Insert a Revolute Joint

base model: models/RigidBody.mdl

final model: models/RevoluteJoint.mdl

Explanations

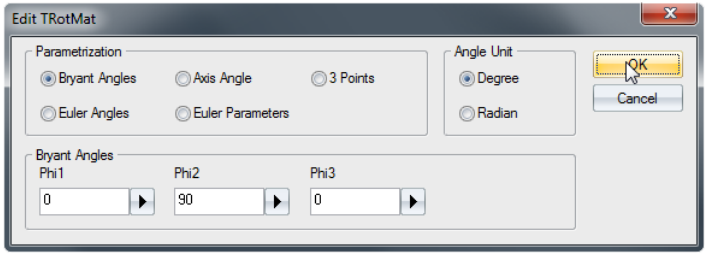
- A revolute joint is an interactor, which connects two bodies via two Frames
- The revolute joint fixes 5 degrees of freedom
  - It couples all translations of the two connected bodies
  - The rotation about the three-axis of the two frames is unrestricted and kept as single degree of freedom
  - The other two rotations are also coupled
- Important: With the convention of the three-axis as axis of rotation it is important to correctly position and rotate the two Frames, which are used to define the joint
- The RevoluteJoint should be used to built a pendulum using a Cylinder
- The axis of rotation should be the global 1-axis or x-axis
- The Cylinder should be connected at its upper end
- The anchor of the pendulum should be positioned 1.5 m above the `Ground`

Insert frames

Open the base model `RigidBody.mdl` in alaska/ModellerStudio

1. Insert a `TFrame` into the `Ground` and name it `"Frame1"`
2. Open the `"Component View"` of `Frame1` and set the position using the variable *`Pos`* to $\{0, 0, 1.5\}$
3. To align the three-axis of `Fame1` parallel to the global 1-axis we have to rotate it about its 2-axis about 90 degrees
4. To do so, double-click on the variable *`Rot`* of `Frame1`, which stands for `"Rotation"`
5. Use the editor to specify the deserved rotation:
   1. Keep the selection of `"Bryant Angles"`
   2. Enter the number 90 in the box of `"Phi2"`. which marks the box for rotation about 2-axis
   3. Switch the unit from `"Radian"` to `"Degree"` and click OK

Insert frames

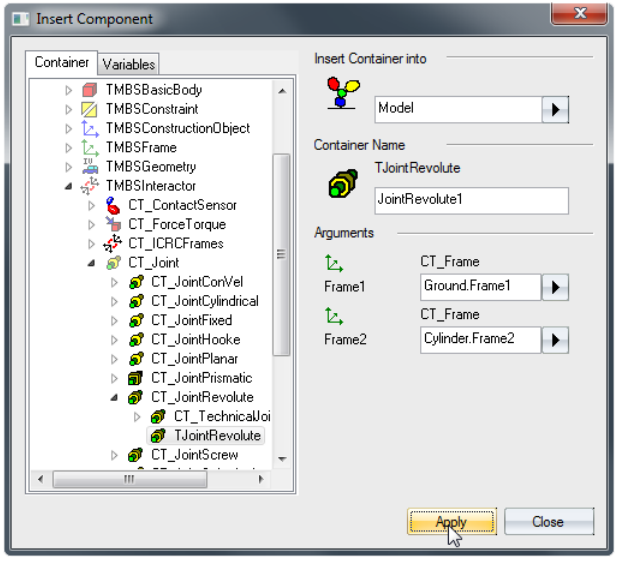


6. Insert a *TFrame* into Cylinder and name it "Frame2"
7. Open its "Component View" and set
   1. Variable *Pos* to $\{0, 0, 0.5\}$
   2. Variable *Rot* in the same way as for Frame1 (rotation about 2-axis with 90 degrees)

Insert RevoluteJoint

1. Insert a *TMBSInteractor* → *CT_Joint* → *CT_TJointRevolute* → *TJointRevolute* to the "Model", keep the name and set as arguments
   1. Frame1: `Ground.Frame1`
   2. Frame2: `Cylinder.Frame2`
2. (alternatively use the location *Joints* → *Revolute* within the "Short Cut Tree")

Insert RevoluteJoint



Check and initial conditions

1. To control the model, open the `Viewer` and select `Batch` at the "`Task Tree`", click run 

- To check the degree of freedom, we want to make the pendulum swing
- This can be done using initial conditions
- We want to set an initial deflection angle of 45 degree in the revolute joint
- Most of the model elements, particularly bodies and joints, possess a container with initial conditions
- This container is always named "`IC`"

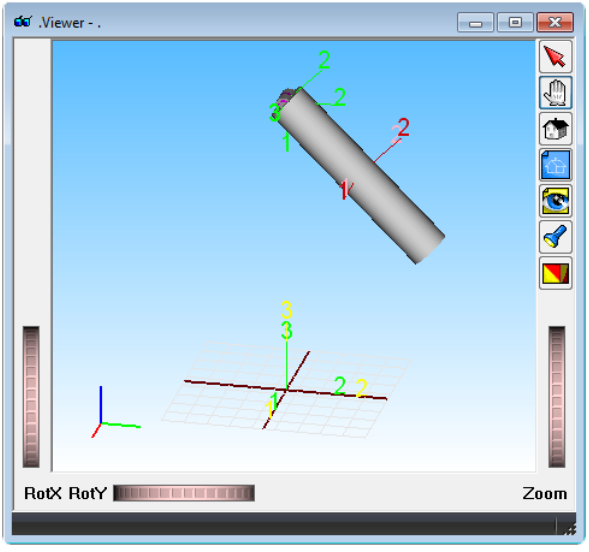
Set initial conditions

3. Open the "Component View" of RevoluteJoint1.IC
4. To set an initial angle double-click the variable *Rev*, which stands for the revolution angle
5. To give an angle in degree and automatically convert it to radian enter the statement "45*RAD"
6. Select Batch at the "Task Tree" and click run 

Change end time of the Integration task

- The pendulum should swing for 10 seconds

7. Open the "Component View" of Batch.Integration by double-clicking on it within the "Task Tree"
8. Double-click on the variable *EndTime* and set 10 as new value
9. Open the Viewer
10. Select Batch at the "Task Tree" and click on run 


.Viewer - .
RotX RotY
Zoom

Next tutorial

Next tutorial: Insert a Force Vector