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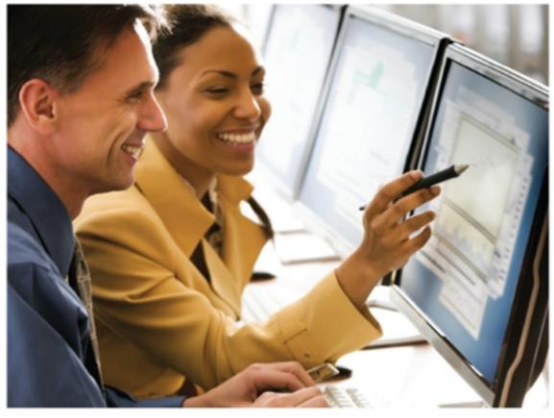
Exercises: Building Mechanical Assemblies – Part 1

Physical Modeling for Formula Student



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Four-Bar Linkage Kinematics

Try

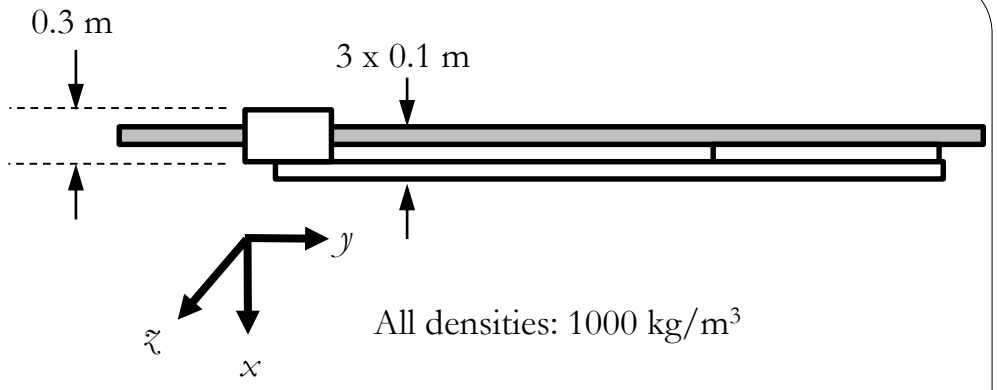
```
>> fourbar_start
```

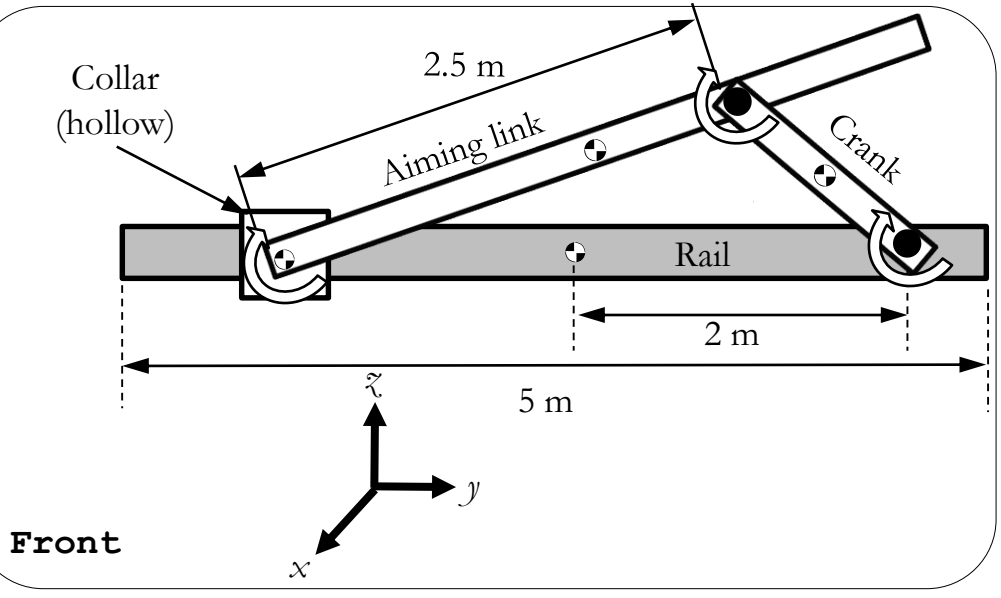
Task: Assemble a four-bar linkage model with sliding collar.

Steps: The model `fourbar_start` contains a model of the crank, aiming link, collar, and rail components of a four-bar linkage.

1. **Connect the aiming link and crank.**
   Connect the aiming link to the outer center surface of the collar, as shown in the diagram. Then, connect the crank to the inner surface of the aiming link at a point 2.5 m away from its left end.

2. **Close the loop.**
   Close the assembly loop by connecting the crank to the rail at a point 2 m from the center of mass of the rail.

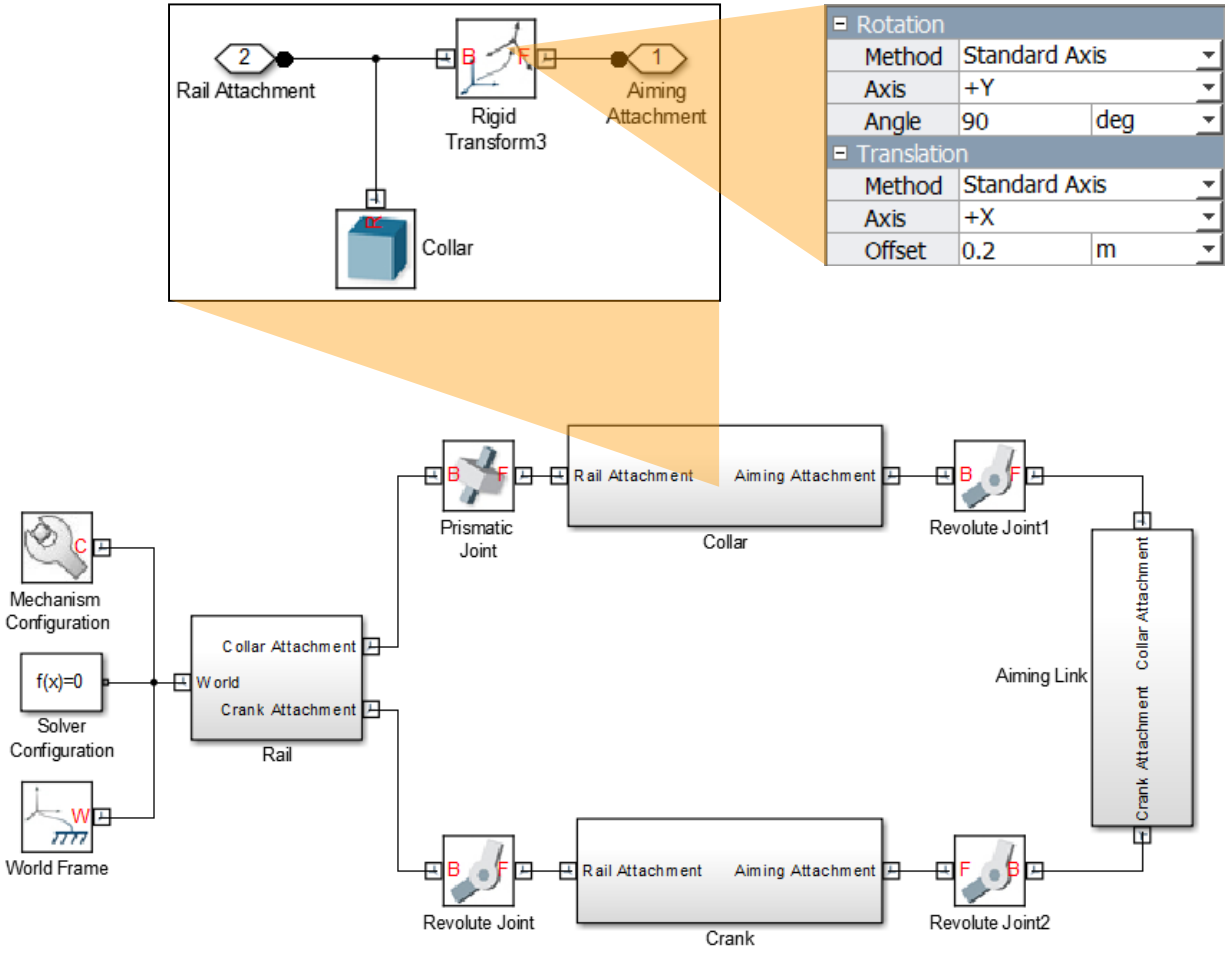




Solution: Four-Bar Linkage Kinematics

Try

```
>> fourbar_solution
```



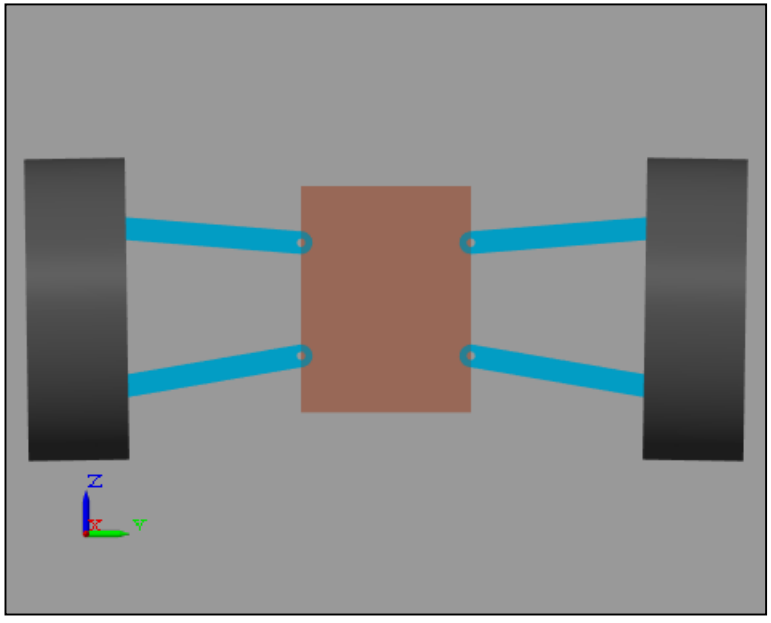
Suspension Assembly

Try

```
>> suspEx_start
```

Task: Add the left wheel to the suspension assembly course example.

Steps: The model `suspEx_start` contains a model of a simplified chassis and the right wheel suspension. Add a left wheel to the model by reusing the blocks used to model the right wheel.



1. **Create interface points between the Chassis Subsystem and Left Wheel Suspension Subsystem.**
   - Inside the Chassis Subsystem block, add Rigid Transform blocks to create interfaces between the chassis and the left wheel. Use the Rigid Transform blocks corresponding to the right wheel as reference.

2. **Create the Left Wheel Suspension Subsystem.**
   - Copy and reuse the existing Right Wheel Suspension Subsystem.
   - Change the parameters of the Rigid Transform blocks in the newly copied subsystem to orient the left wheel appropriately.

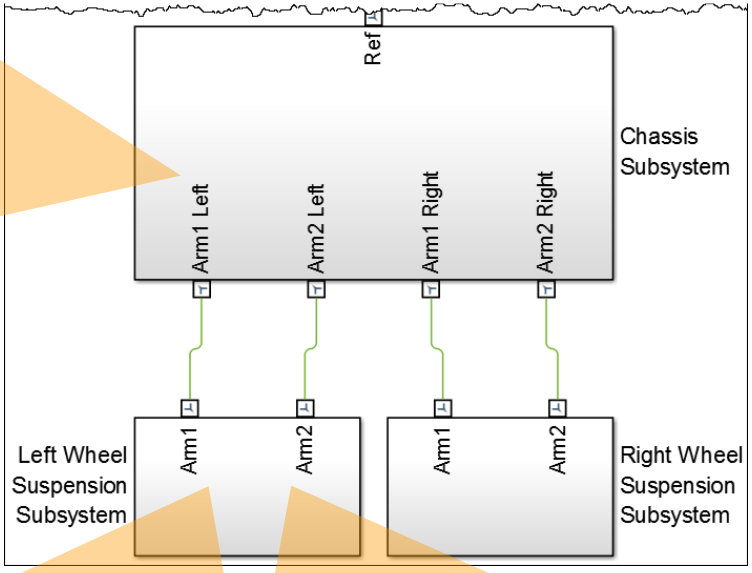
Solution: Suspension Assembly

Try

```
>> suspEx_solution
```

Mirror Right Wheel Transforms' Y coordinates

Translation		
Method	Cartesian	
Offset	[0 -chassis_w/2 arm1_chassis_dist]	cm



Mirror Translation in both Arms

Translation		
Method	Standard Axis	
Axis	+X	
Offset	arm1_l/2	cm

Flip Rotation in Wheel

Rotation		
Method	Standard Axis	
Axis	+Y	
Angle	-90	deg