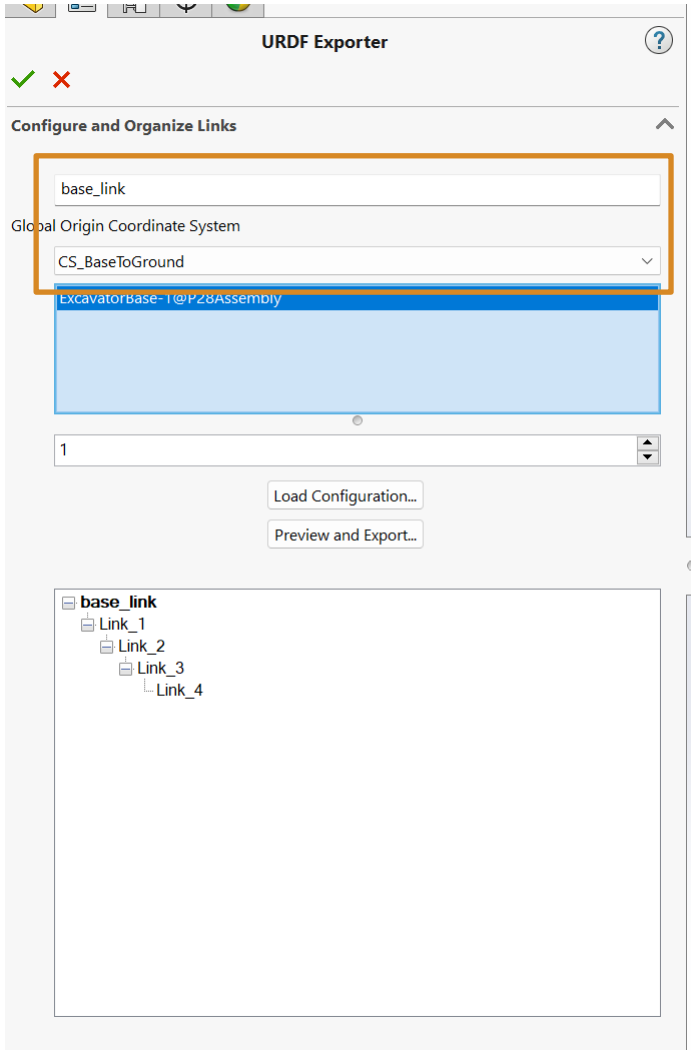
Example


(-) Bucket<1> (Default<<Default>_Display State 1>)
(-) BucketLink<1> (Default<<Default>_Display State 1>)
(-) StickLeftLink<1> (Default<<Default>_Display State 1>)
(-) StickRightLink<1> (Default<<Default>_Display State 1>)
(-) BucketPiston<1> (Default<<Default>_Display State 1>)
(-) BucketCyl<1> (Default<<Default>_Display State 1>)
(-) BoomLeftCyl<1> (Default<<Default>_Display State 1>)
(-) BoomLeftPiston<1> (Default<<Default>_Display State 1>)
(-) BoomRightCyl<1> (Default<<Default>_Display State 1>)
(-) BoomRightPiston<1> (Default<<Default>_Display State 1>)
(-) StickCyl<1> (Default<<Default>_Display State 1>)
(-) StickPiston<1> (Default<<Default>_Display State 1>)
Mates
Boom
Stick
Bucket
BoomRightCyl
BucketLink
StickRightLink
StickLeftLink
ExcavatorBase
Chassis
Point1
CS_ChassisToBoom
Point2
CS_BaseToChassis
PLANE1
Axis1
CS_BoomToStick
PLANE2
Axis2
Point4
CS_StickToBucket
PLANE3
Axis3
Point5
CS_ChassisToLeftBoomCyl
PLANE4
Model
Motion Study 1
CS_BoomToStick_Axis1

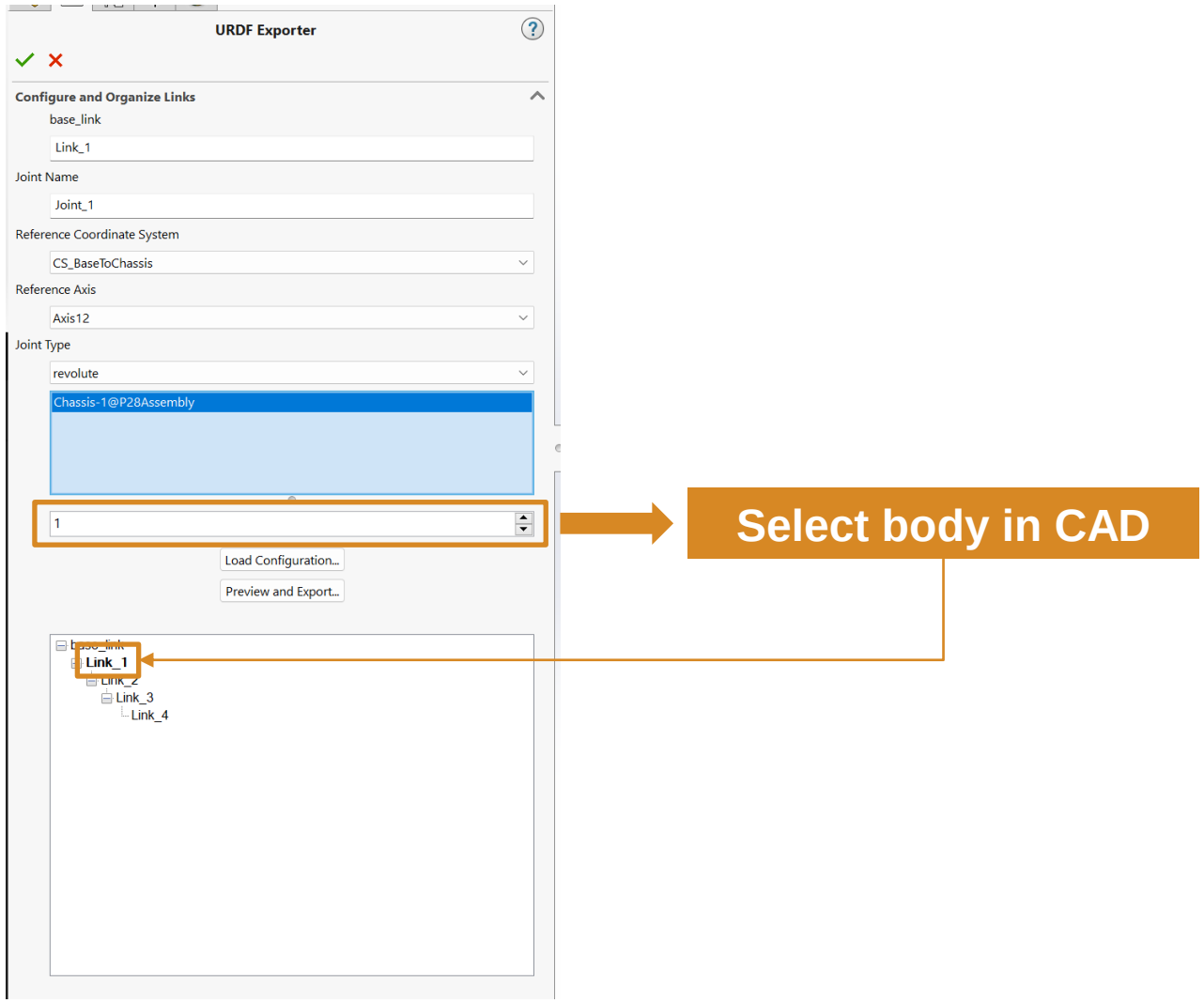
Start the URDF exporter



1: Start with base_link and define the global (base) coordinate system



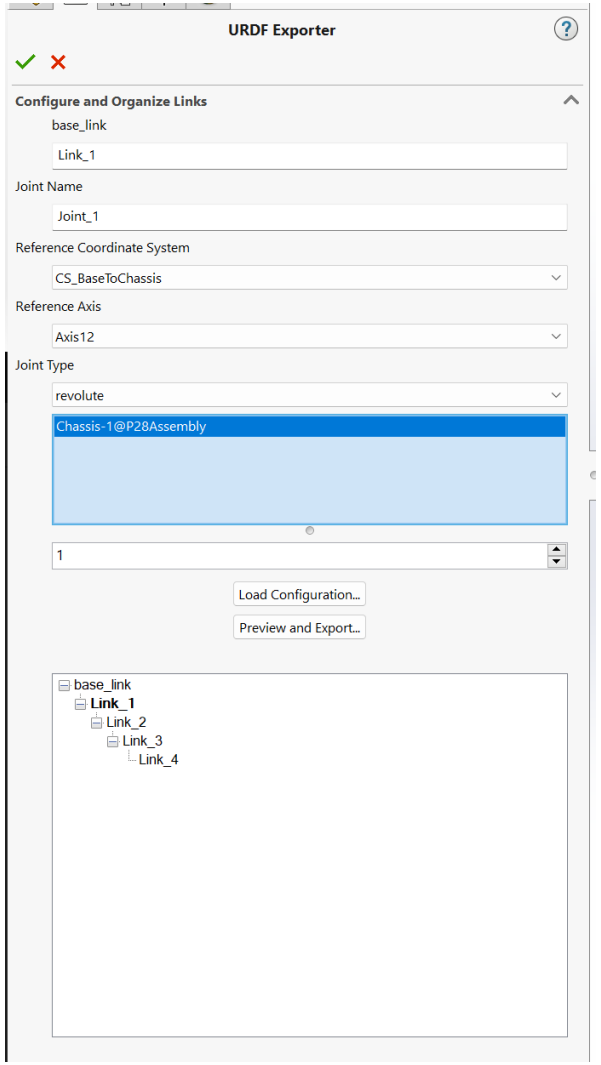
2: Define number of child bodies and select those



3: Define properties

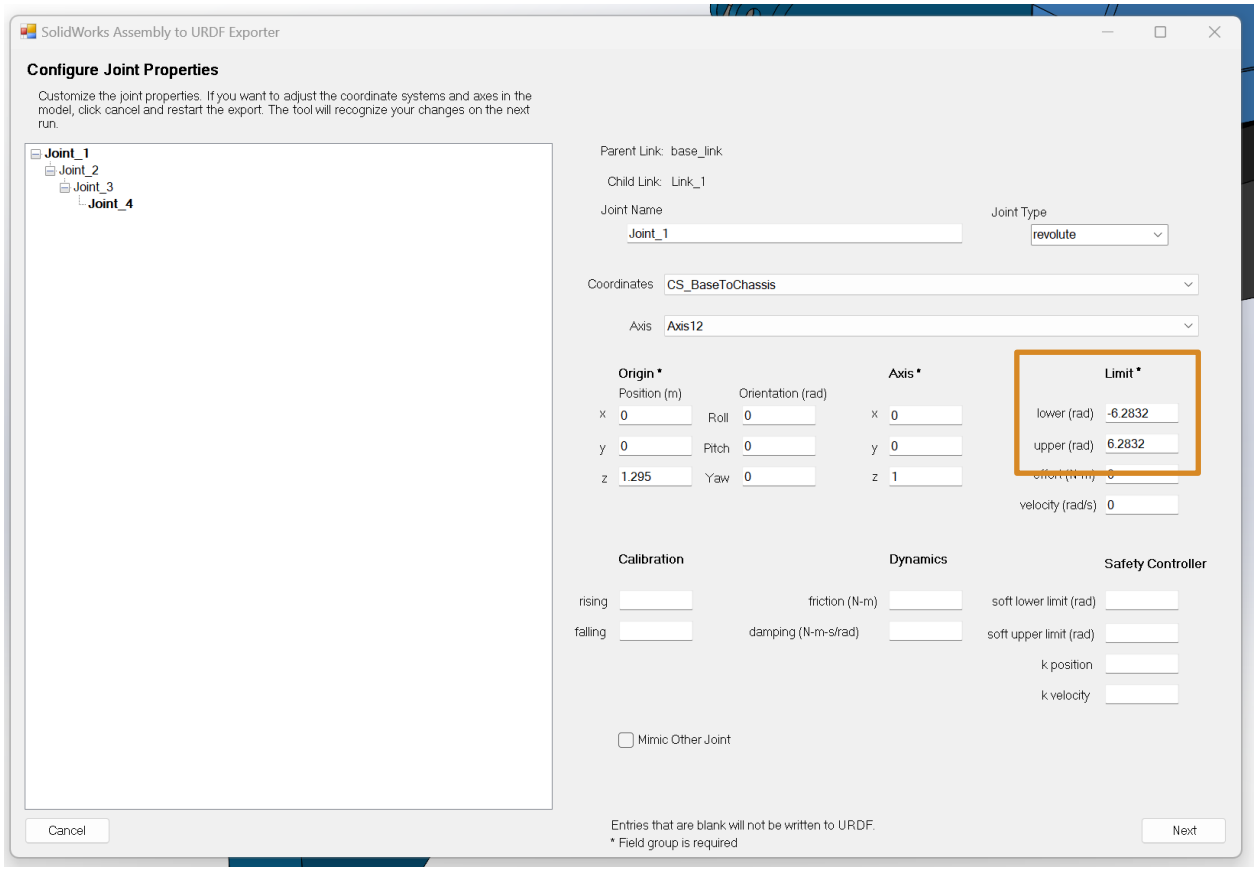
- Define name of joint
- Define Reference Coordinate System
- Define Reference Axis (e.g., rotational axis)
- Define movement type (e.g., rotation)

- Then, start over with step (2) until the last body (which has 0 childs)



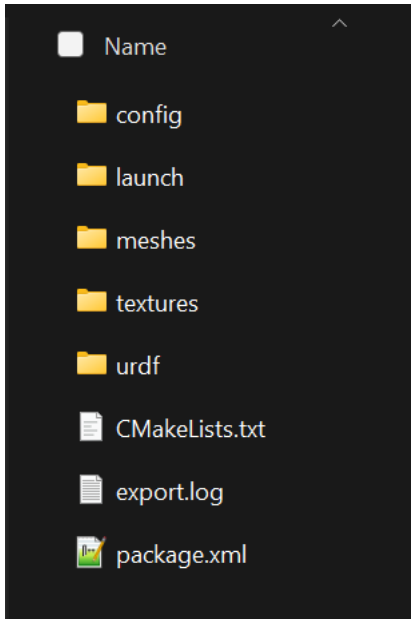
Click „Preview and Export „and set additional properties

- Origins, inertia tensors, etc. are calculated automatically from CAD and material properties.
- You must specify the joint limits for later use in MATLAB
- Click „Next“



Click „Export URDF and Meshes“

- Move urdf file from „urdf“ to „meshes“



Import in MATLAB

Current Folder

Name	Date Modified
base_link.STL	04.09.2023 09:21
Link_1.STL	04.09.2023 09:21
Link_2.STL	04.09.2023 09:21
Link_3.STL	04.09.2023 09:21
Link_4.STL	04.09.2023 09:21
P28Assembly.SLDASM.urdf	04.09.2023 09:21

Command Window

```
>> rbtree = importrobot("P28Assembly.SLDASM.urdf")

rbtree =

  rigidBodyTree with properties:

     NumBodies: 4
        Bodies: {[1×1 rigidBody]  [1×1 rigidBody]  [1×1 rigidBody]  [1×1 rigidBody]}
          Base: [1×1 rigidBody]
     BodyNames: {'Link_1'  'Link_2'  'Link_3'  'Link_4'}
      BaseName: 'base_link'
       Gravity: [0 0 0]
    DataFormat: 'struct'

>> show(rbtree)

ans =

  Axes (Primary) with properties:

              XLim: [-11.5000 11.5000]
              YLim: [-11.5000 11.5000]
            XScale: 'linear'
            YScale: 'linear'
     GridLineStyle: '-'
          Position: [0.1300 0.1100 0.7750 0.8150]
             Units: 'normalized'

  Show all properties

fx >>
```