



# ***ROBOTICS - 01PEEQW***

## ***Lab 00 #1***

***Getting started with SimMechanics***

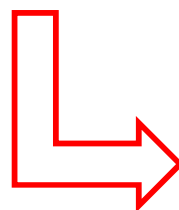
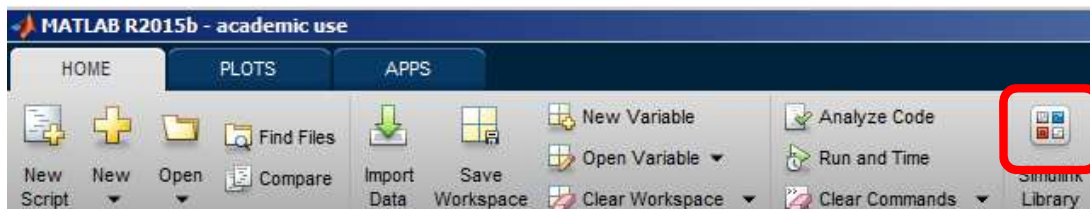
***Basilio Bona***

***DAUIN – Politecnico di Torino***

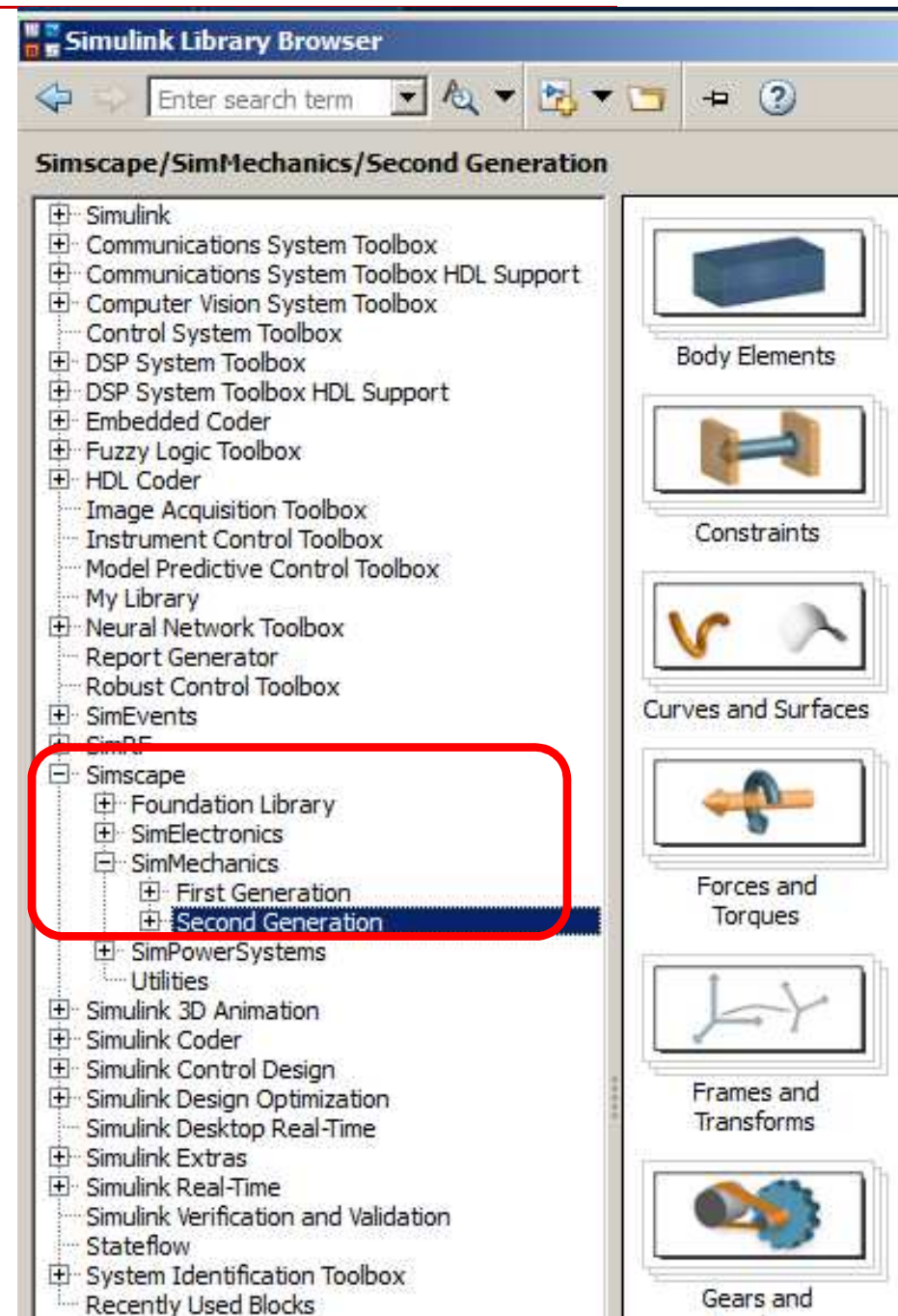
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# SimMechanics

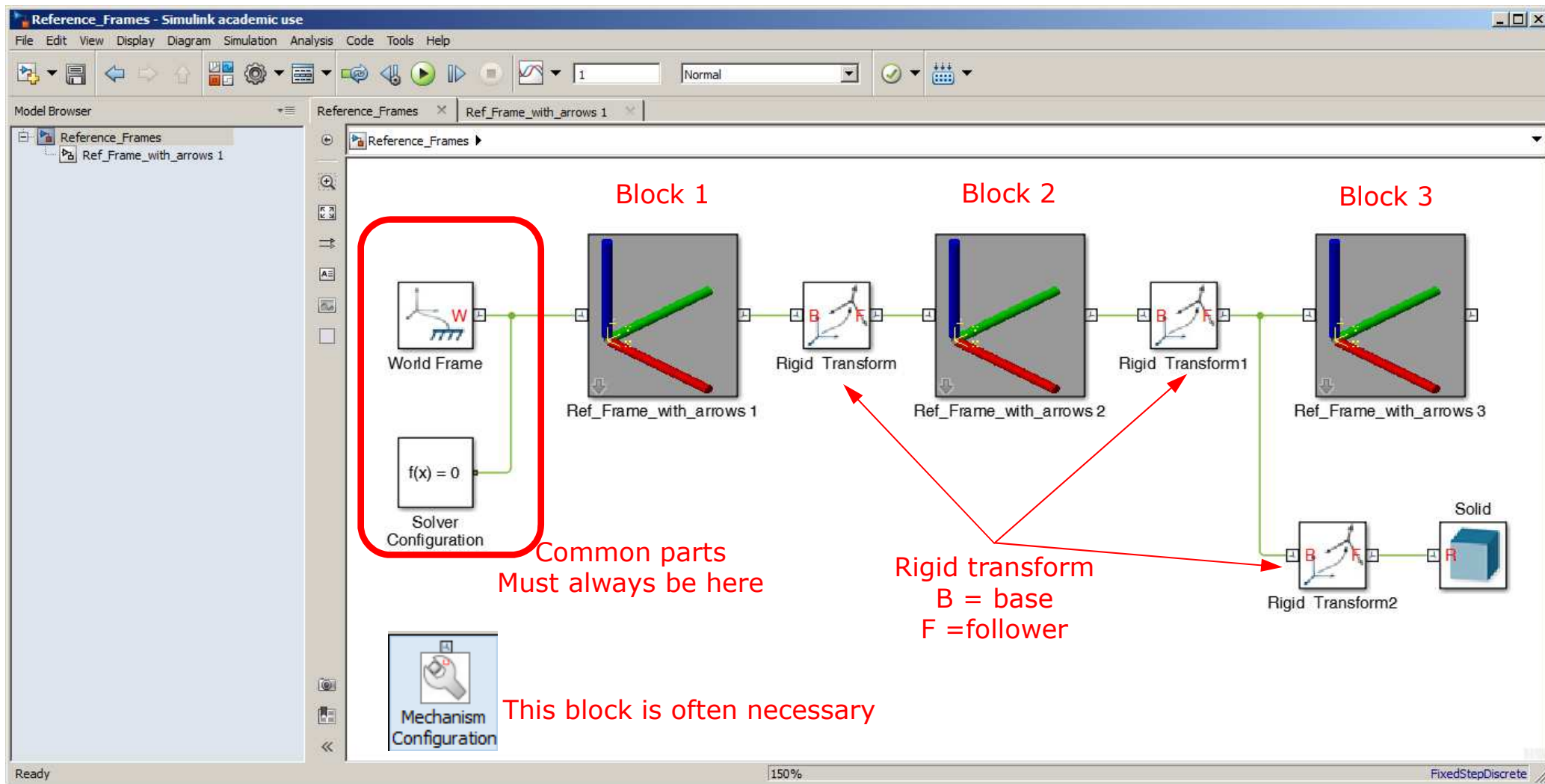
- ❑ SimMechanics is the registered name for a Simulink toolbox devoted to the simulation of mechanical systems



- ❑ Open Matlab, then Simulink Library, then SimMechanics Second Generation



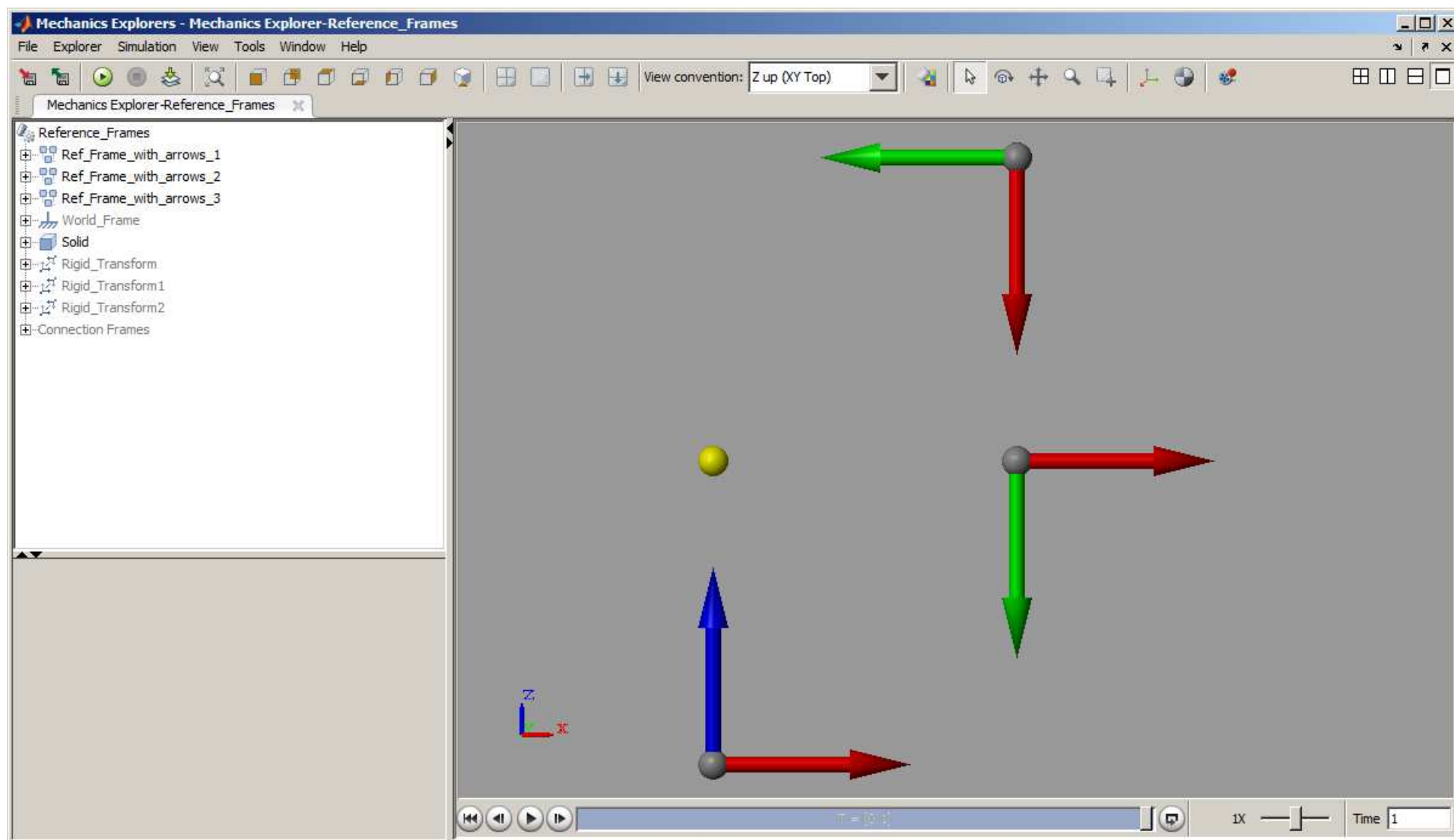
- ❑ Files have .slx type
- ❑ Open Reference\_Frames.slx in SimMechanics [examples](#)
- ❑ This model will appear



❑ Click here



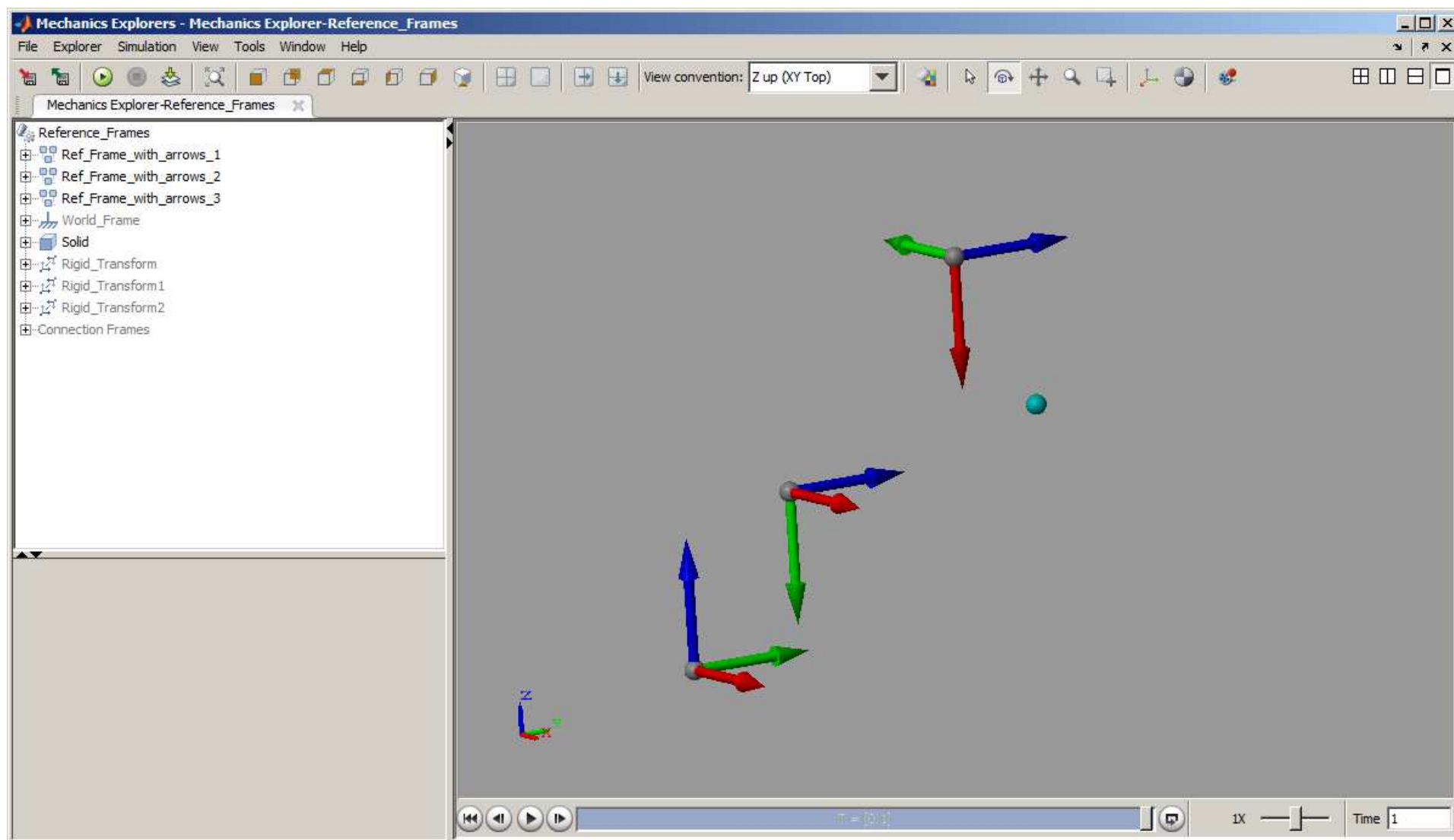
❑ This will appear



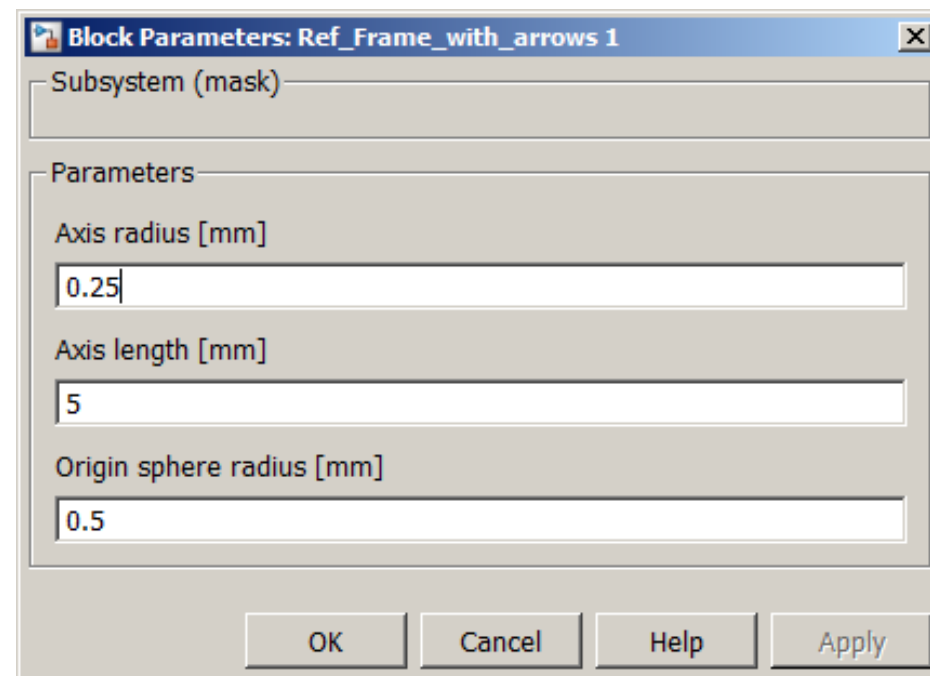
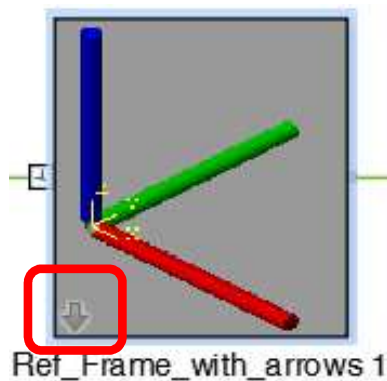
❑ Click here



❑ This will appear



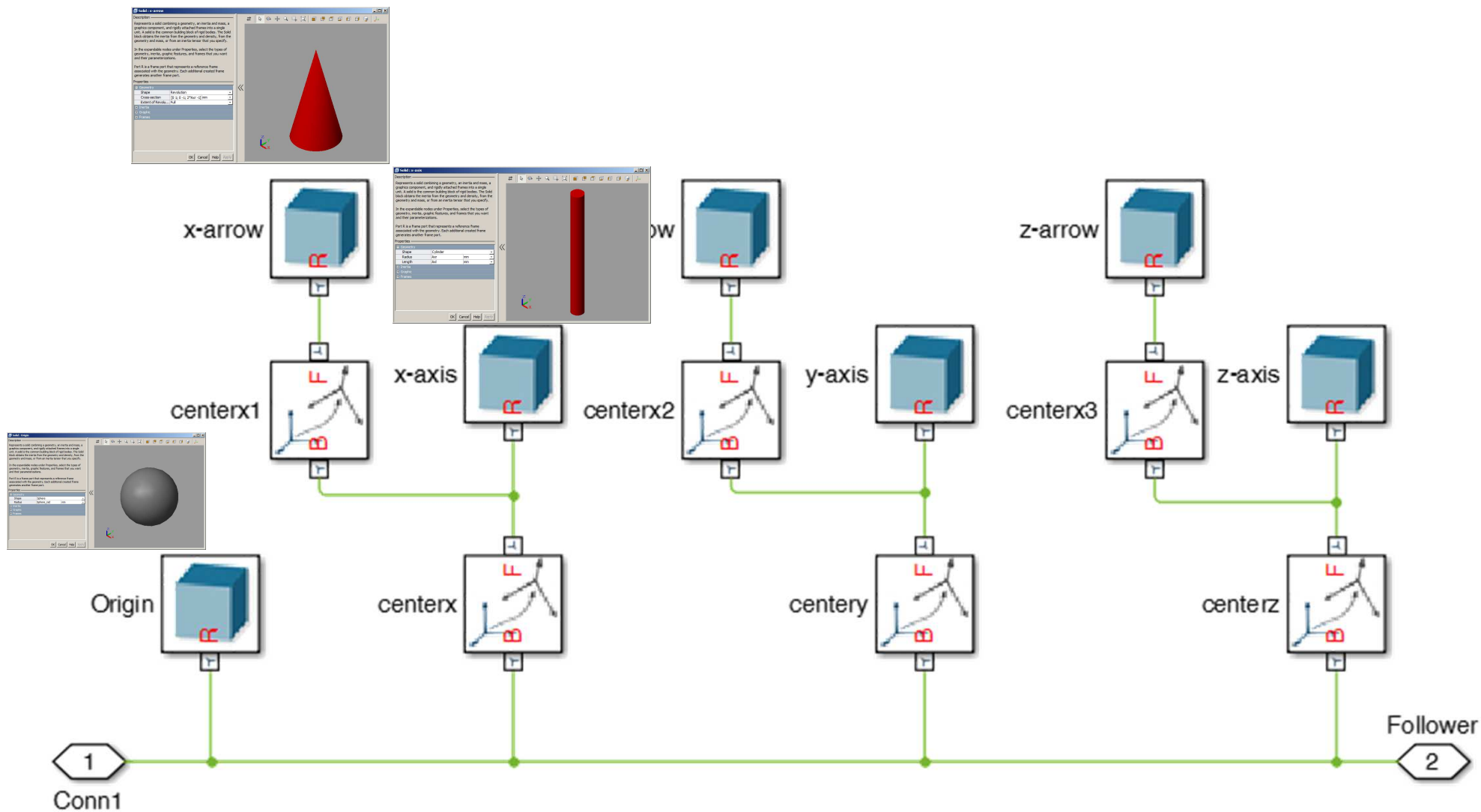
- ❑ If you 2-click on Block 1 this mask will appear
- ❑ It contains the parameters passed to the elements inside
- ❑ To look under the mask, click on the down arrow



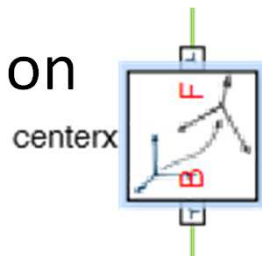
- ❑ This will appear ...

# SimMechanics

- The block is composed of an origin and three unit vectors, each consisting of a cylinder with a cone on top, to represent an arrow



- ❑ If you 2click on



- ❑ This will appear

**Rigid Transform : centerx**

Description

Defines a fixed 3-D rigid transformation between two frames. Two components independently specify the translational and rotational parts of the transformation. Different translations and rotations can be freely combined.

In the expandable nodes under Properties, choose the type and parameters of the two transformation components.

Ports B and F are frame ports that represent the base and follower frames, respectively. The transformation represents the follower frame origin and axis orientation in the base frame.

Properties

[-] Rotation		
Method	Standard Axis	
Axis	+Y	
Angle	90	deg
[-] Translation		
Method	Cartesian	
Offset	[Ax]/2+Axr 0 0]	mm

OK Cancel Help Apply





- The Rigid Transform follows some precise rules
  - It is composed by a Rotation and a Translation
  - First the Translation  $t$  then the Rotation  $R$ , so that it implements the homogeneous matrix  $T$

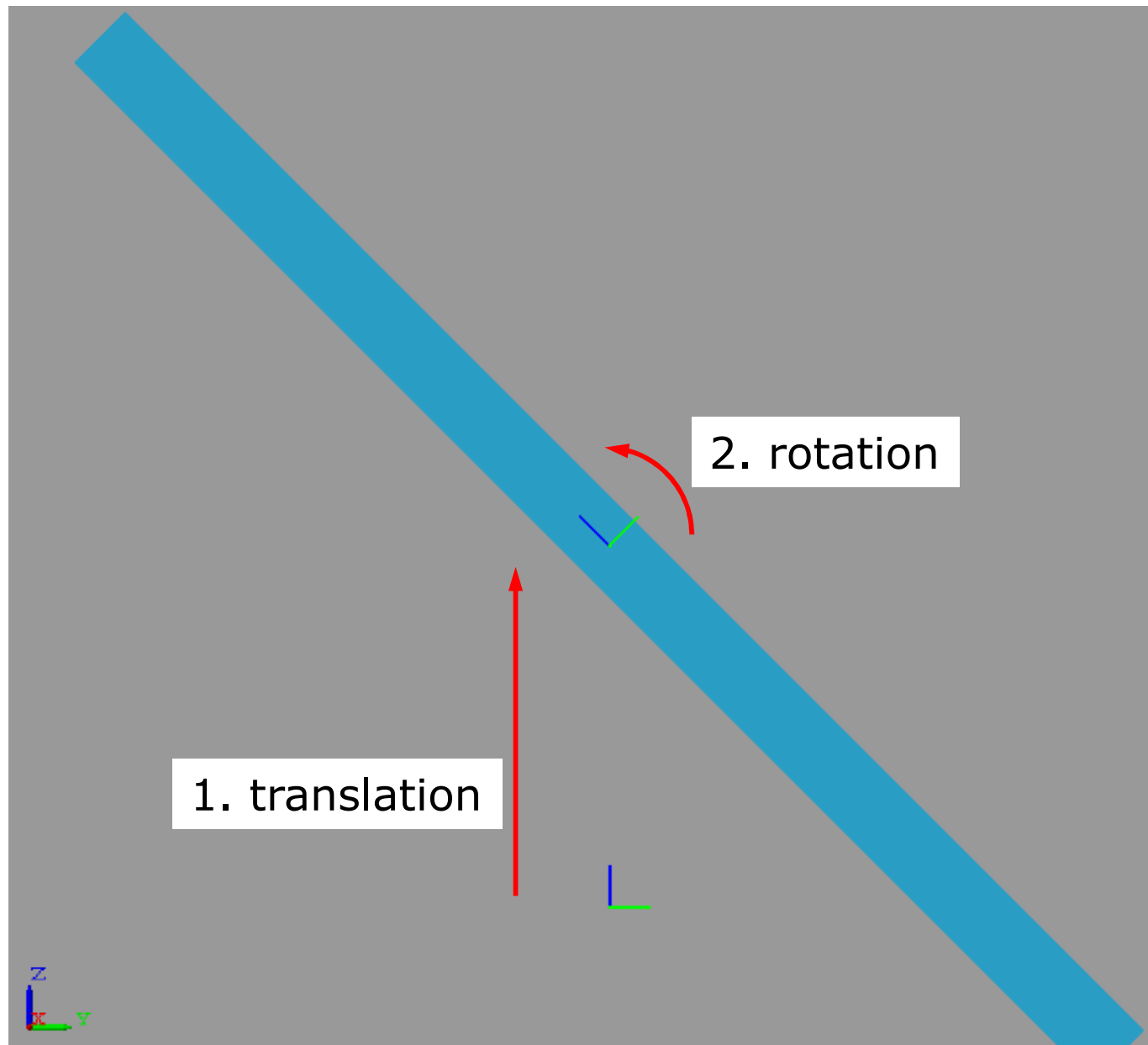
$$T = \begin{bmatrix} R & t \\ \mathbf{0}^T & 1 \end{bmatrix}$$

3. Different methods are available to define rotations; they are

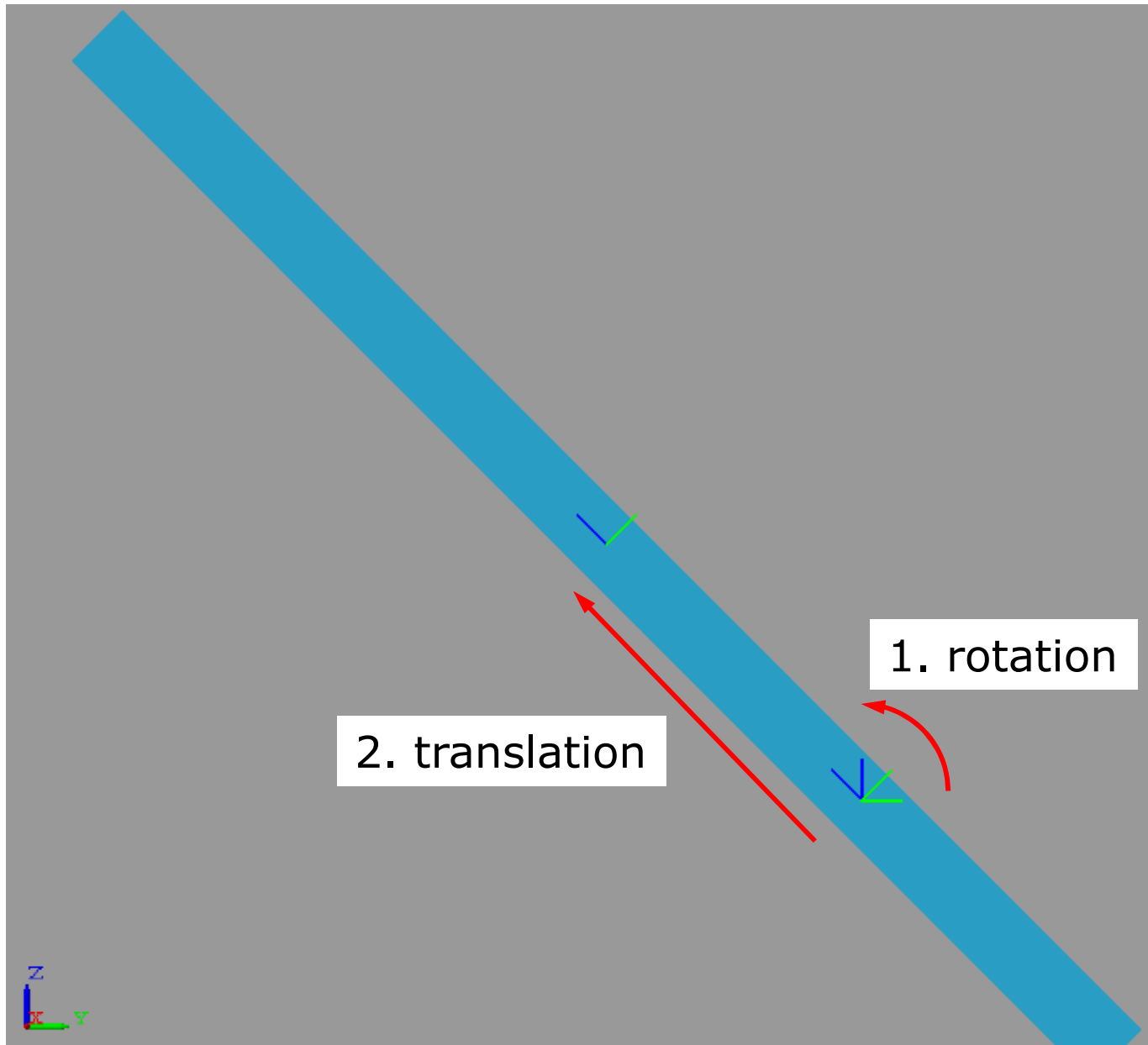
- Standard axis
  - Aligned axis
  - Arbitrary axis
  - Rotation sequence
  - Rotation matrix

4. Different methods are available to define translations; they are

- Cartesian
- Standard axis
- Cylindrical



Simple\_03.slx



Simple\_04.slx



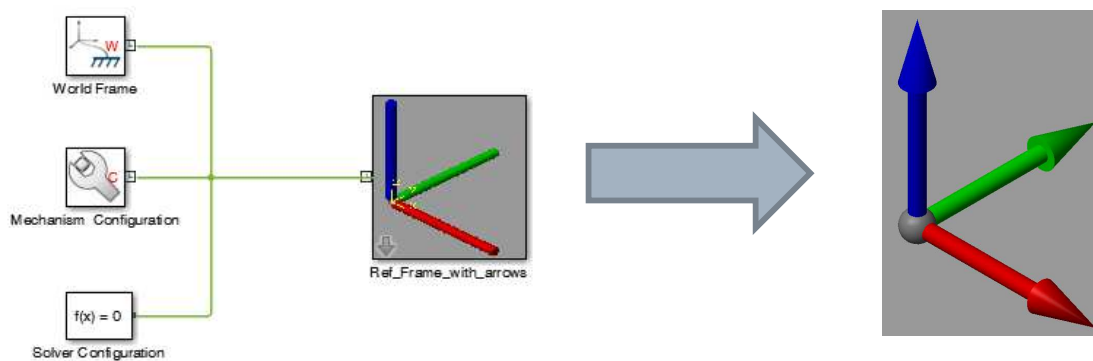
# SimMechanics

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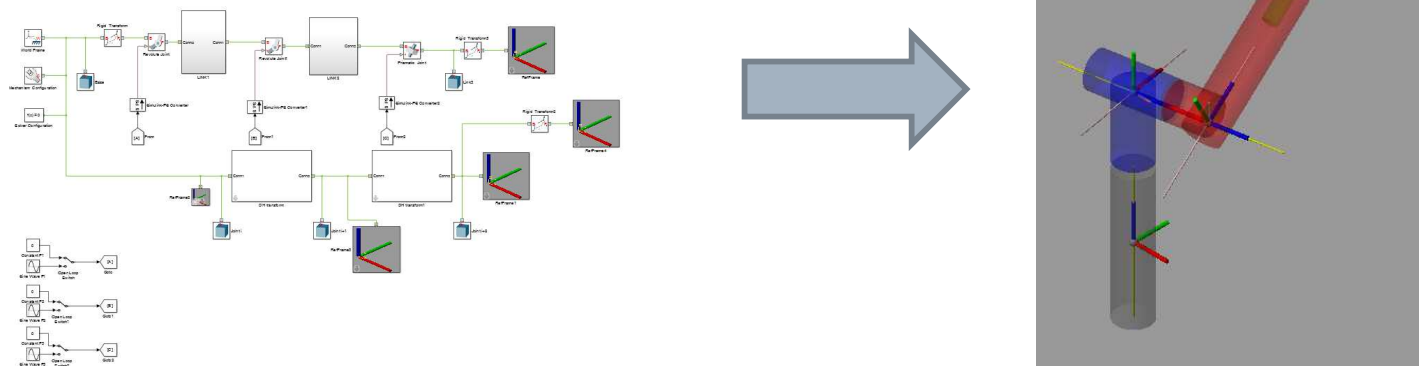
- ❑ Other material
  - SimMechanics-related material:
    - SimMechanics [examples](#) of a Pan Tilt structure (zip file with notes)
    - Mathworks documentation [Web page](#)
  - Matlab-related material:
    - [Kinematics Library](#) (zip file): several .m functions that can be used in the project development
    - [s\\_prof.m](#) (zip file with test script): 2-1-2 profile generator for path planning
    - [Useful m-functions](#) (zip file) used to plot reference frames and links

## Other [examples](#) (zip file)

- A simple reference frame (red-green-blue) with arrows



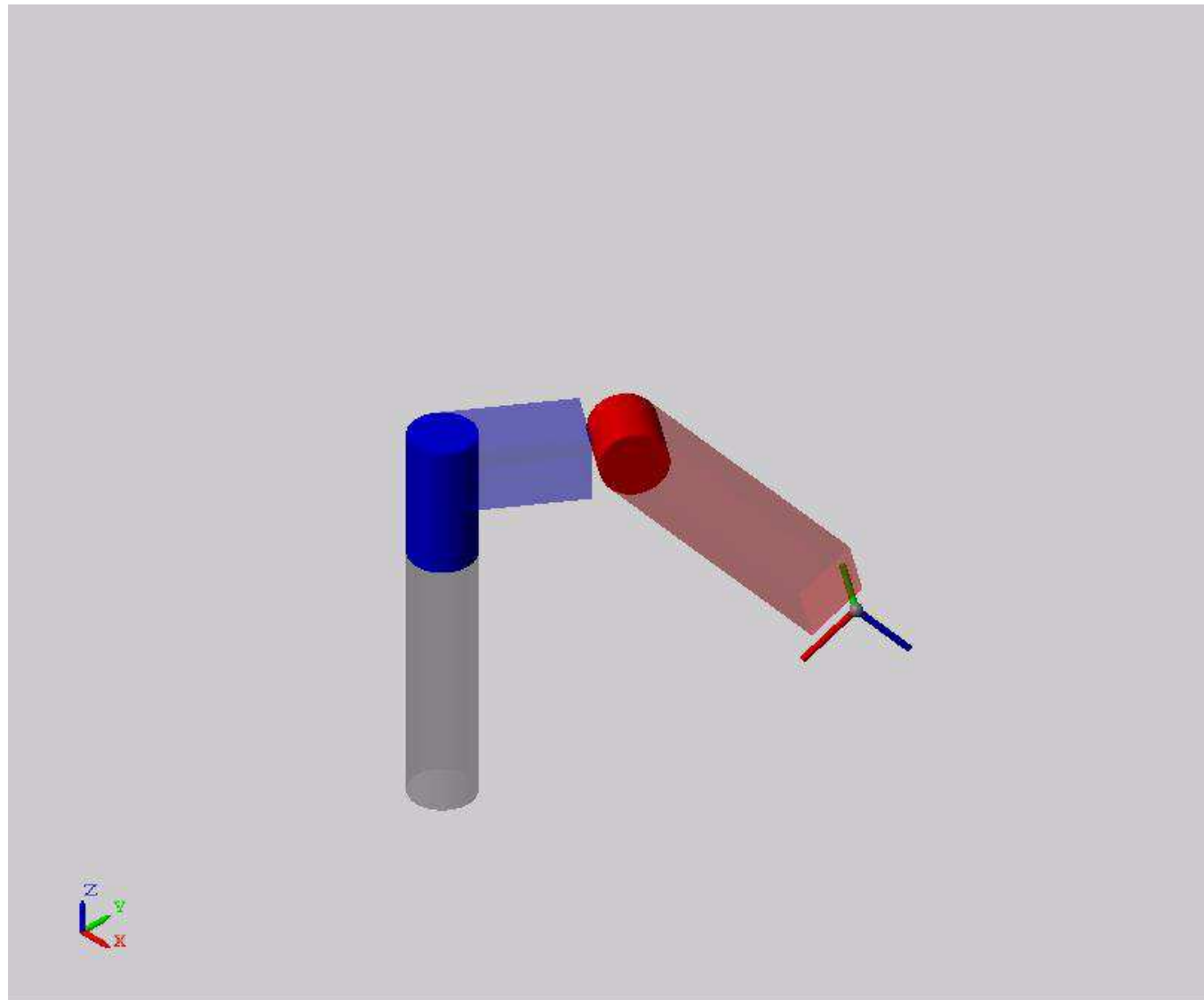
- A robot with its reference frames





# SimMechanics

The model `DH_PanTilt_01.slx` is in SimMechanics [examples](#)



The model `DH_PanTilt_03.slx` is in SimMechanics [examples](#)

