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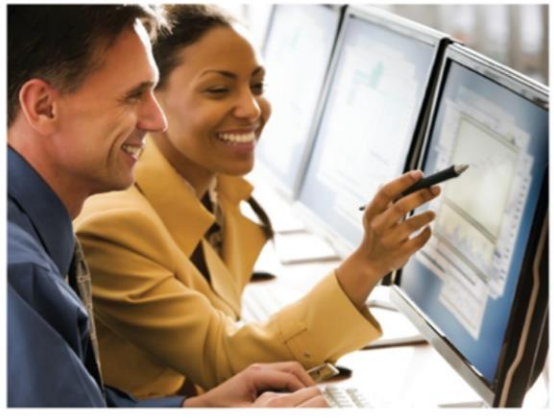
Exercises: Importing CAD Models

Physical Modeling for Formula Student



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Crank Assembly Import

Task: Import the SolidWorks® model of an automotive crank assembly

Steps: Export SolidWorks assembly and import it into SimMechanics™.

1. *** Open `cad_engine.SLDASM` in SolidWorks and export it using SimMechanics Link™.**
   - Verify that SimMechanics Link is installed and registered with SolidWorks.
   - Use the SimMechanics Link menu to export the CAD assembly.

2. **Import the XML file using `smimport`**
   - Import the exported xml file from the previous step or the provided file `cad_engine.xml`.
   - Check whether the import was successful and if there are any warnings in the MATLAB® Command Window.

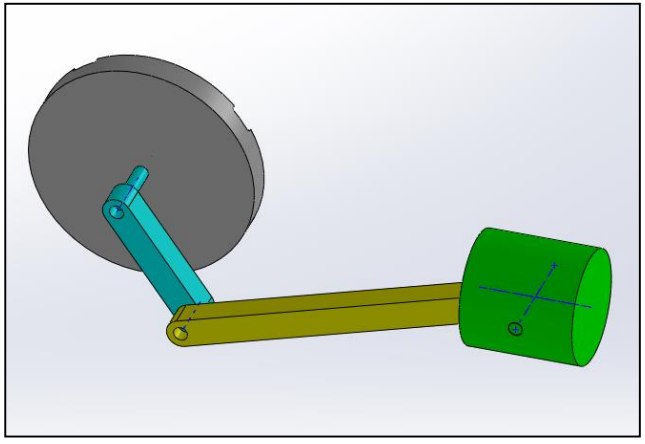
3. **Simulate the model**

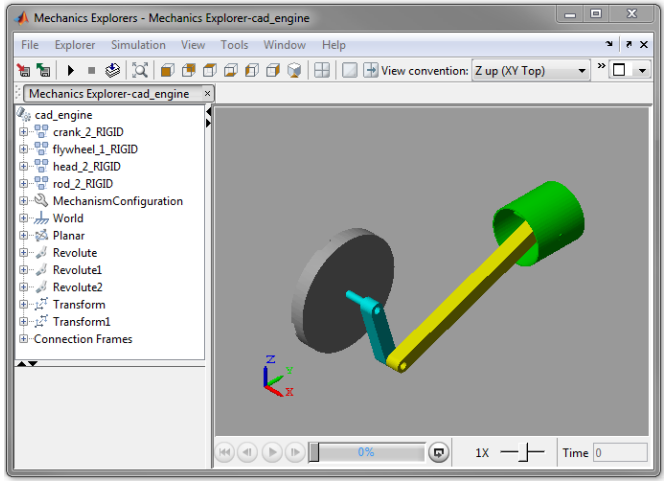
4. **(Bonus) Add damping, initial conditions, and sensors to the appropriate joints. Also, change the direction of gravity to match the coordinate convention of the model.**
   - For the Revolute2 block,
     - Specify a `Low` priority position target of `-55 deg`
     - Specify a `High` priority velocity target of `10 rev/s`
     - Set the **Damping Coefficient** to `5e-4 N*m/(rad/s)`
     - Sense the joint position
   - Change gravity to be in the negative z-direction.

***** This step requires SolidWorks and SimMechanics Link to be installed on the system.

Try

```
>> smimport('cad_engine.xml');
```



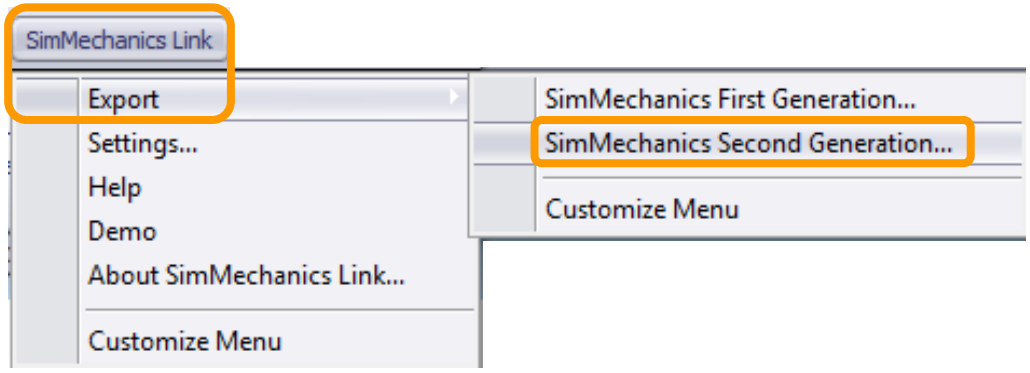


Solution: Crank Assembly Import

Try

```
>> cad_engine_imported
>> cad_engine_modified
```

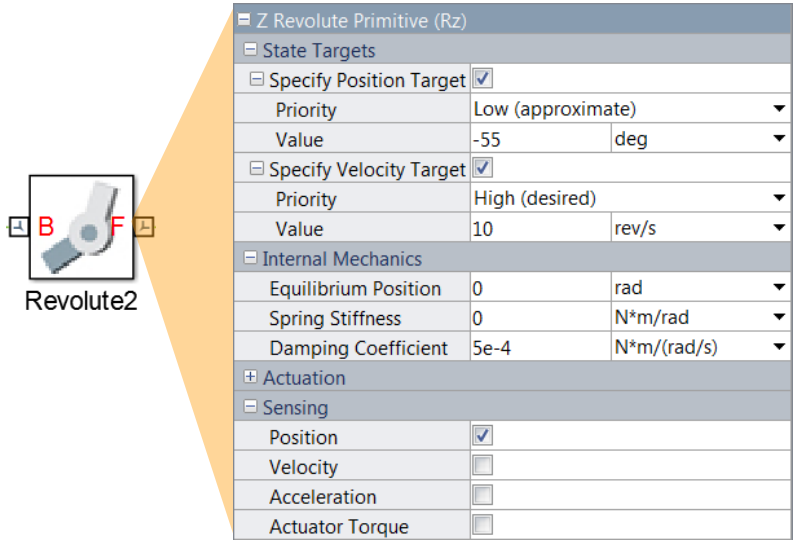
1. Export in SolidWorks

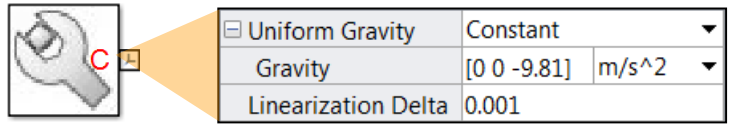


2.

```
>> smimport('cad_engine.xml')
Warning: The set of constraints between flywheel_1_RIGID and
crank_2_RIGID could not be mapped to a joint. A rigid connection has been
added between port F of flywheel_1_RIGID and port F of crank_2_RIGID for
these constraints.
```

3.





In this case, the warning about the unmapped constraint can be ignored since the flywheel and the crank are rigidly connected.

Creating Frames from Geometric Features

Try

```
>> cadFramesStart
```

Task: Use a Solid block to import geometries from CAD and create coordinate frames based on geometric features.

Steps: In a previous chapter, you used Rigid Transform blocks to create coordinate frames at the midpoints of the crank connection pins. Open the `cadFramesStart` model and take the following steps.

1. Add a Solid block to the model and load its geometry from the `crank.STEP` file.

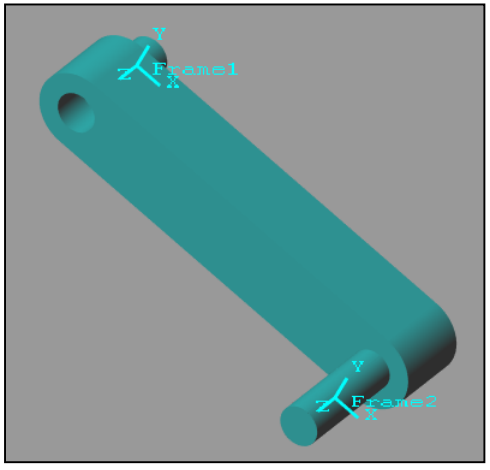
2. Expand the **Frames** menu of the Solid block dialog and select the New Frame () button.

3. In the new dialog that appears, select a feature (face, edge, or vertex).

4. Change the **Frame Origin** option to `Based on Geometric Feature`. Then, click the **Use Selected Feature** button.

5. Use the **Frame Axes** option to align the axes as needed.

Note This approach works for all solid geometries except for those imported from STL files.



Solution : Creating Frames from Geometric Features

Try

```
>> cadFramesSoln
```