Simulation X

Lecture for ELEC 391

How to get Simulation X

- Go to the Simulation X website
- Create a free account and download the latest Version
- Visit UBC engineering resources and click on the link provided for Simulation X
- You are asked to log in with your ECE account
- Use the first part of your ECE email as the ID and your normal password
- Use the server information mentioned there to connect to the License server for SimulationX

Windows 10: Control Panel\System and Security\System on the left, select **Advanced System Settingsi**.
On System Properites window, Advanced tab at the bottom click on: **Environment Variables**.

Usually under System variables, you may see: LM_LICENSE_FILE set to: 27001@altera-tlm.ece.ubc.ca (or similar).
Select it, and clikc on Edit button. You can add more by adding ';' (semicolon without quotes).
e.g. for simulationX add:

27001@altera-tlm.ece.ubc.ca;27017@teaching-lm2.ece.ubc.ca

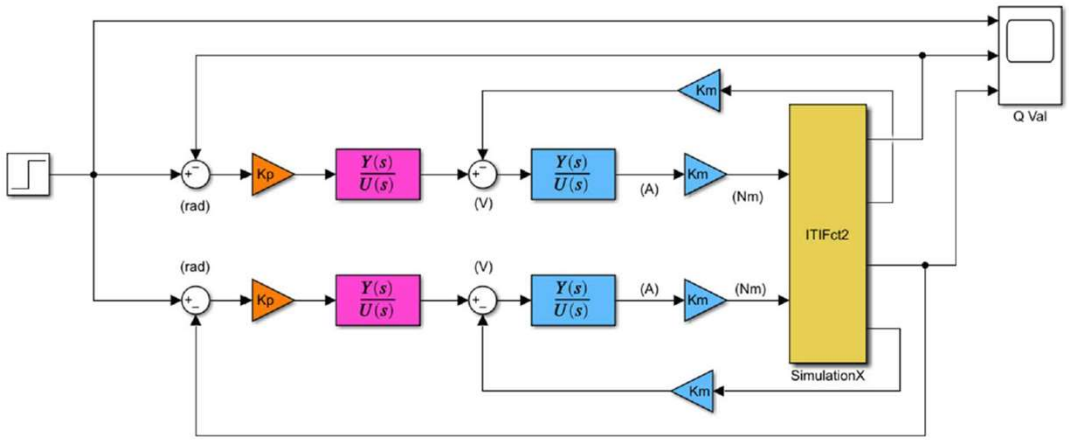
If LM_LICENSE_FILE is not set, you can simply create a text file named simulationX.lic with the following 2 lines in it:

SERVER teaching-lm2.ece.ubc.ca ANY 27017
USE_SERVER

After starting simulationX, it will ask for license option, choose Professional Edition with FlexLM license file. Select the search botton and find the above text file.
It will check for license and start up with the list of modules to select. You could choose the ones you need, or all by default.

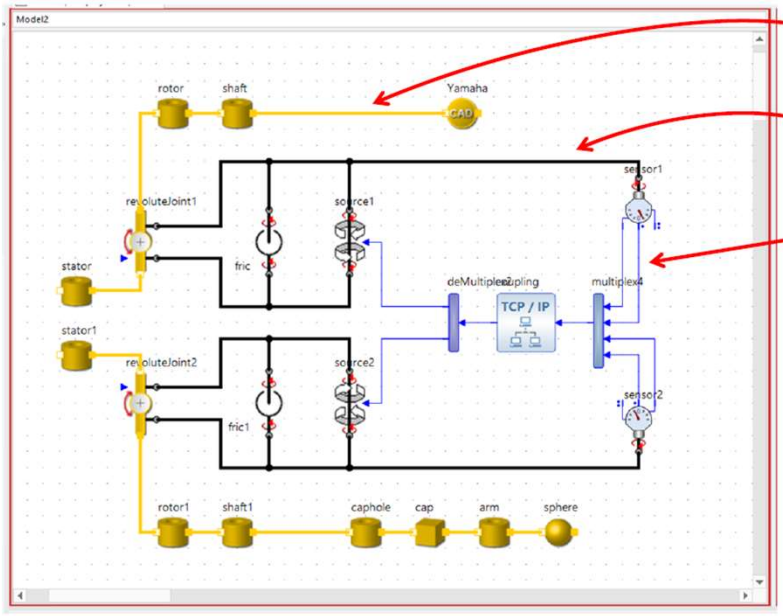
- Do not create the license file, use the server!
- Your UBC VPN must be connected at all times!
- Use Sim X 4.2 for now

Simulink



Example System

- 2 identical systems
- Step response
- P-Controller (orange)
- Amplifier (pink)
- Electrical motor model (blue)



Yellow
Position

Black
Force

Blue
Information

SIMULATION X

Position

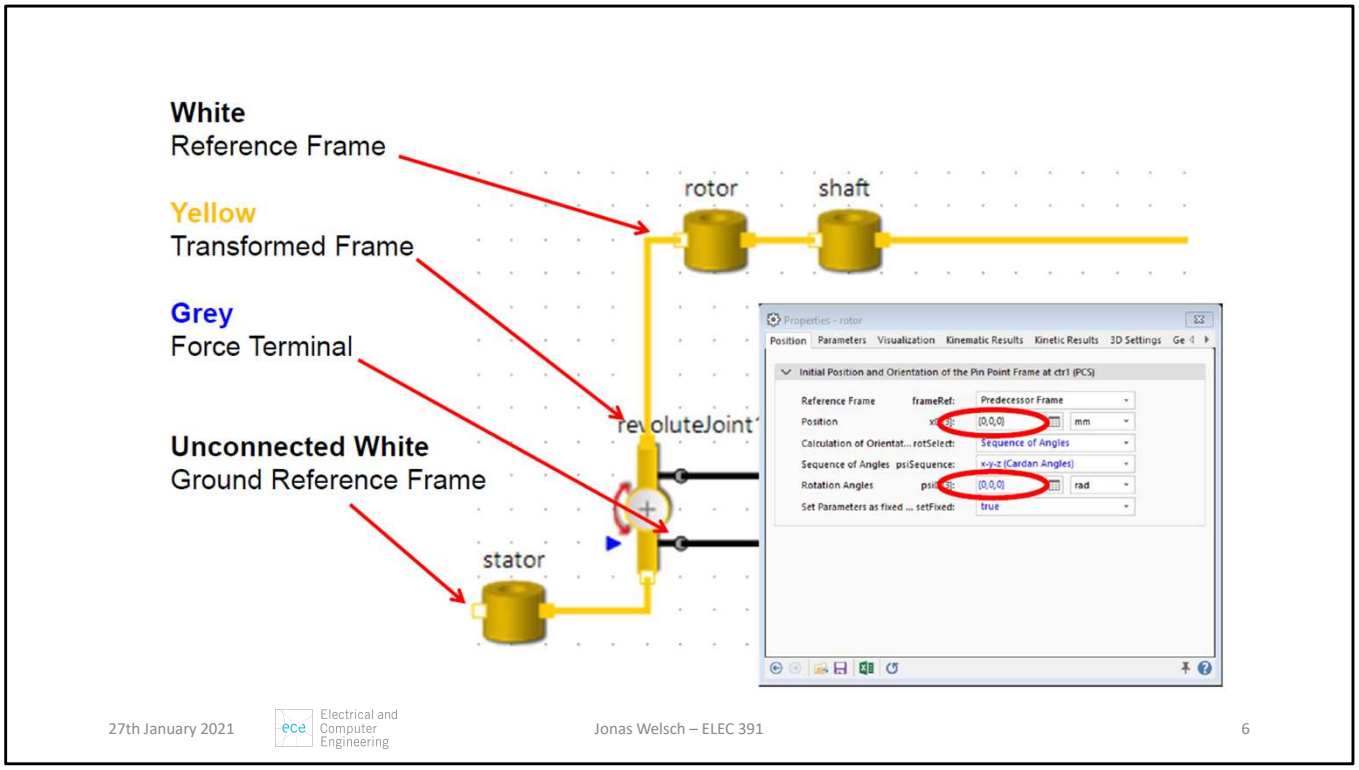
- Location or components
- Predecessor frame + motion / rotation
- Defines system inertia

Force

- Mechanical models
- Not a physical object that you can pick up and hold

Information

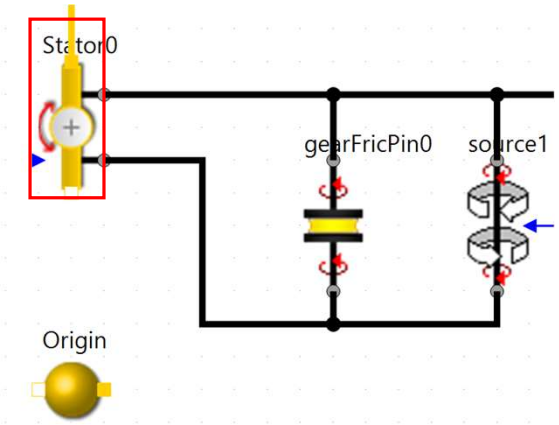
- Signals
- Just like Simulink

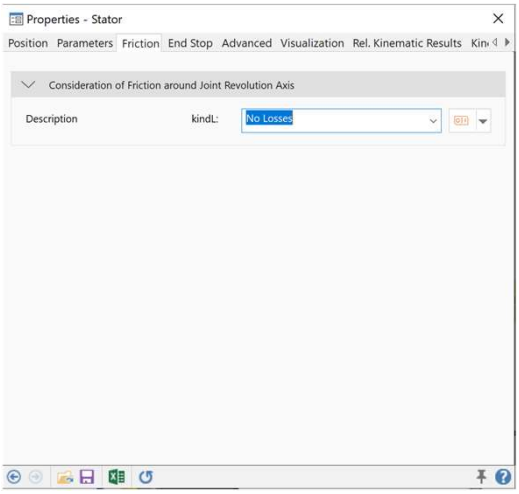


General Logic

white square: input
yellow square: output
fixed elements: generally input and output
two inputs means those components can receive ‘information’ from both sides
e.g. gears have two inputs
interconnecting lines share the same base model
new elements always reference the element they are connected too!

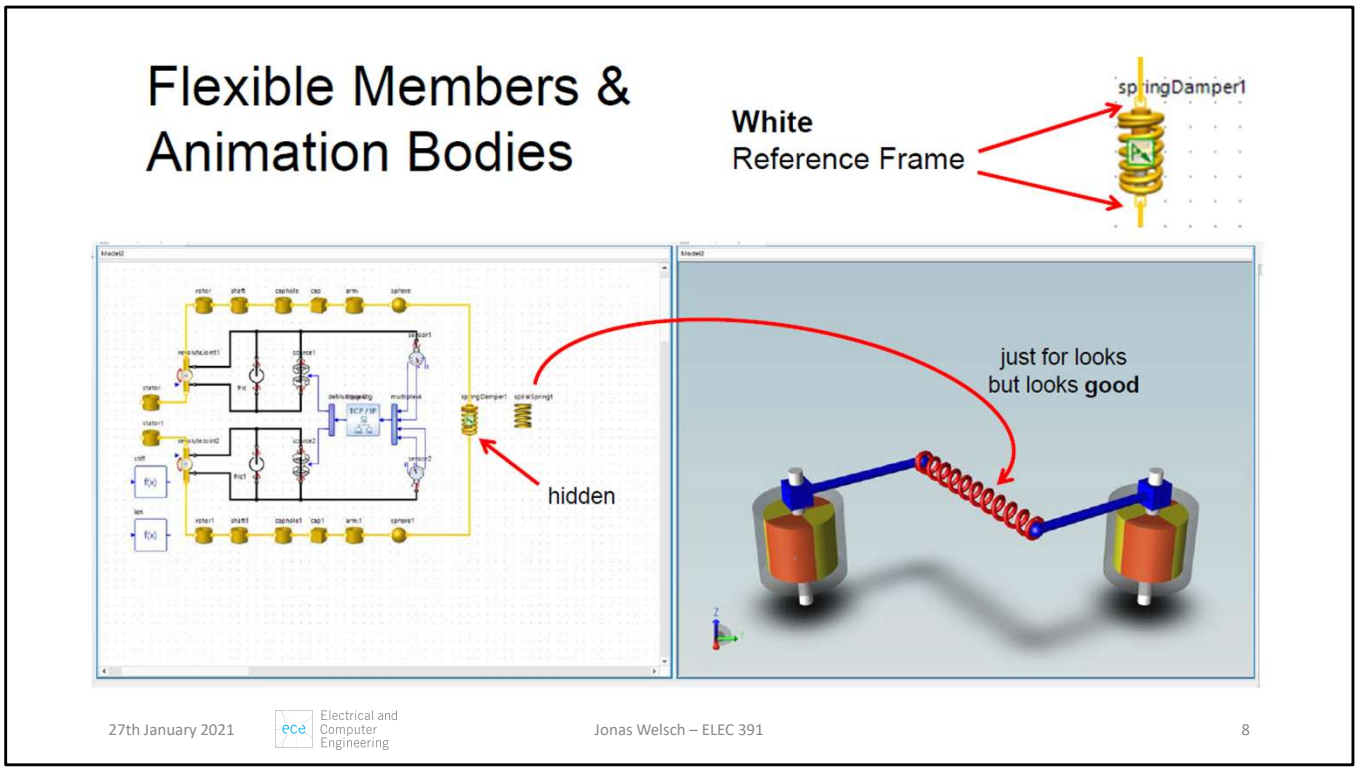
Transfer blocks & physical model





Transfer blocks allow the switch between models.

- block marked is a ‘joint’
- does not have any physical form
- only introduces ability to turn
- possible parameters for restriction to turn and possible friction (e.g. bearing friction data)
- Further physical properties can be added through the physical model blocks



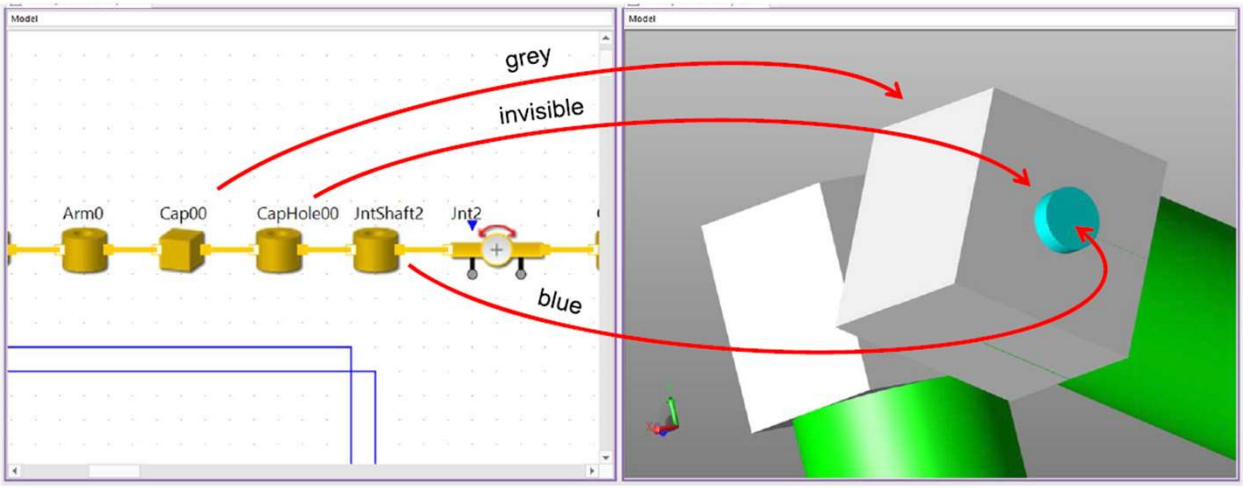
Force Elements

- No fixed length
- 2 Reference Frames (White)
- Reaction force
- Closed kinematic chains

Animation Bodies

- No dynamic effect
- Visual representation only
- No explicit connection (yellow) to model
- Physical spring hidden

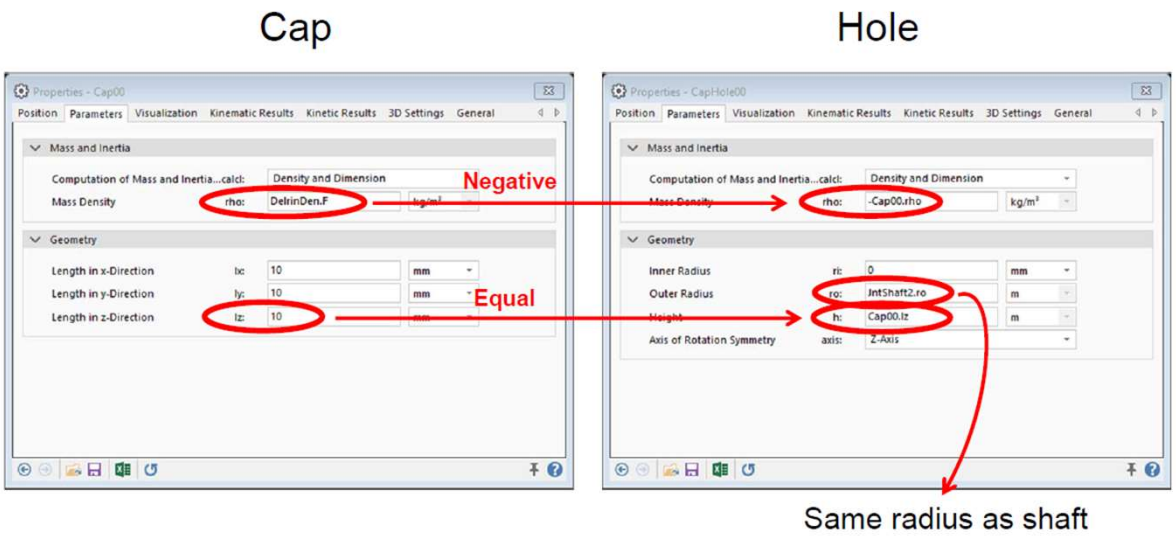
Holes



Hole

- Remove inertia from system
- Shaft not same material as Cap

Holes



Hole

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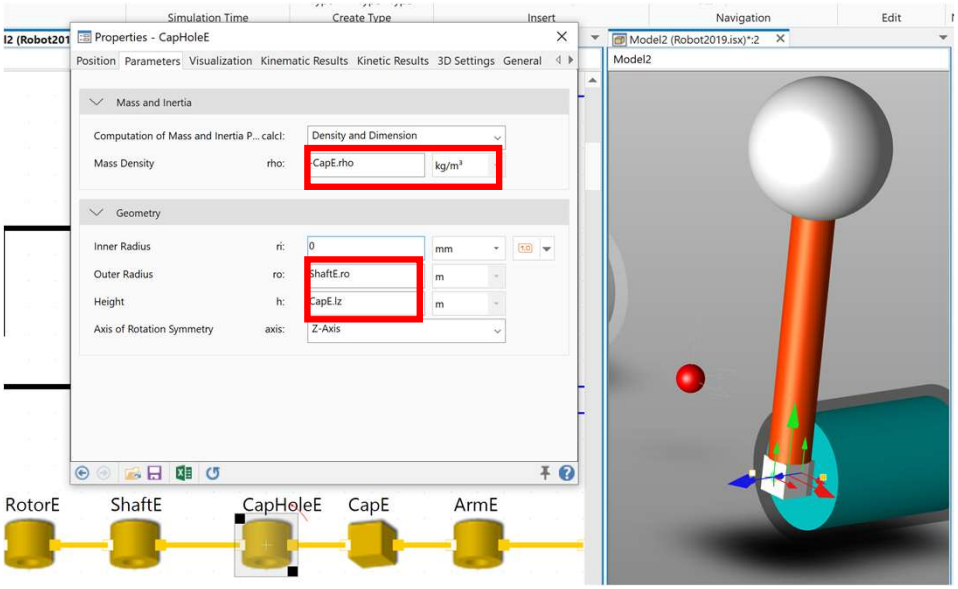
Parameters

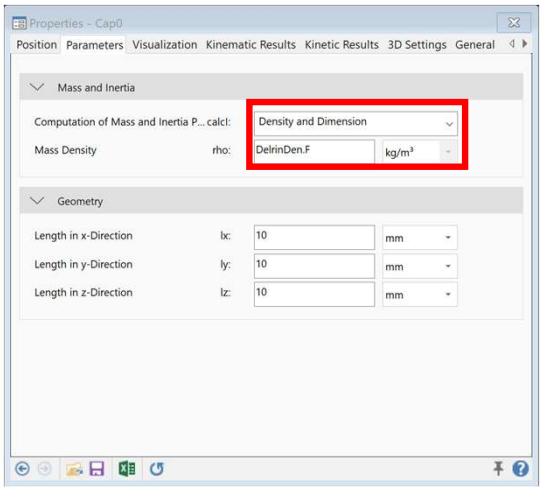


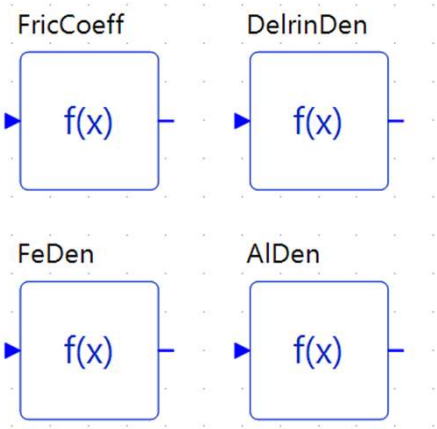
Parameters are useful to adapt your models to changes easily

- negative density for the hole
- Parametrized dimensions

WHATCH OUT FOR UNITS!

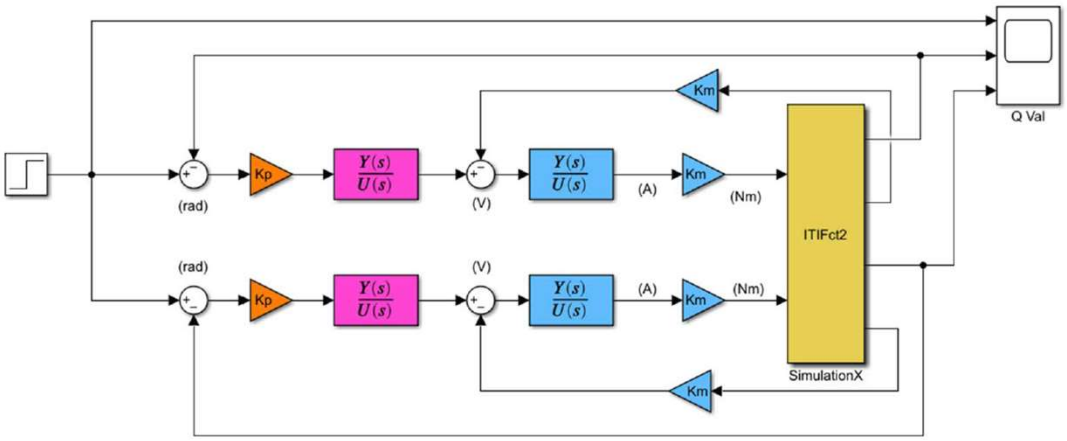
Parameters





- Add parameter blocks for further parameters
- They do not need to be connected to anything

Simulink



Example System

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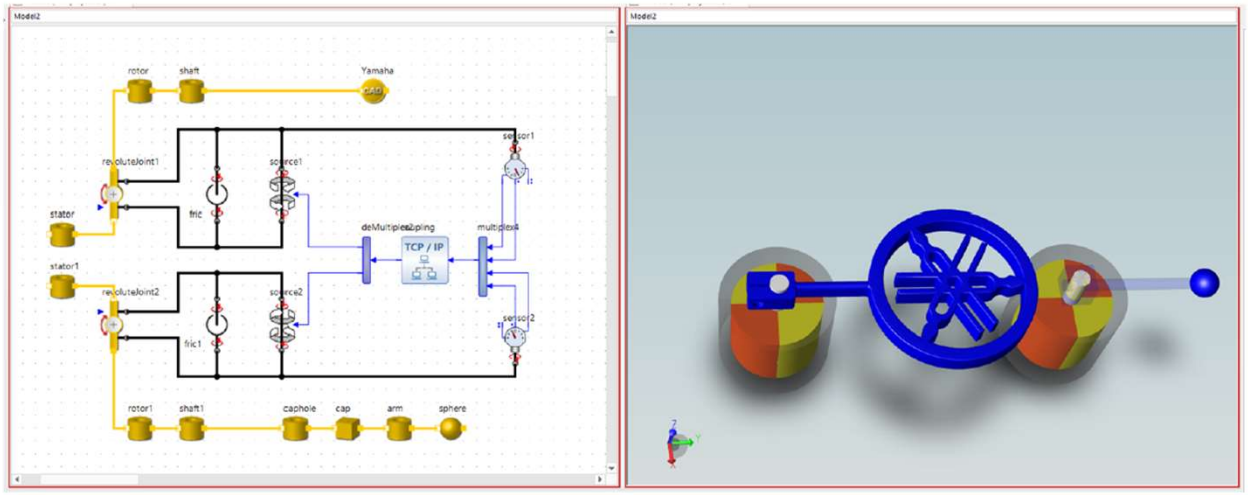
Actual & Approx Inertia

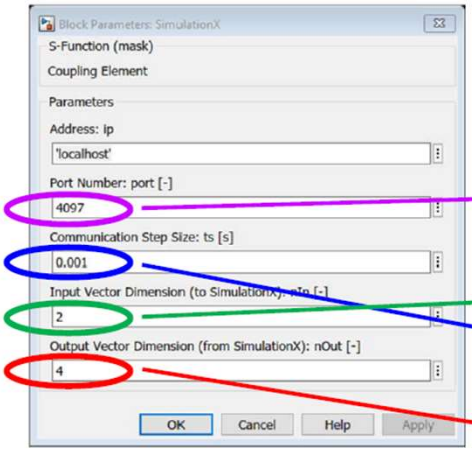


Example System

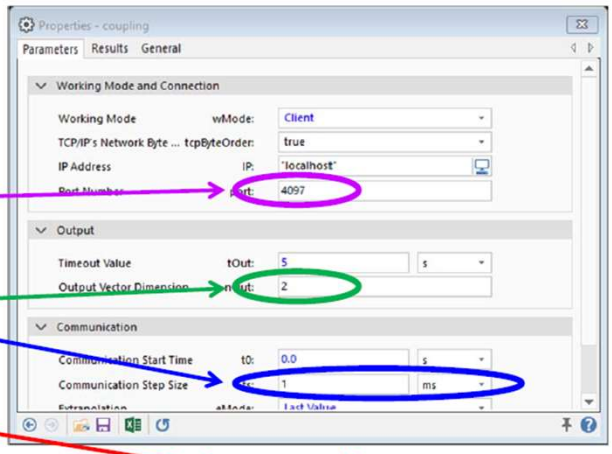
- Yamaha pendulum
- Actual part from SolidWorks
- STL format
- Sphere mass
- Located at COM
- Arm transparent -> no dynamics
- Identical motor (rotor) dynamics

Co-Simulation

Simulink ITIFct2

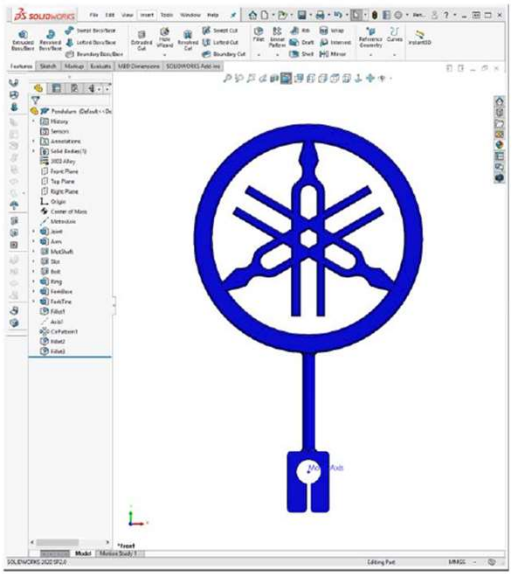


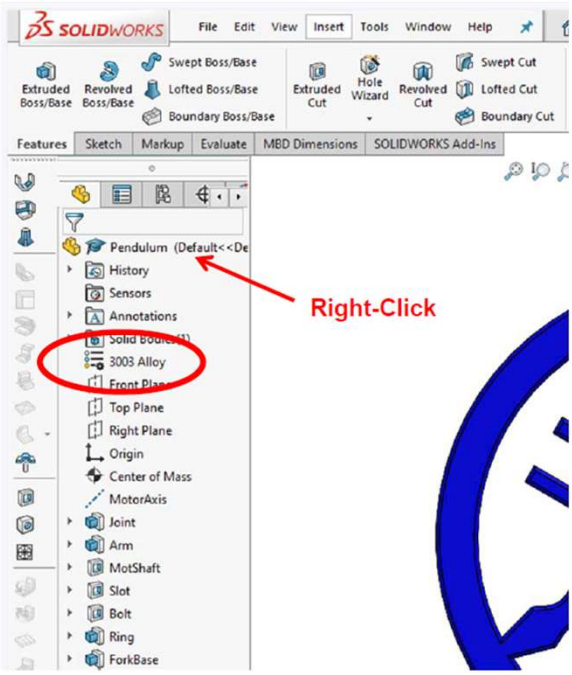
SimulationX TCP/IP



run error if wrong

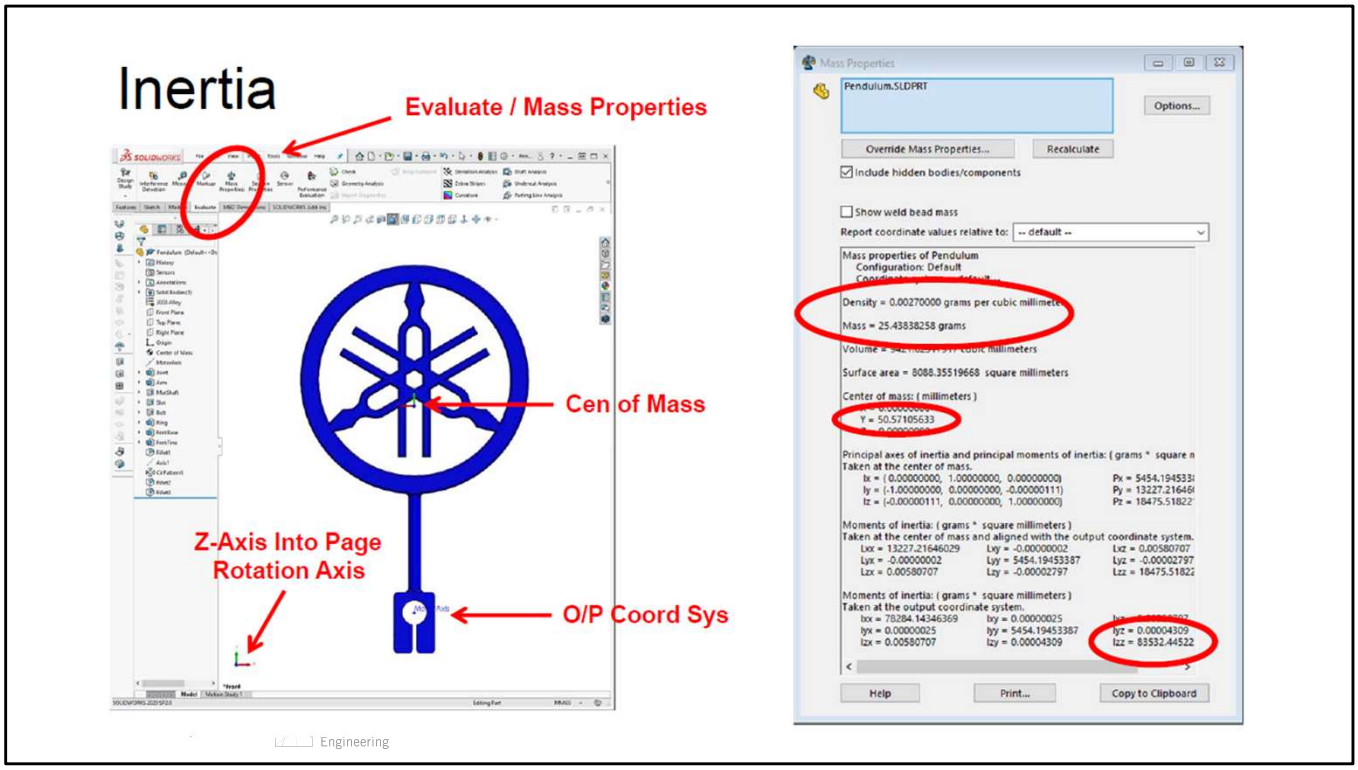
Material





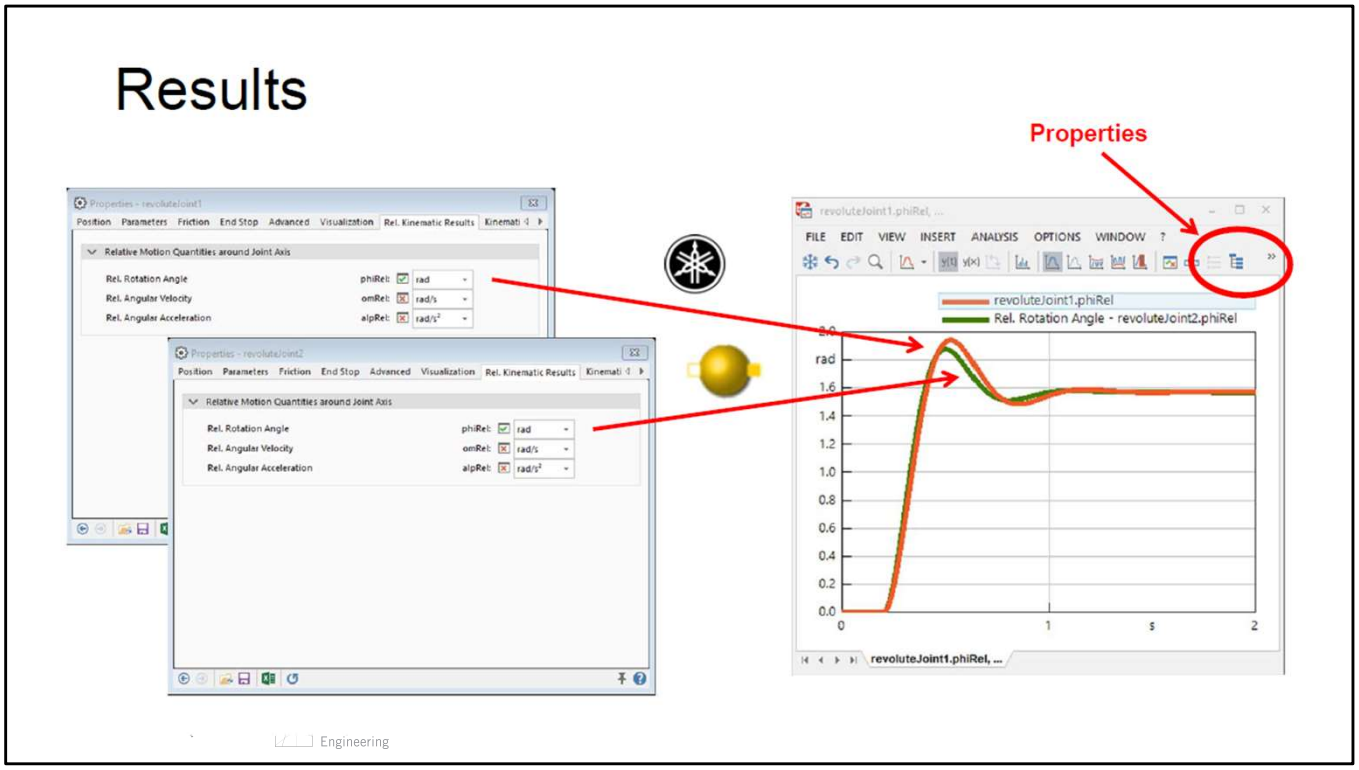
From SolidWorks

- Apply material to part
- Shows up in design tree



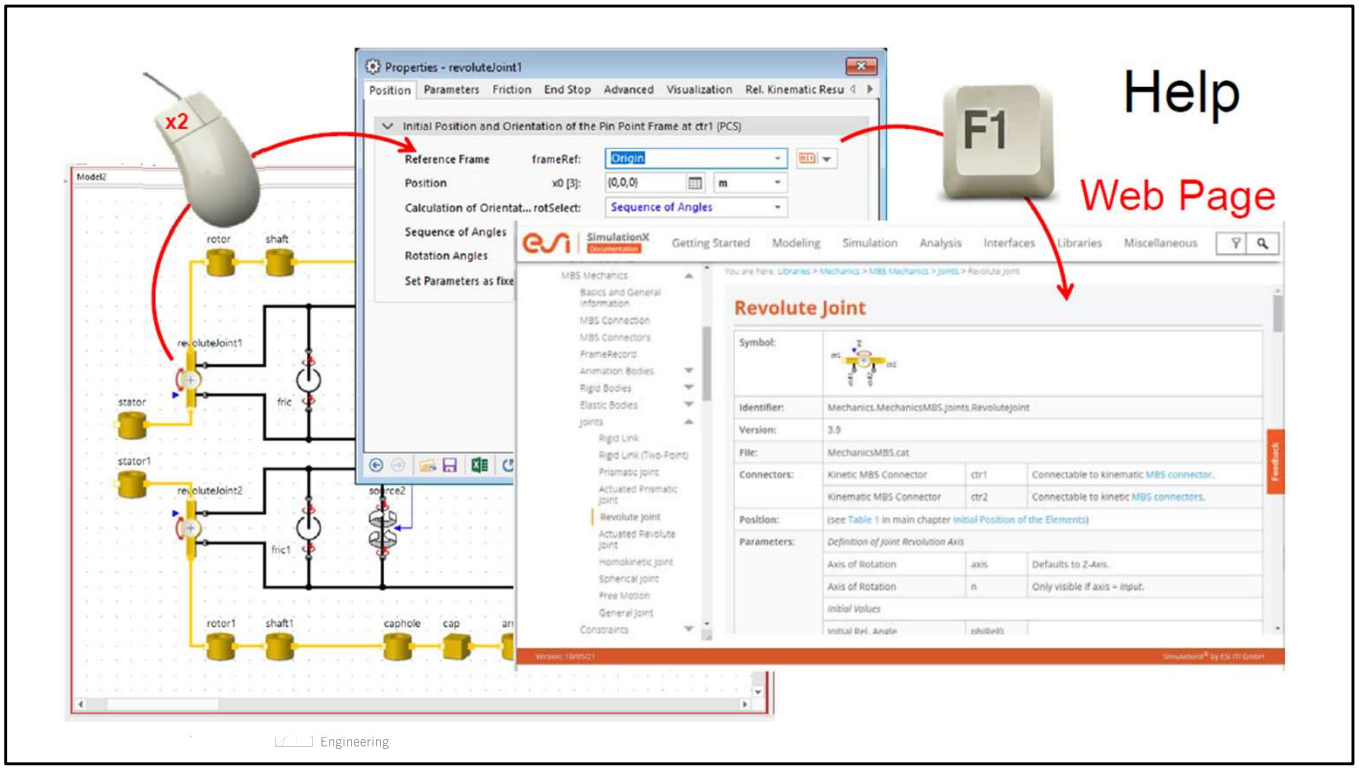
Evaluate Tab

- Model Properties
- Material density
- Mass
- COM
- Inertia Tensors
- Choose co-ordinate centre wisely to get useful info



Display Results

- Drag & drop
- Minor differences in inertia



Getting Help

- Double-click what you are interested in
- Press F1
- Web-Page appears
- Other topics on left
- Search bar above

General Reminders

- keep it as simple as possible to save time
- Most important part is that you used and got a basic understanding of the programs
- You can only form teams afterwards
- It’s a pass fail test