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Introduction to Robotics and

CoppeliaSim
from the creators of V-REP

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Chandigarh University

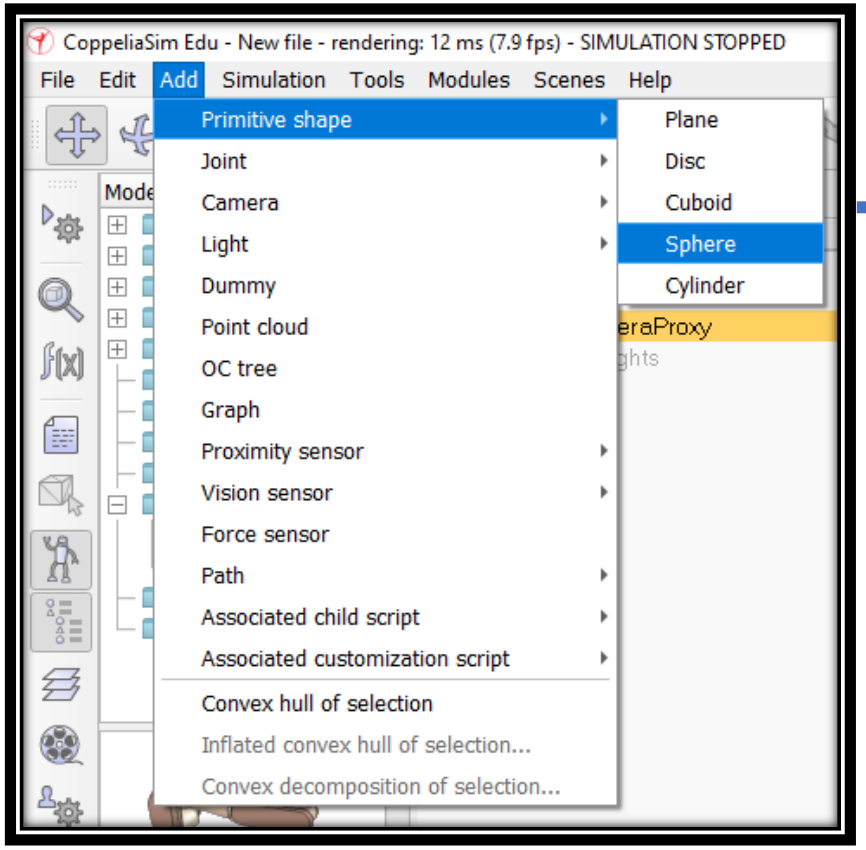
Research Profile -Dr. Prashant Upadhyaya - Google Scholar

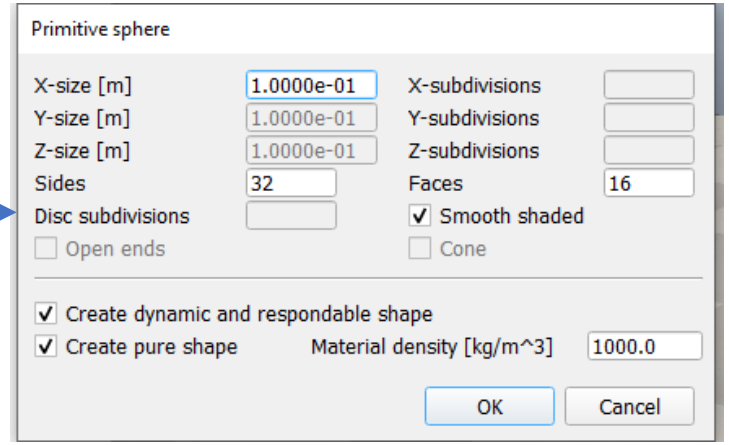
BubbleRob : Tutorial

STEP 1

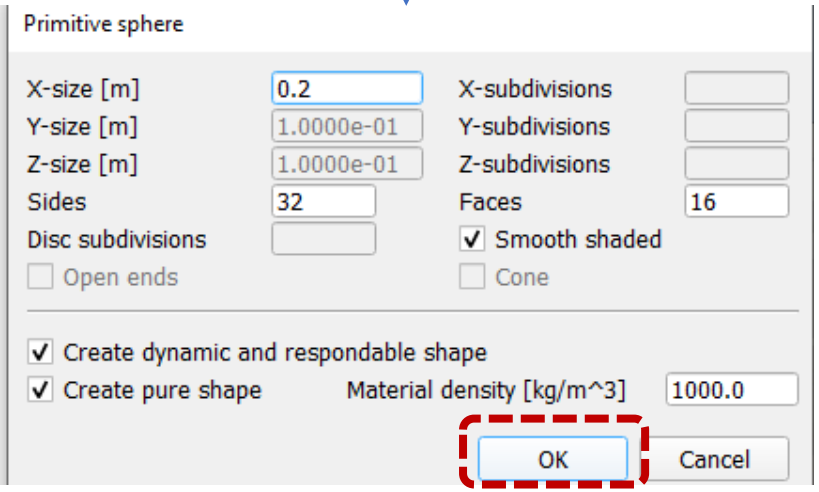
Add a primitive sphere of diameter 0.2 to the scene with

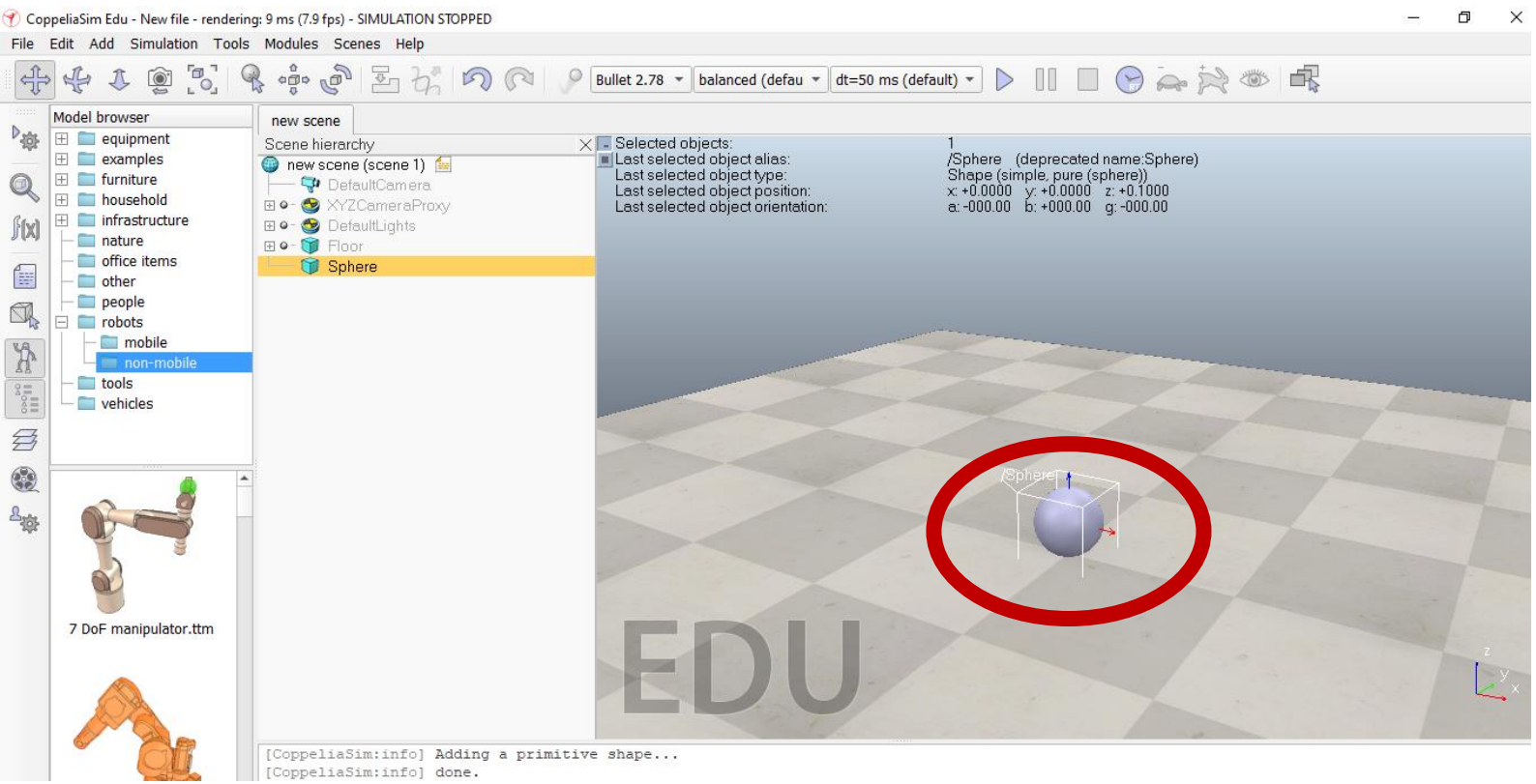
[Menu bar --> Add --> Primitive shape --> Sphere]





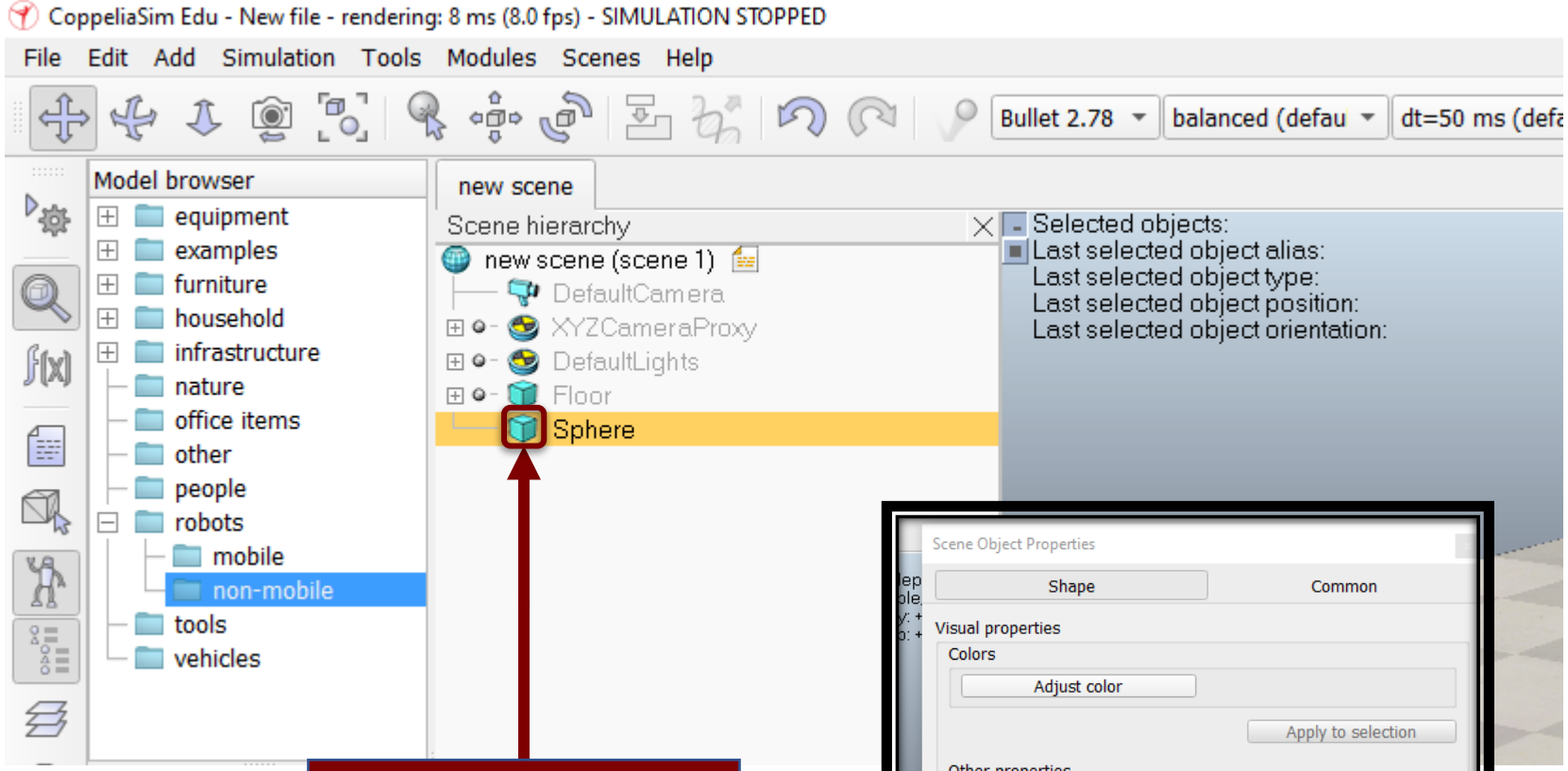
We adjust the X-size item to 0.2, then click OK.



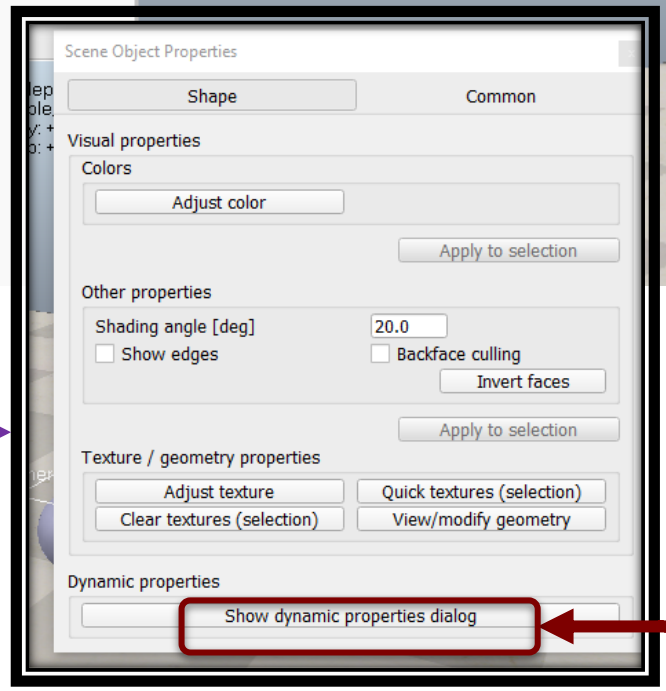


The created sphere will appear in the visibility layer 1 by default, and be dynamic and respondable.

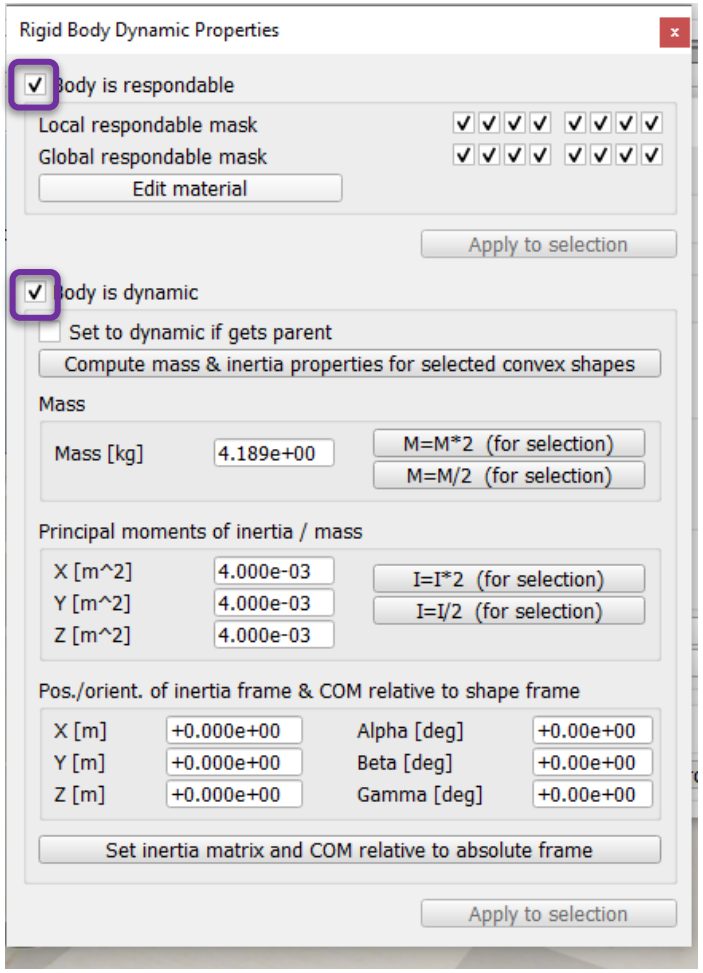
This means that *BubbleRob's body will be falling and able to react to collisions with other respondable shapes* (i.e. simulated by the physics engine)



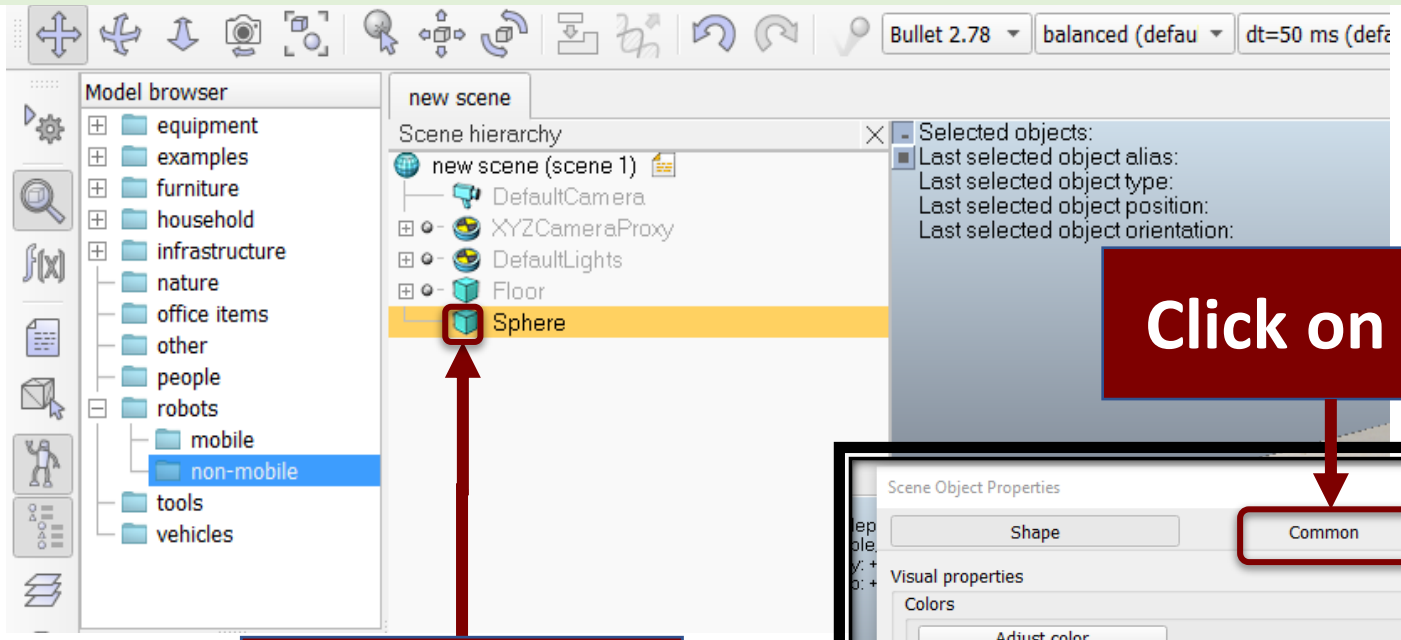
Double Click on teal colour shape



Click on this

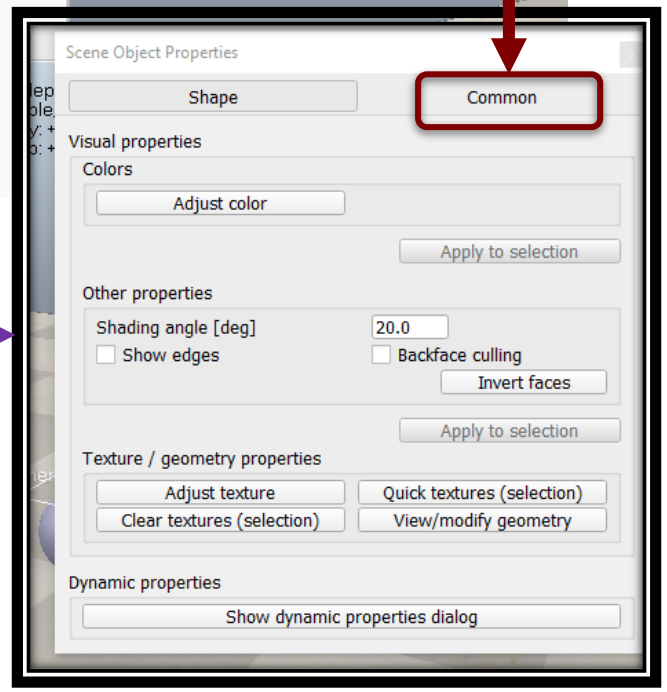


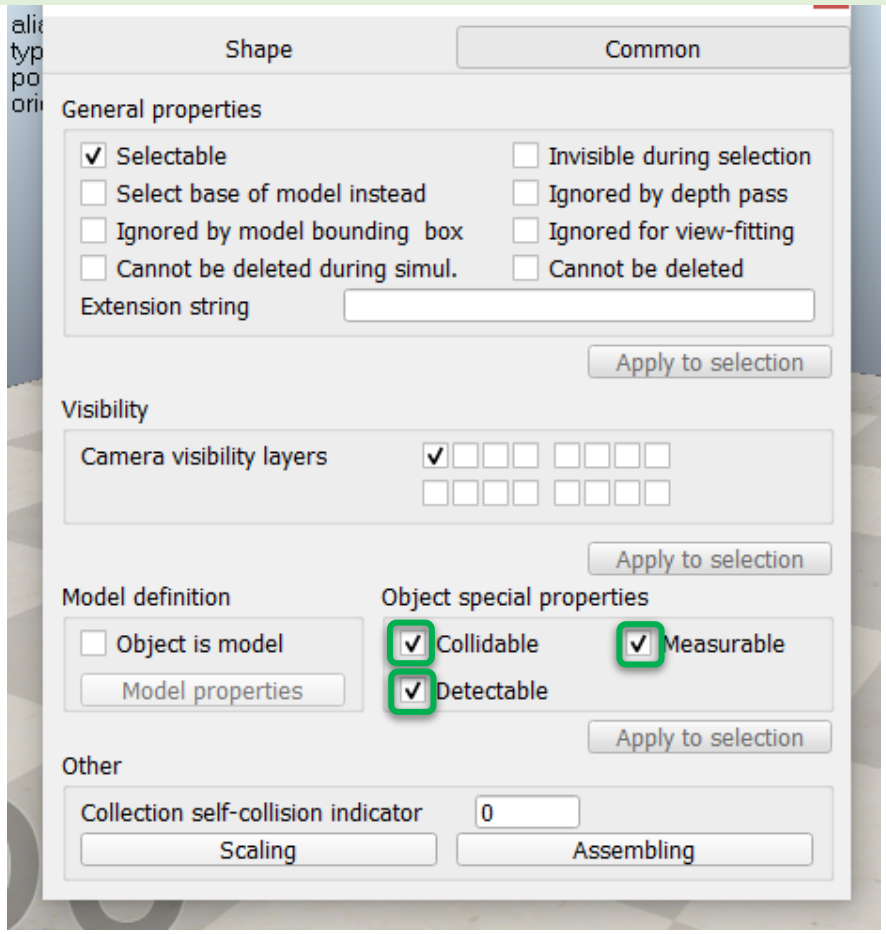
Enable Collidable, Measurable and Detectable in the object common properties



Double Click on teal colour shape

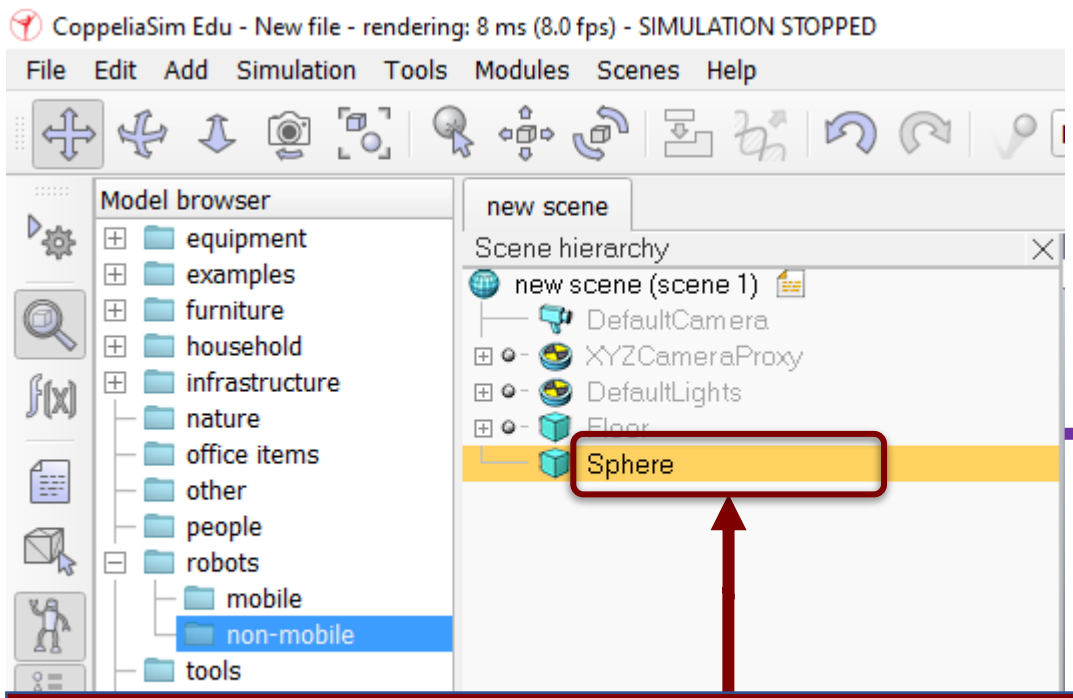
Click on this

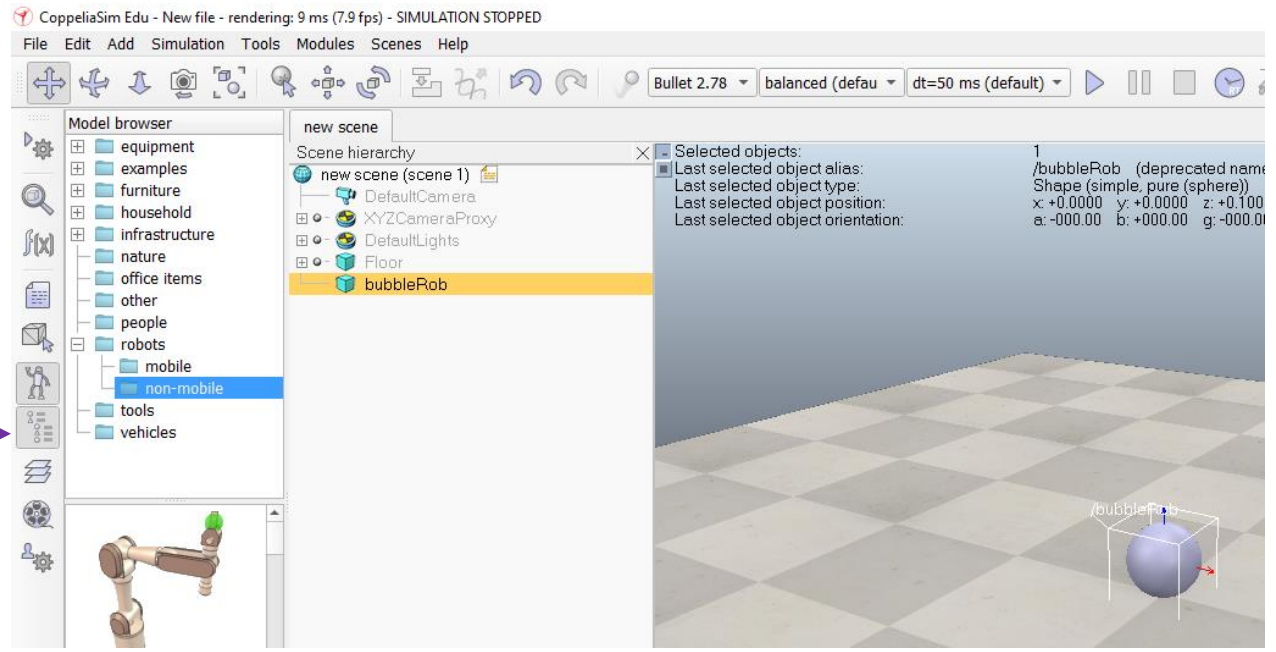




STEP 2

Rename the Sphere as bubbleRob

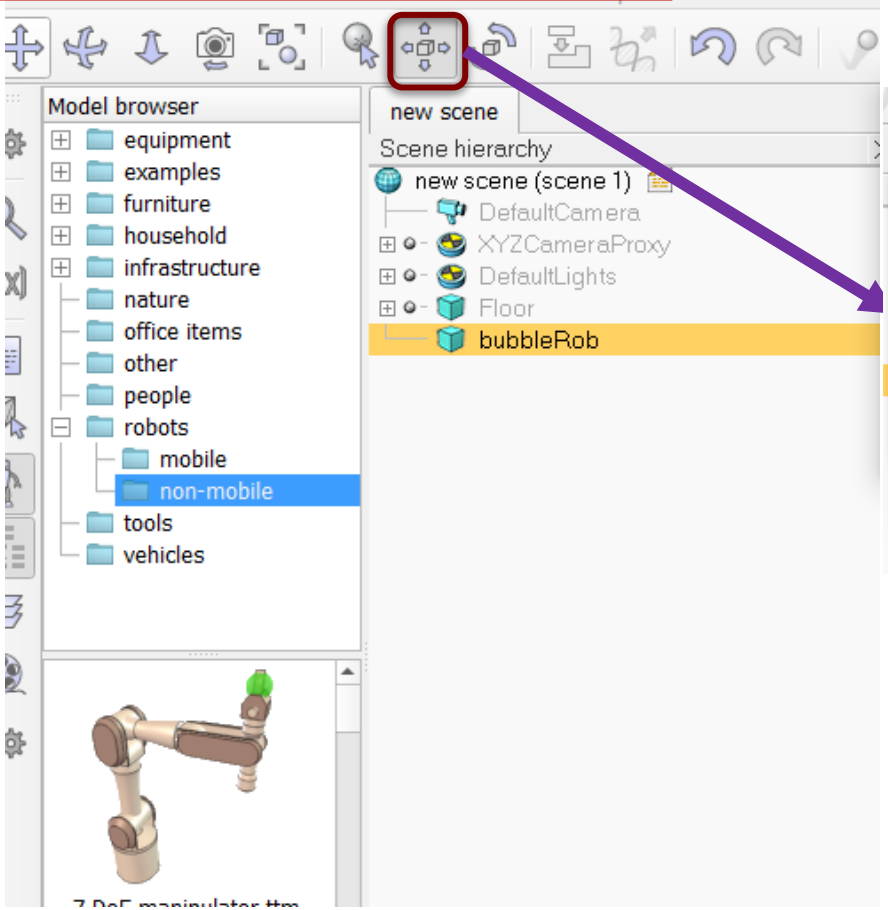


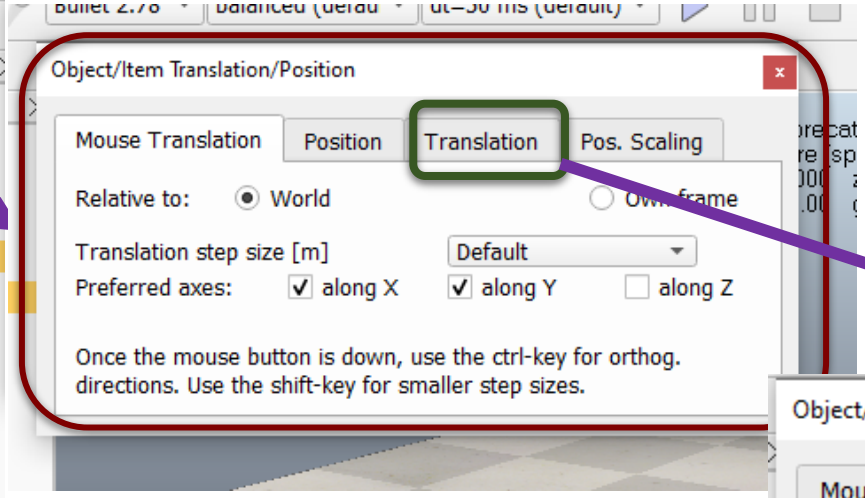


Double Click on this and rename it to bubbleRob and Press ENTER

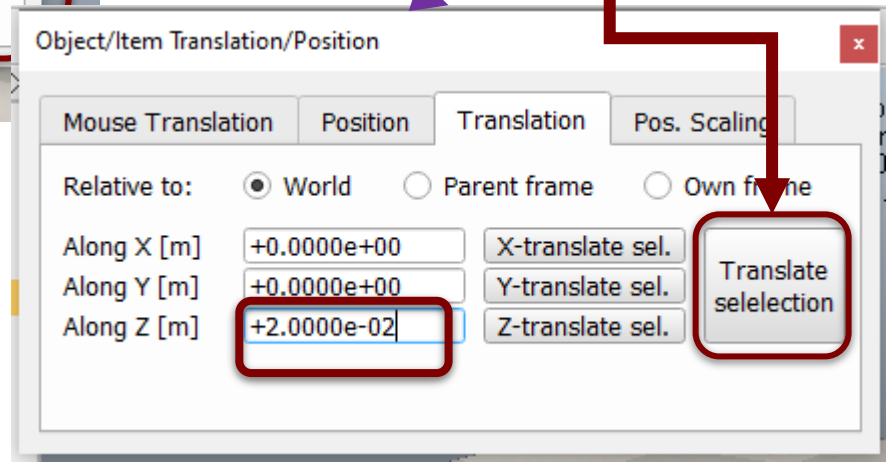
STEP 3

Open the position dialog on the translation tab, Select the sphere representing BubbleRob's body, and enter 0.02 for Along Z.

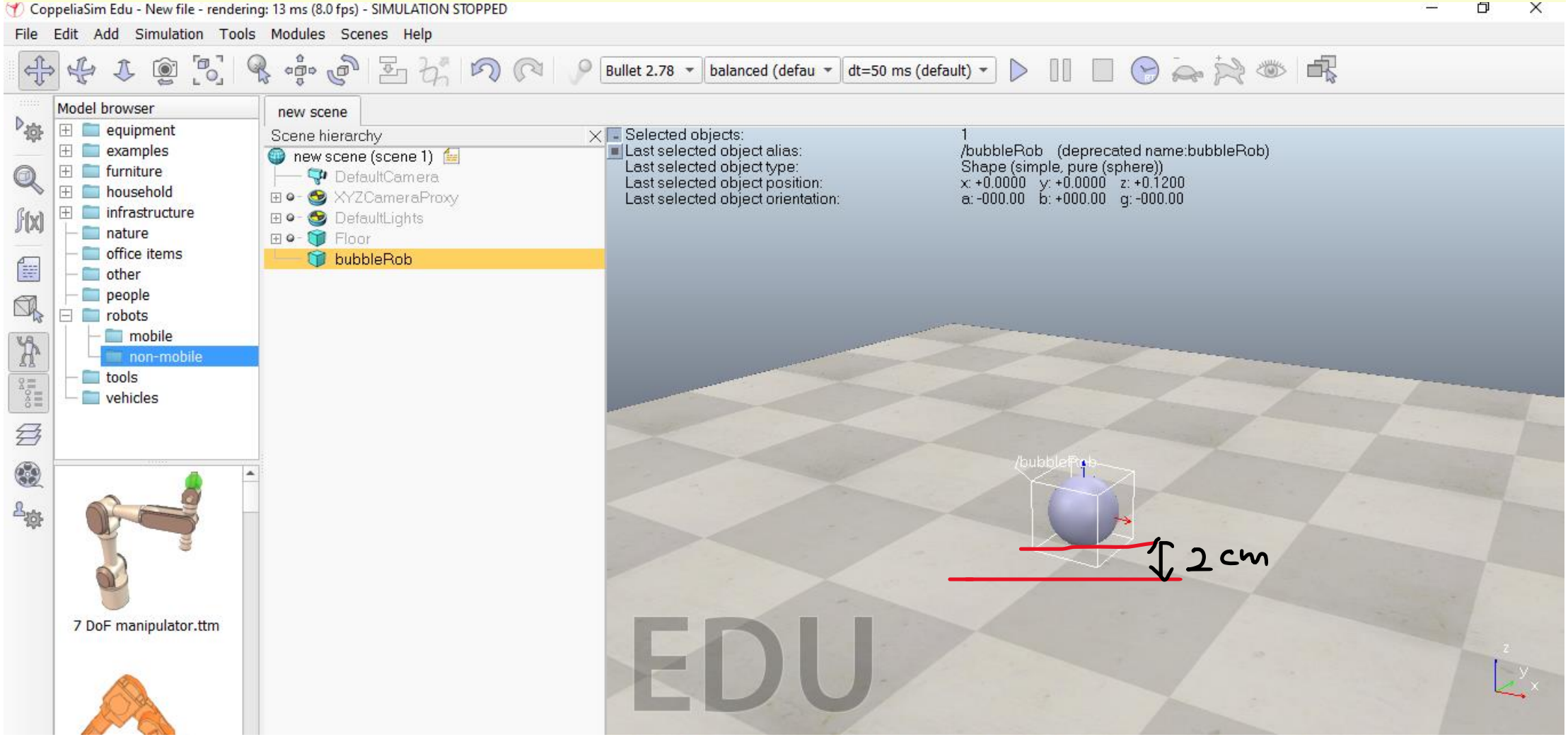




Click on Translate Selection



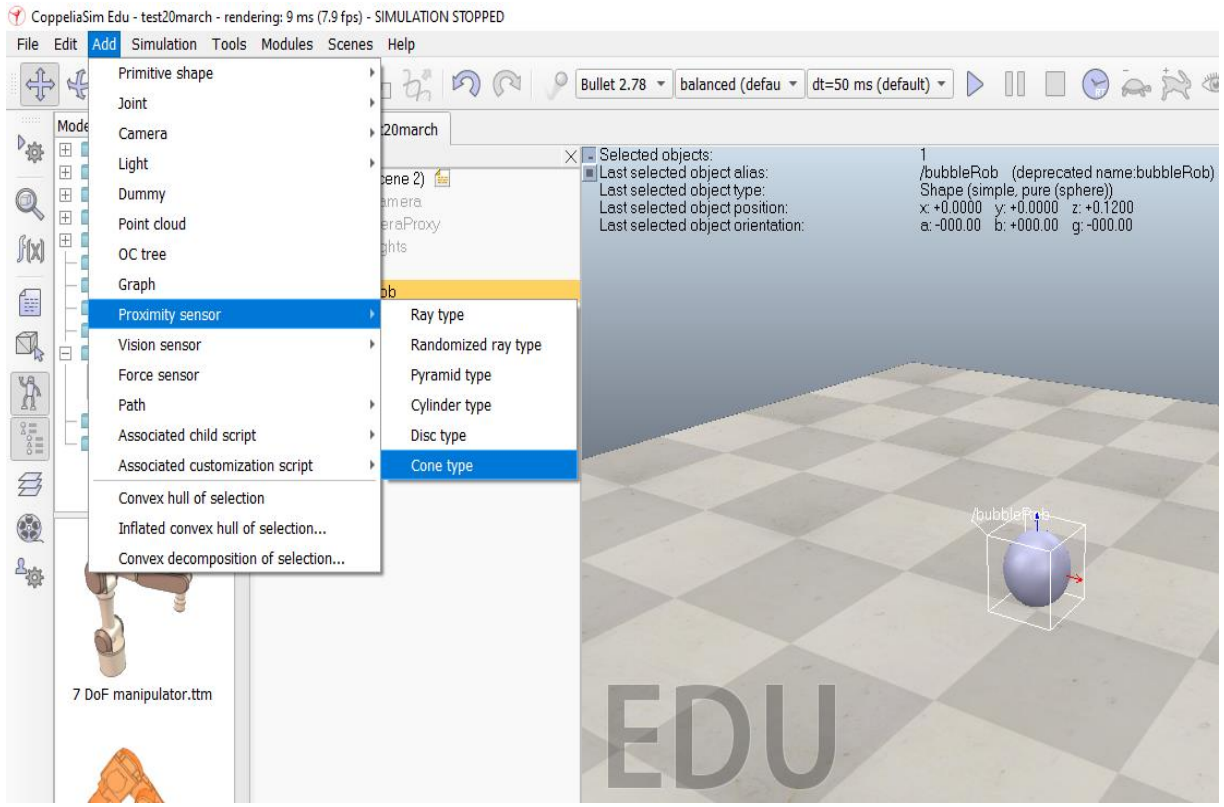
This translates all selected objects by 2 cm along the absolute Z-axis, and effectively lifted our sphere a little bit

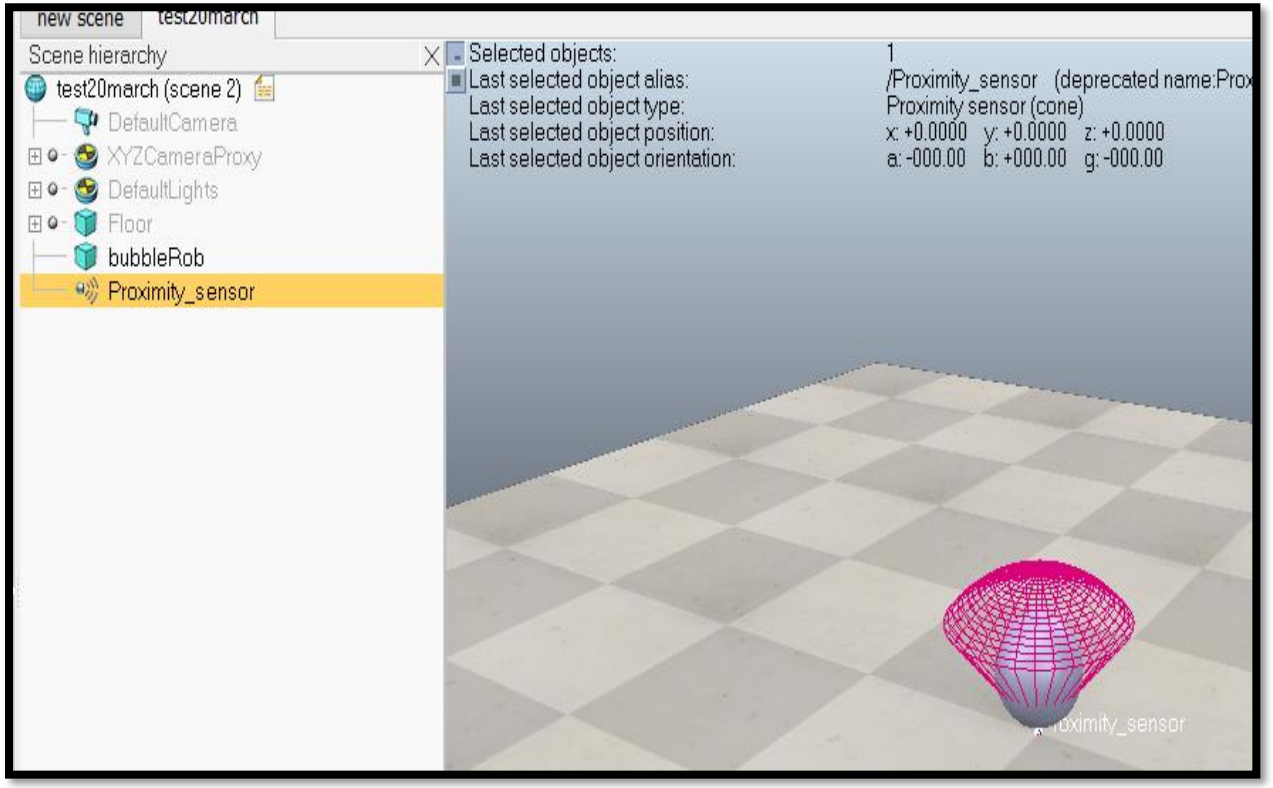


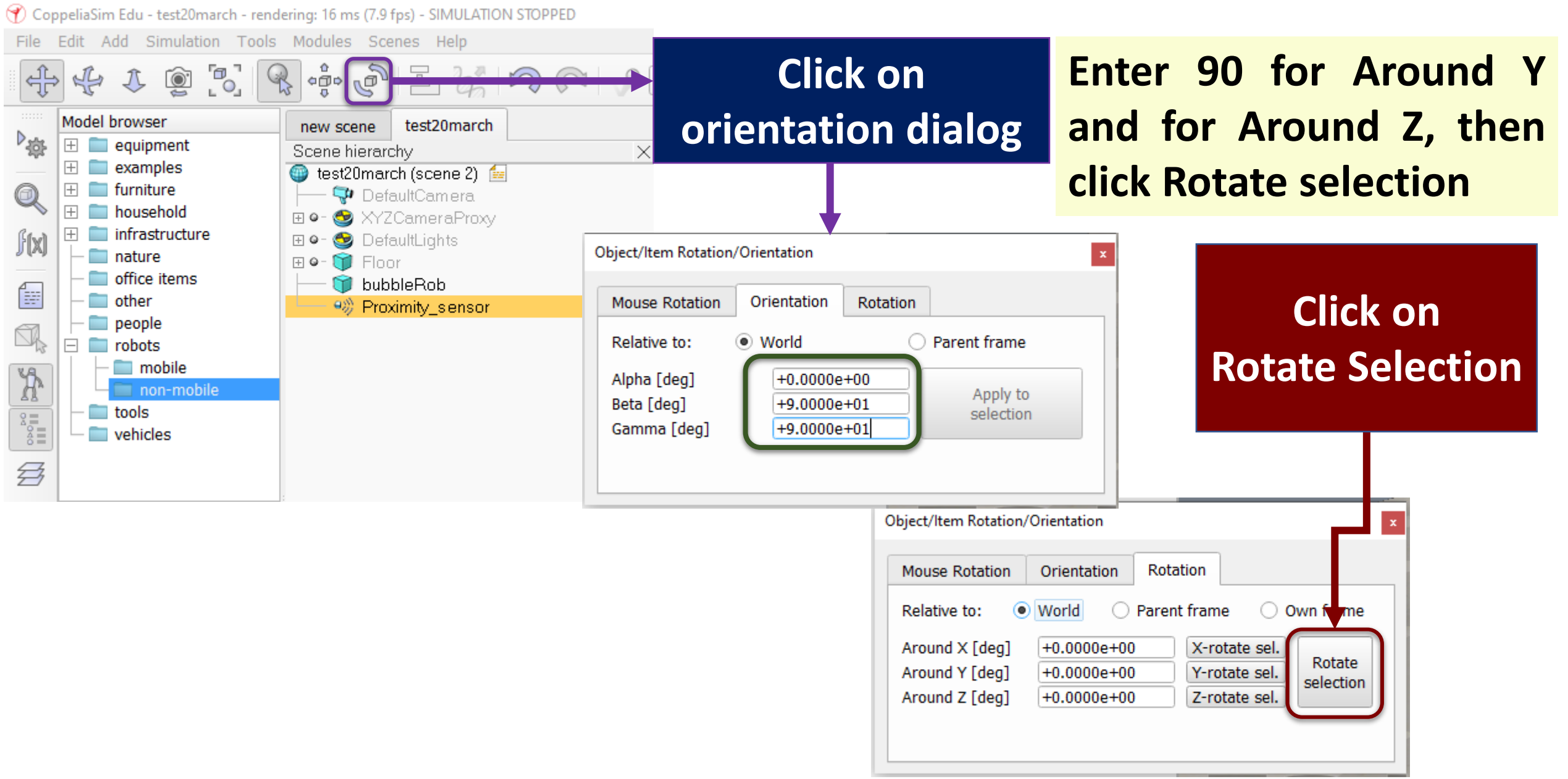
STEP 4

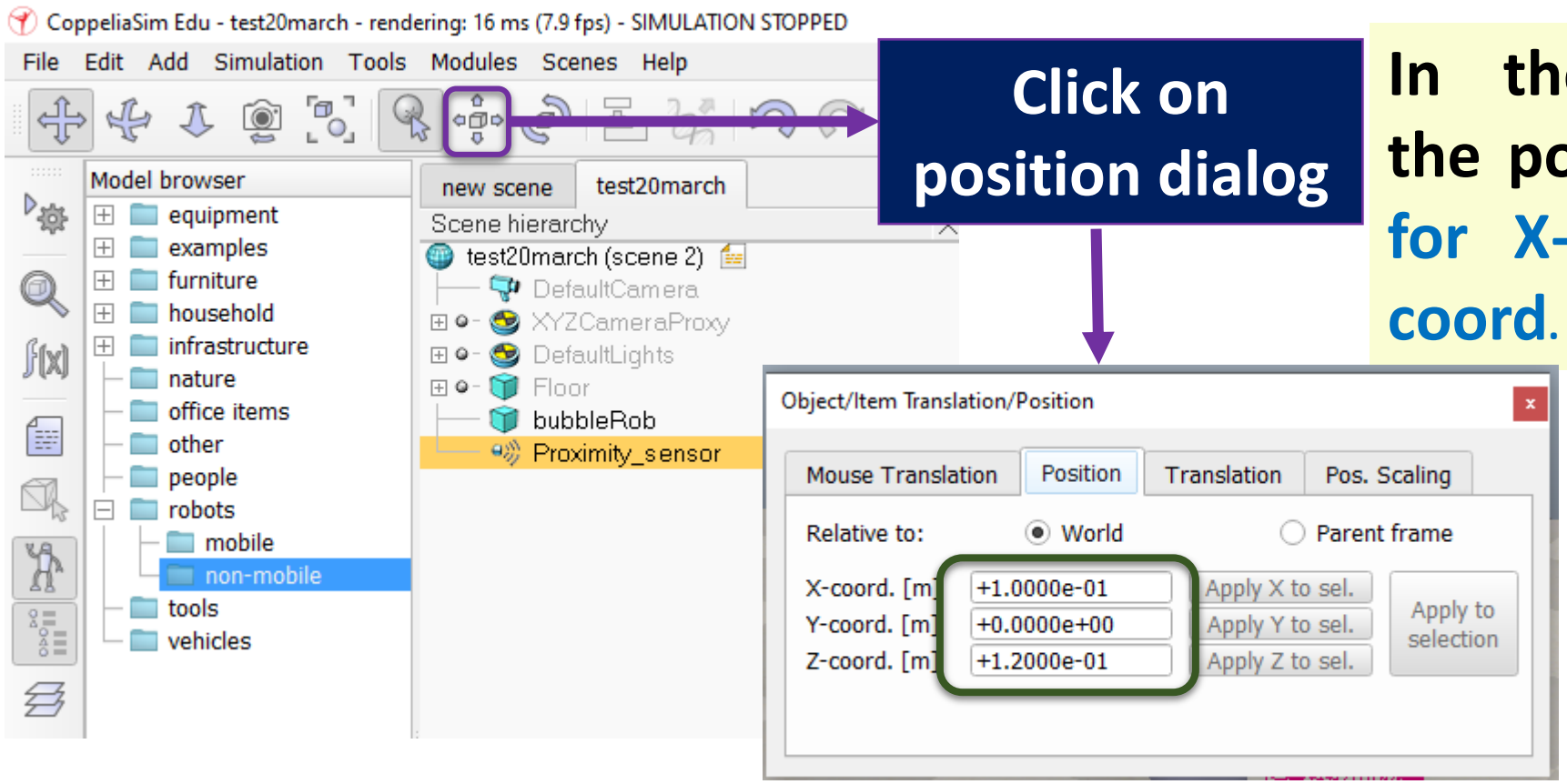
Add a proximity sensor so that BubbleRob knows when it is approaching obstacles: we select

[Menu bar --> Add --> Proximity sensor --> Cone type]



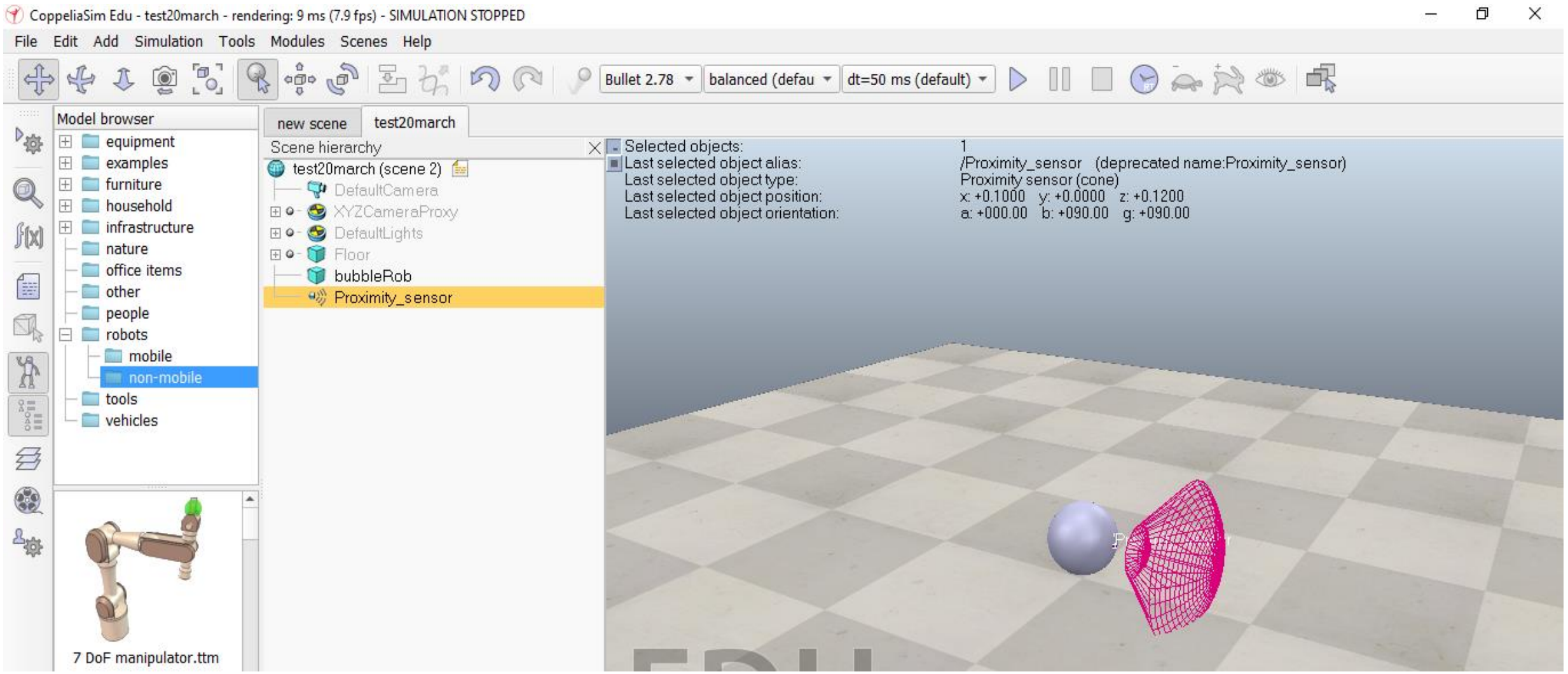



CoppeliaSim Edu - test20march - rendering: 16 ms (7.9 fps) - SIMULATION STOPPED
File Edit Add Simulation Tools Modules Scenes Help
Model browser
equipment
examples
furniture
household
infrastructure
nature
office items
other
people
robots
mobile
non-mobile
tools
vehicles
new scene
test20march
Scene hierarchy
test20march (scene 2)
DefaultCamera
XYZCameraProxy
DefaultLights
Floor
bubbleRob
Proximity_sensor
Click on orientation dialog
Enter 90 for Around Y and for Around Z, then click Rotate selection
Object/Item Rotation/Orientation
Mouse Rotation
Orientation
Rotation
Relative to:
World
Parent frame
Alpha [deg]
Beta [deg]
Gamma [deg]
+0.0000e+00
+9.0000e+01
+9.0000e+01
Apply to selection
Click on Rotate Selection
Object/Item Rotation/Orientation
Mouse Rotation
Orientation
Rotation
Relative to:
World
Parent frame
Own frame
Around X [deg]
Around Y [deg]
Around Z [deg]
+0.0000e+00
+0.0000e+00
+0.0000e+00
X-rotate sel.
Y-rotate sel.
Z-rotate sel.
Rotate selection



Click on position dialog

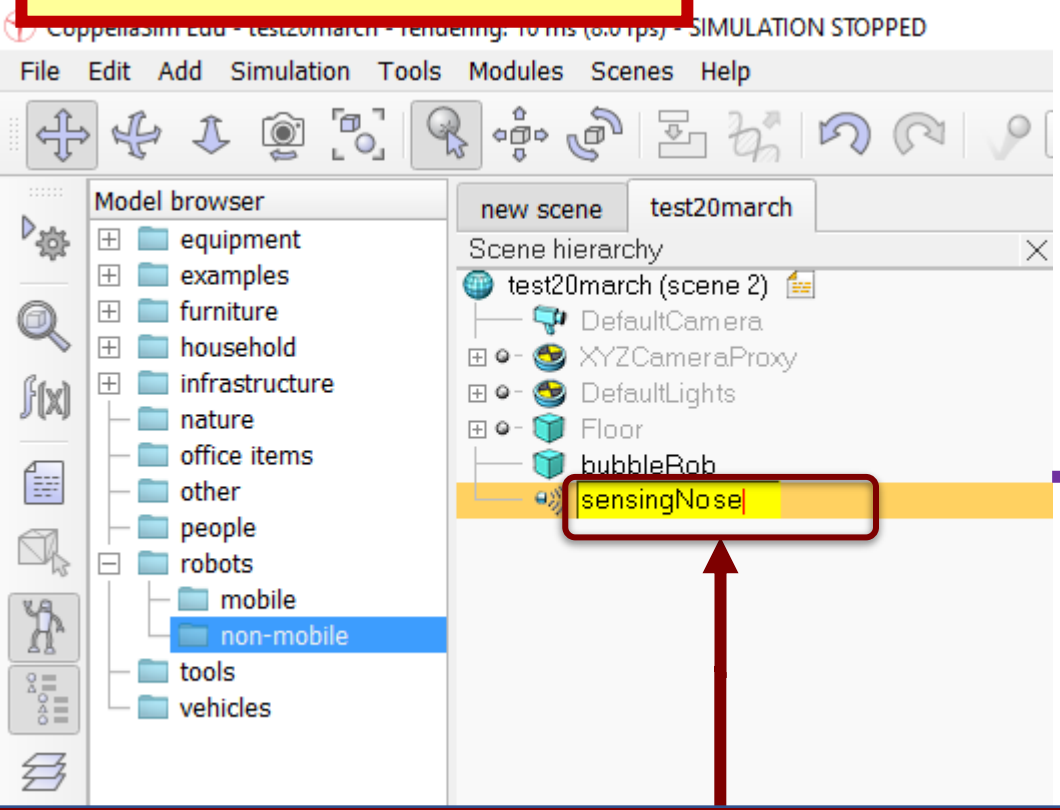
In the position dialog, on the position tab, we enter 0.1 for X-coord and 0.12 for Z-coord.

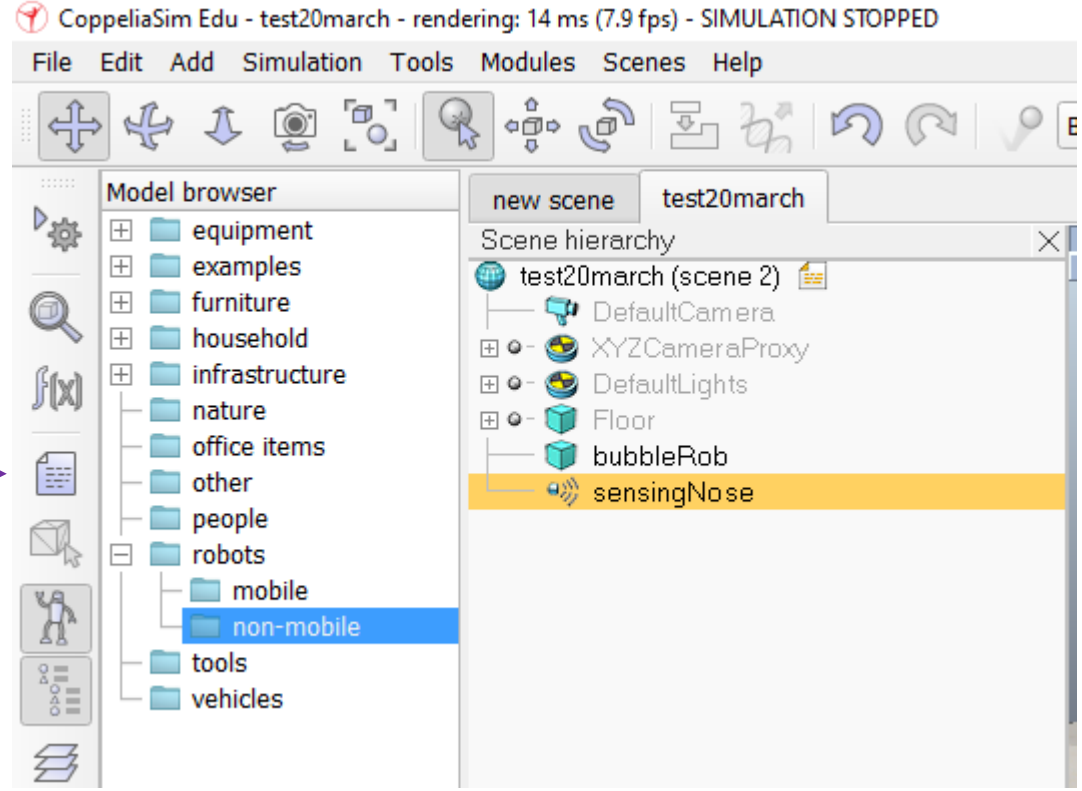


The proximity sensor is now correctly positioned relative to BubbleRob's body

STEP 5

Rename the Proximity Sensor as sensingNose





Double Click on this and rename it to sensingNose and Press ENTER

CoppeliaSim Edu - test20march - rendering: 14 ms (8.1 fps) - SIMULATION STOPPED

File Edit Add Simulation Tools Modules Scenes Help

Model browser

- equipment
- examples
- furniture
- household
- infrastructure
- nature
- office items
- other
- people
- robots
  - mobile
  - non-mobi
- tools
- vehicles

new scene | test20march

Scene hierarchy

- test20march (scene 2)
  - DefaultCamera
  - XYZCameraProxy
  - DefaultLights
  - Floor
  - bubbleRob
  - sensingNose

Double Click

Click on this

Scene Object Properties

Proximity sensor | Common

Main properties

Explicit handling

Show volume parameters | Show detection parameters

Apply to selection

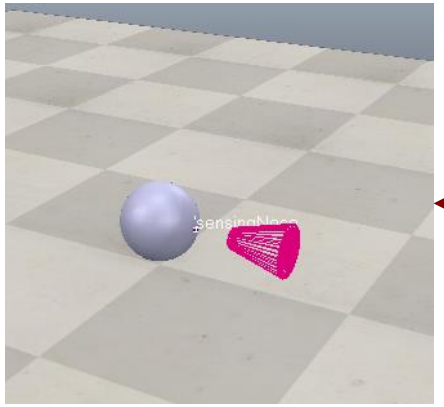
Visual properties

Show volume | Sens. pt size [m] 0.010

Adjust volume color | Adjust detection ray color

Apply to selection

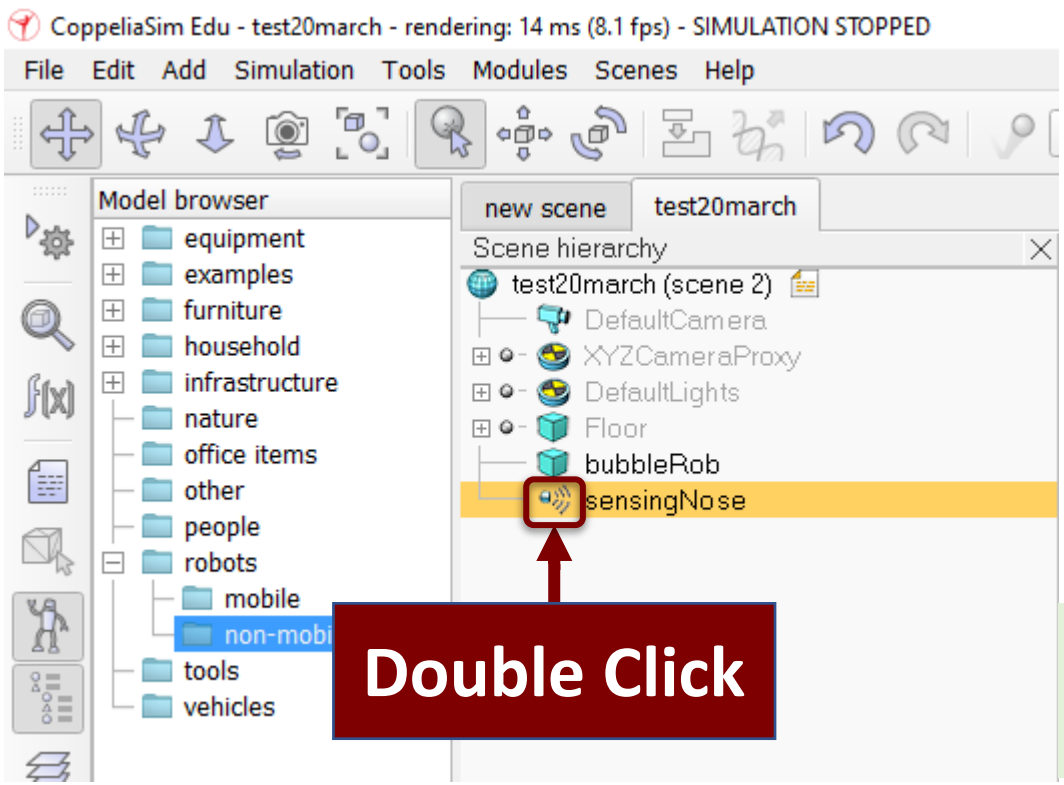
We adjust items **Offset to 0.005**, **Angle to 30** and **Range to 0.15**



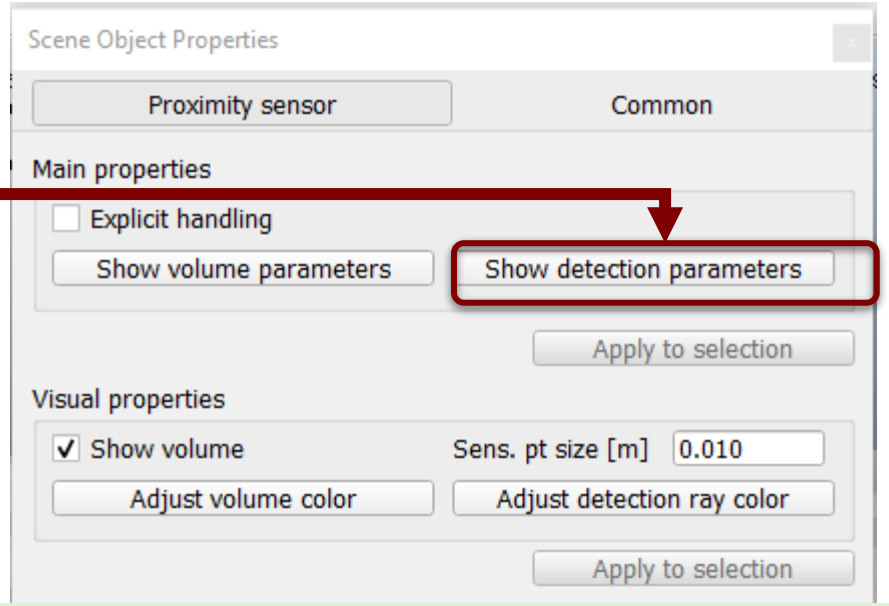
Detection Volume Properties

Offset [m]	+0.0050	Radius [m]	0.1000
Range [m]	0.1500	Radius far [m]	
X size [m]		Angle [deg]	30.00
Y size [m]		Face count	32
X size far [m]		Face count far	
Y size far [m]		Subdivisions	1
Inside gap	0.000	Subdivisions far	16

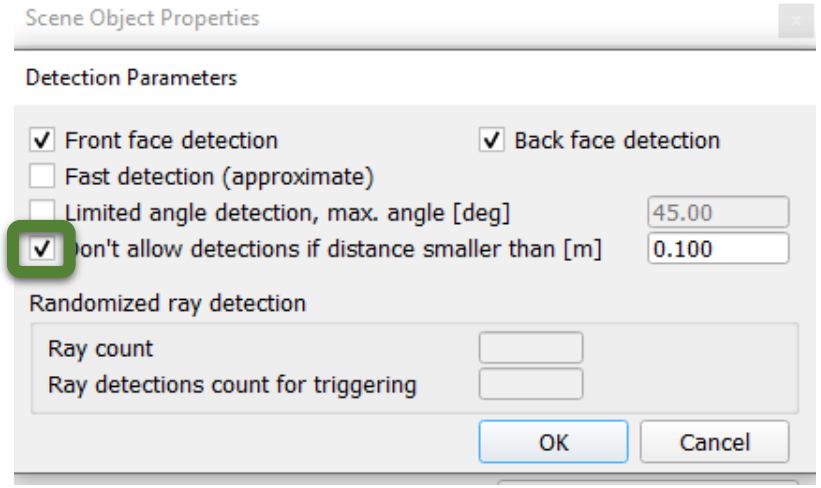
Apply to selection



Click on this

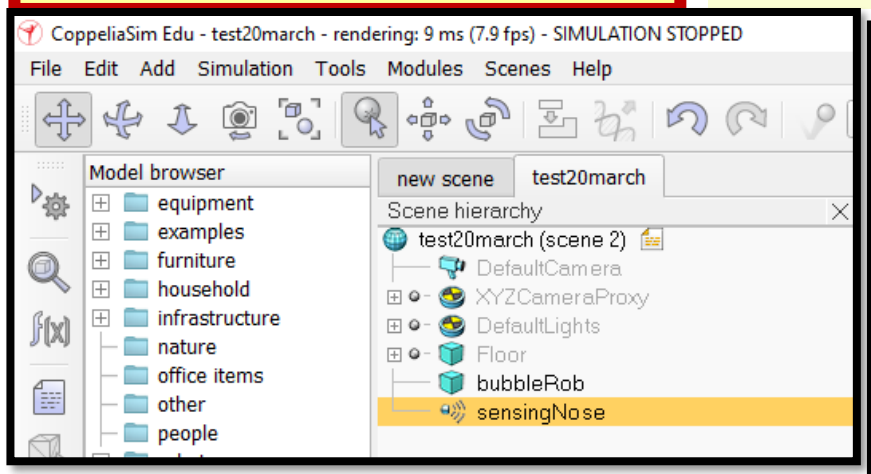


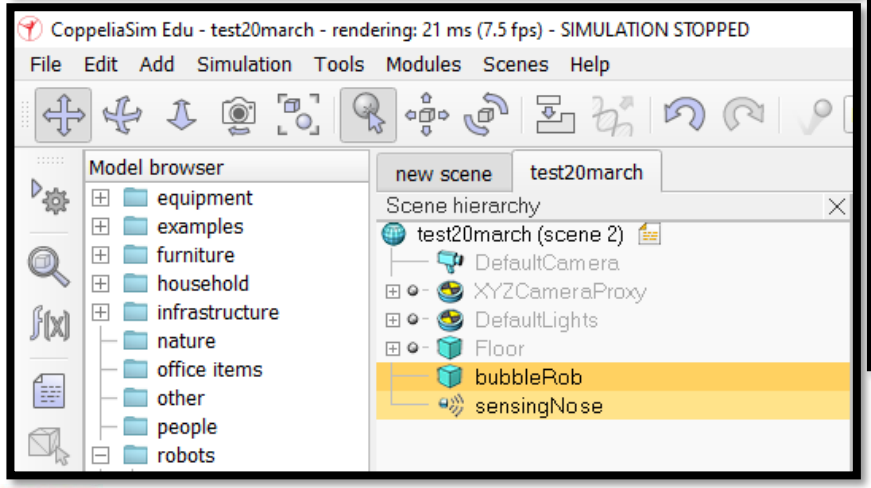
Uncheck item Don't allow detections if distance smaller than then close that dialog again.

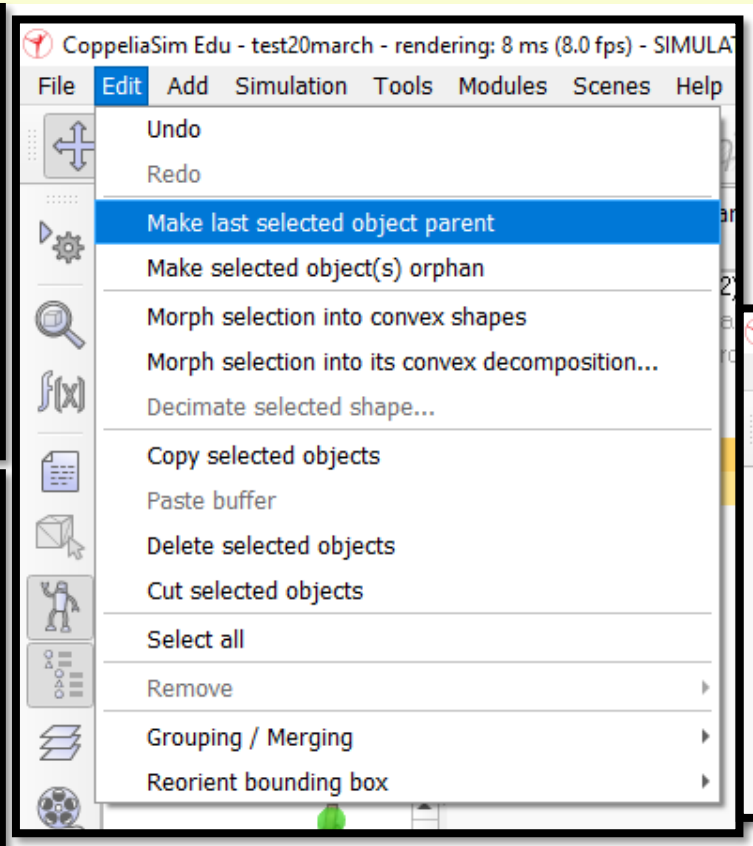


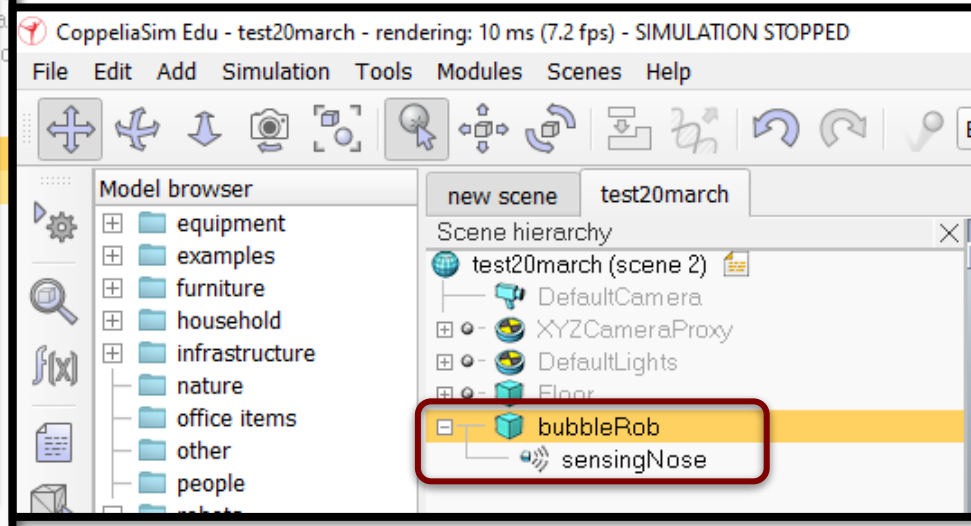
STEP 6

We select sensingNose, then control-select bubbleRob, then click [Menu bar --> Edit --> Make last selected object parent].





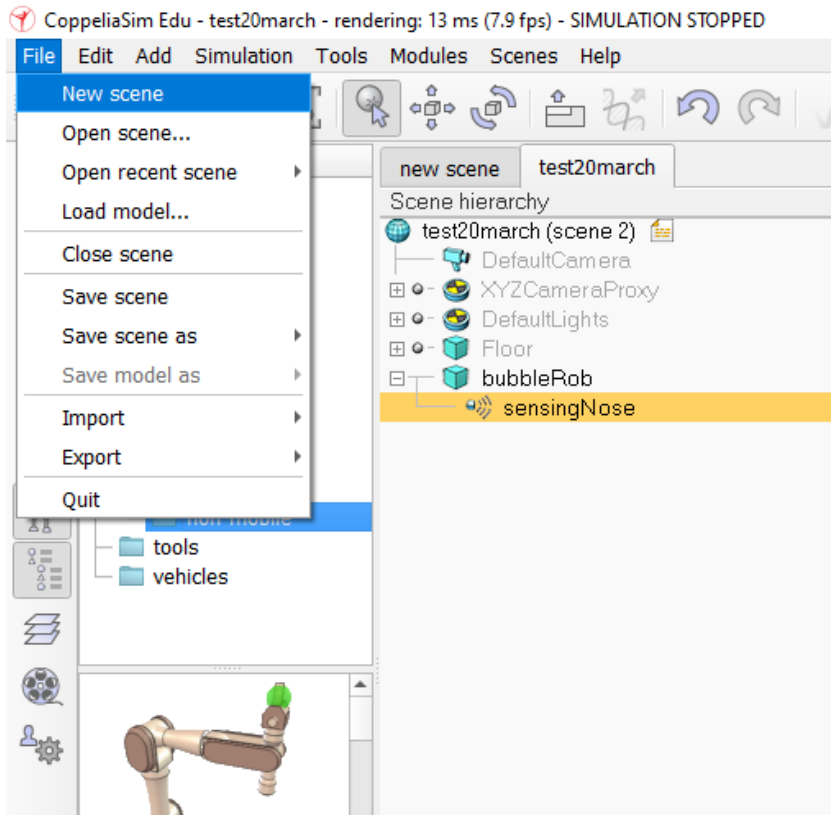


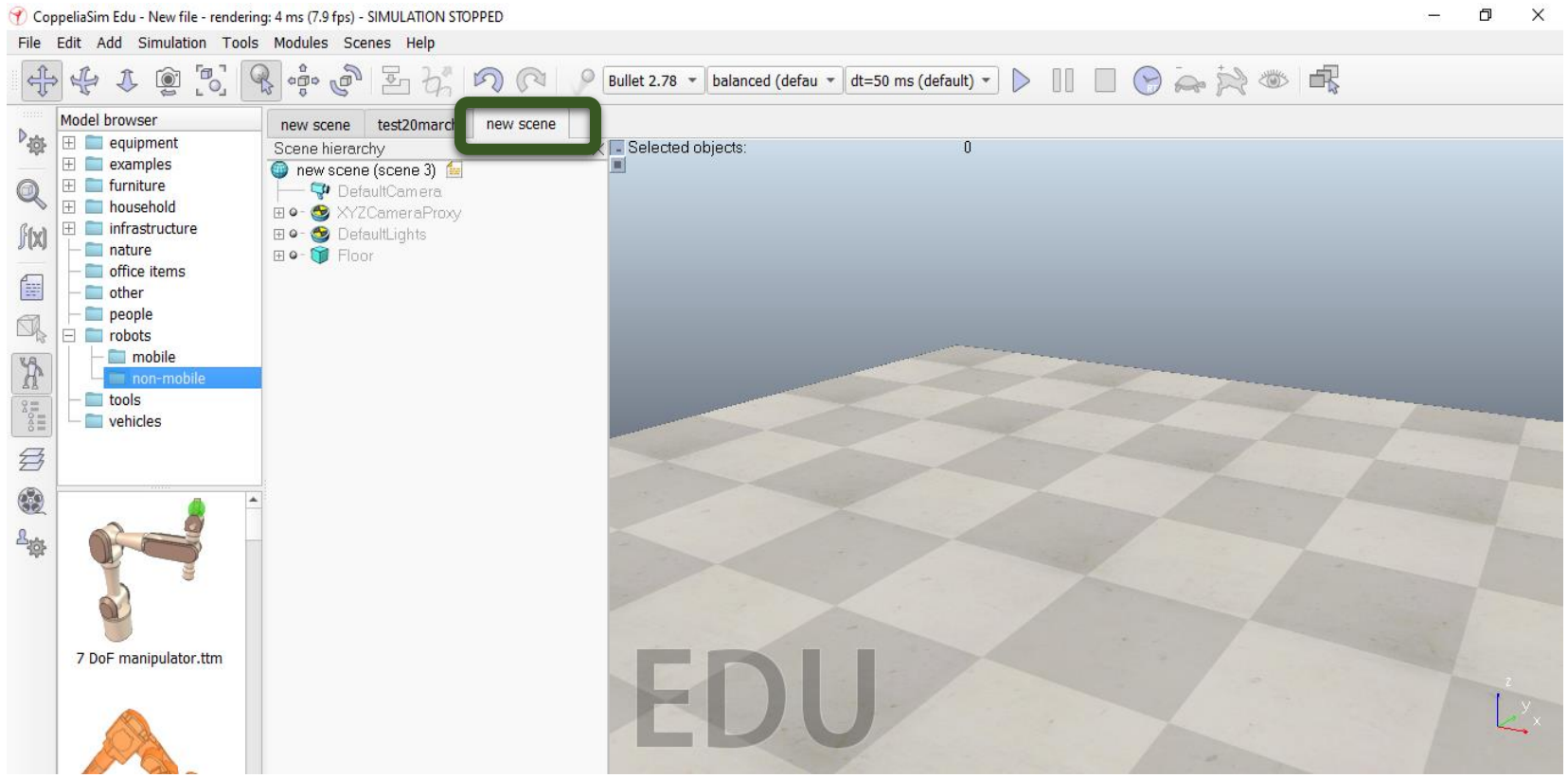


Creating BubbleRob : Wheel

STEP 7

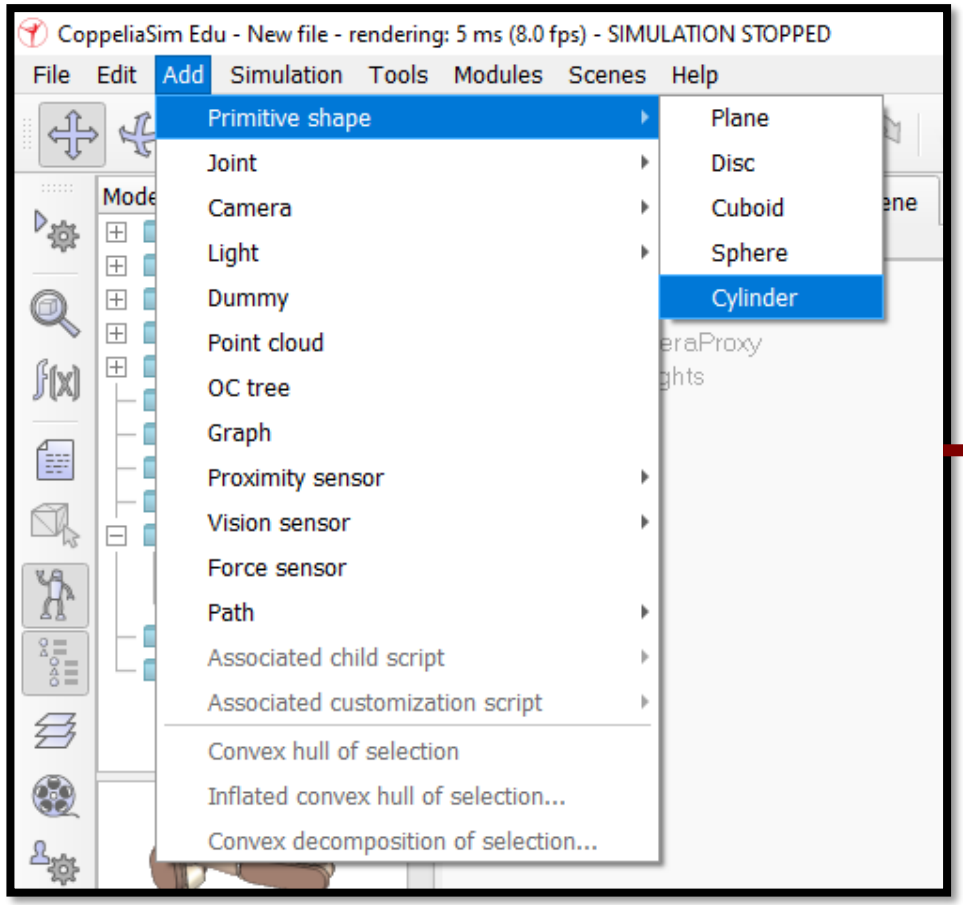
We will design BubbleRob's wheels.
We create a new scene with
[Menu bar --> File --> New scene]

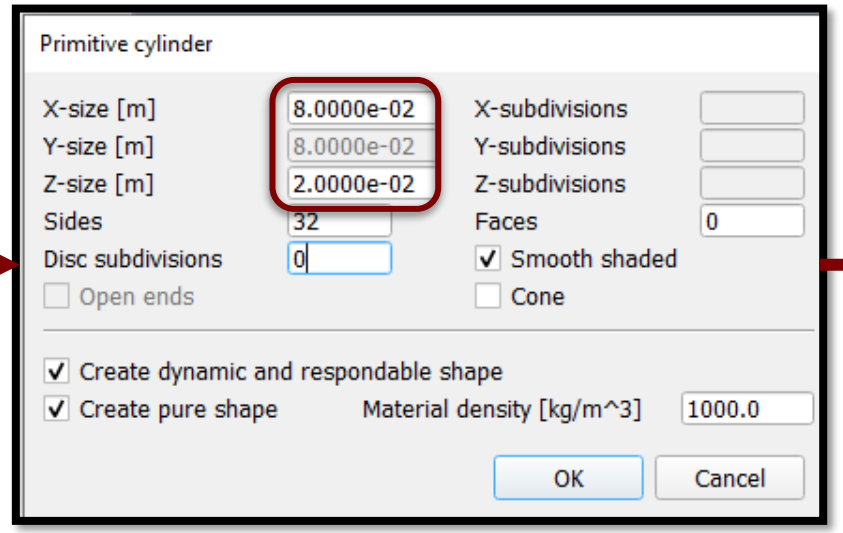


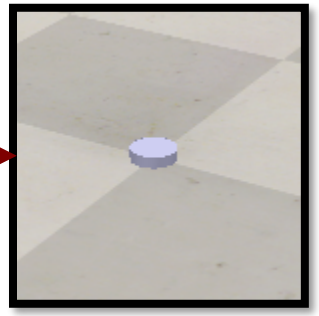


STEP 7

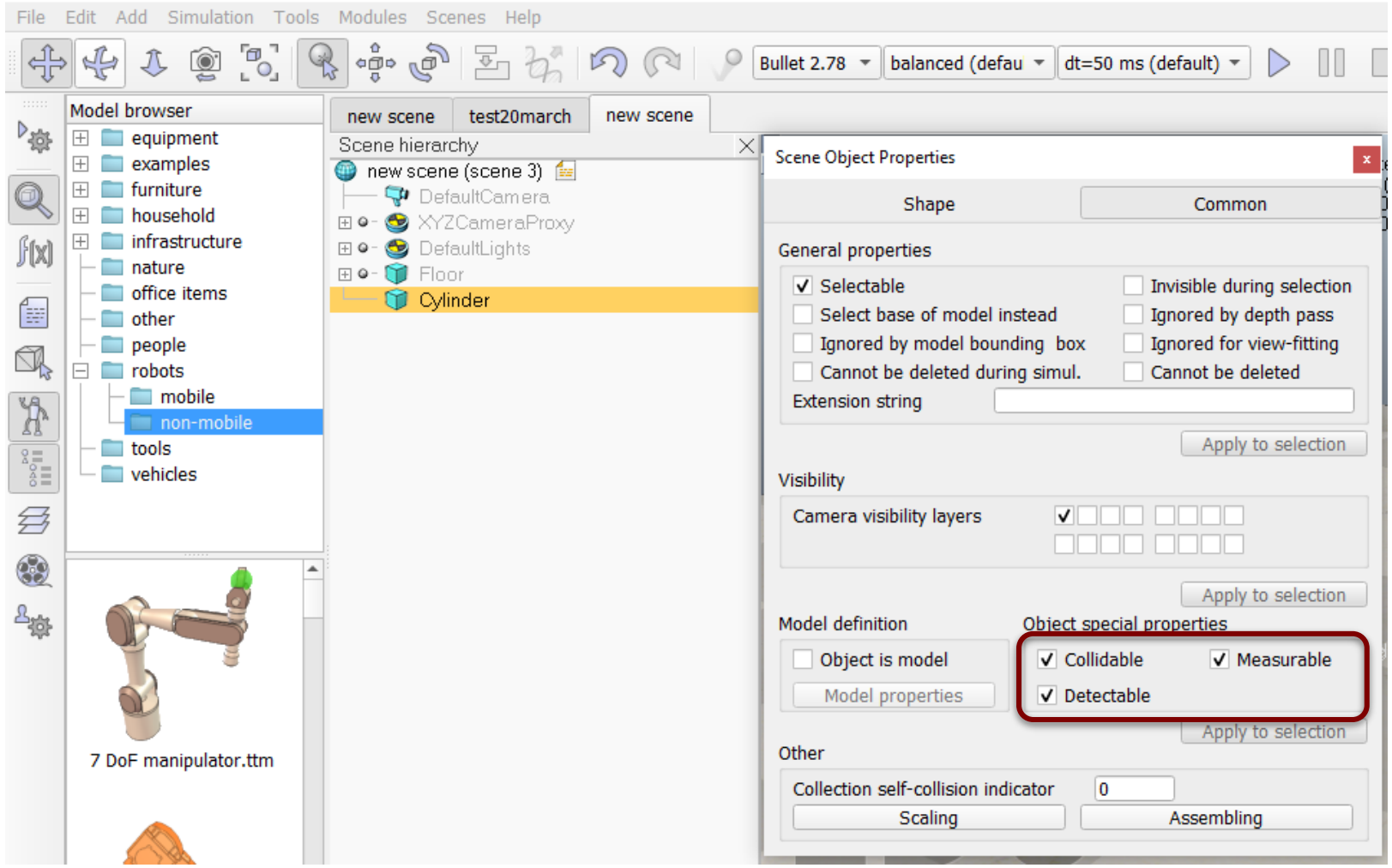
We add a pure primitive cylinder with dimensions (0.08,0.08,0.02)





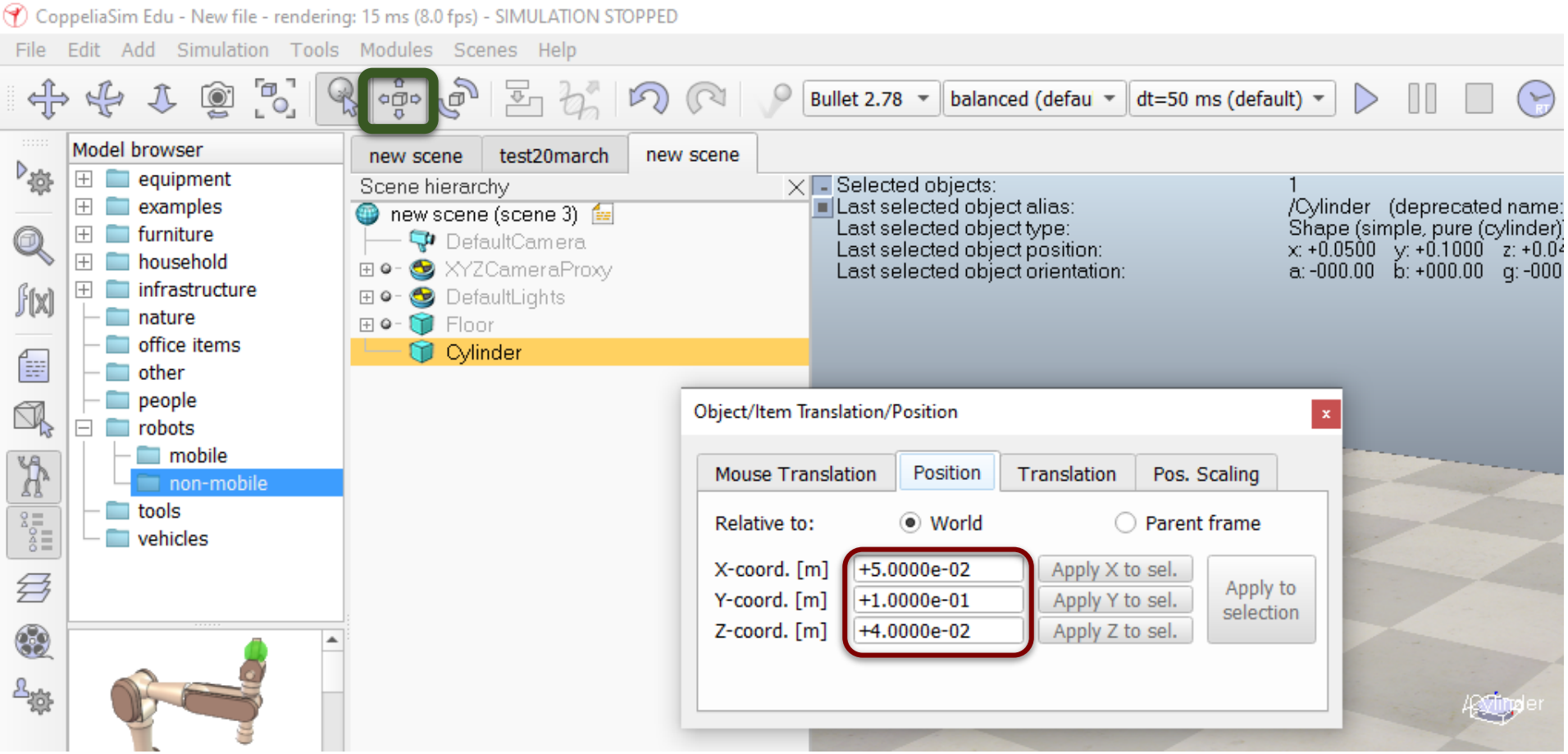


We enable Collidable, Measurable and Detectable in the object common properties for that cylinder, if not already enabled

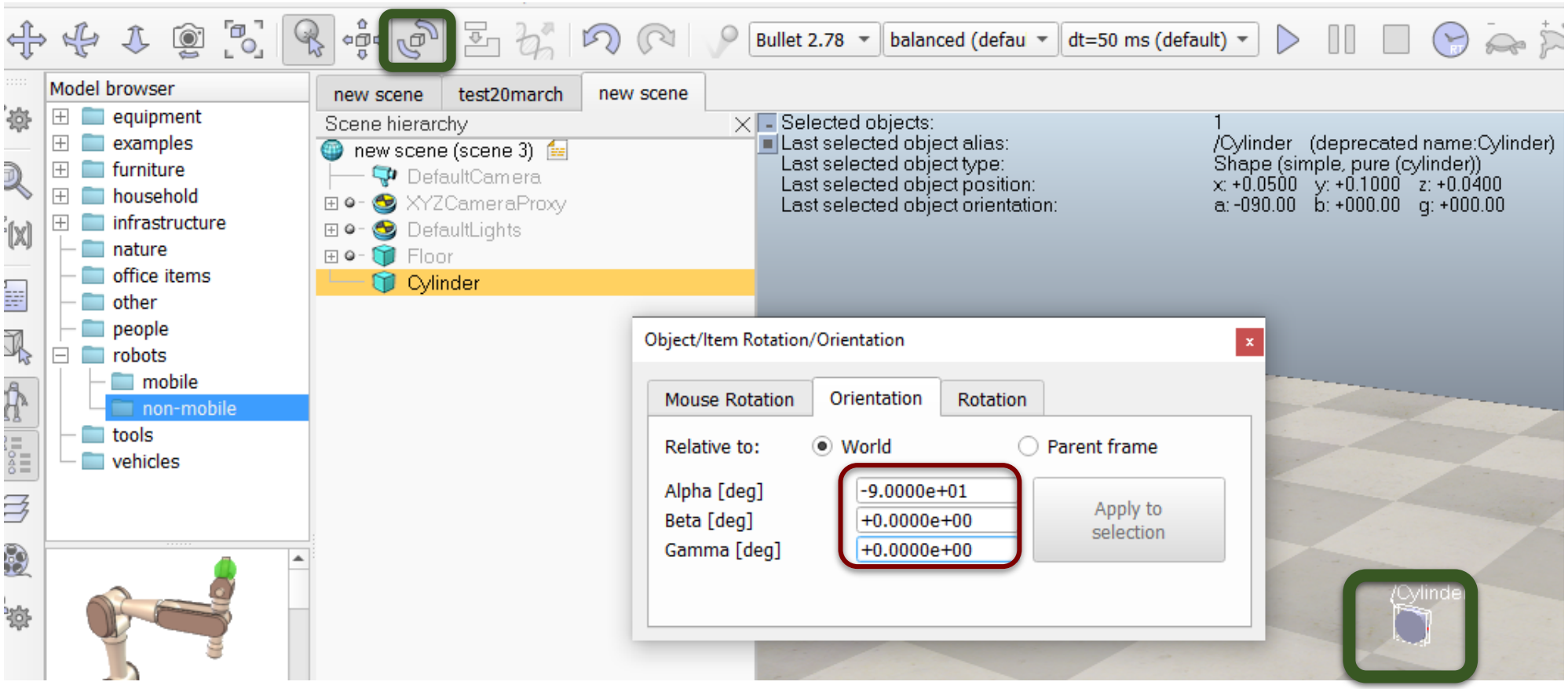


STEP 8

We set the cylinder's absolute position to (0.05,0.1,0.04)

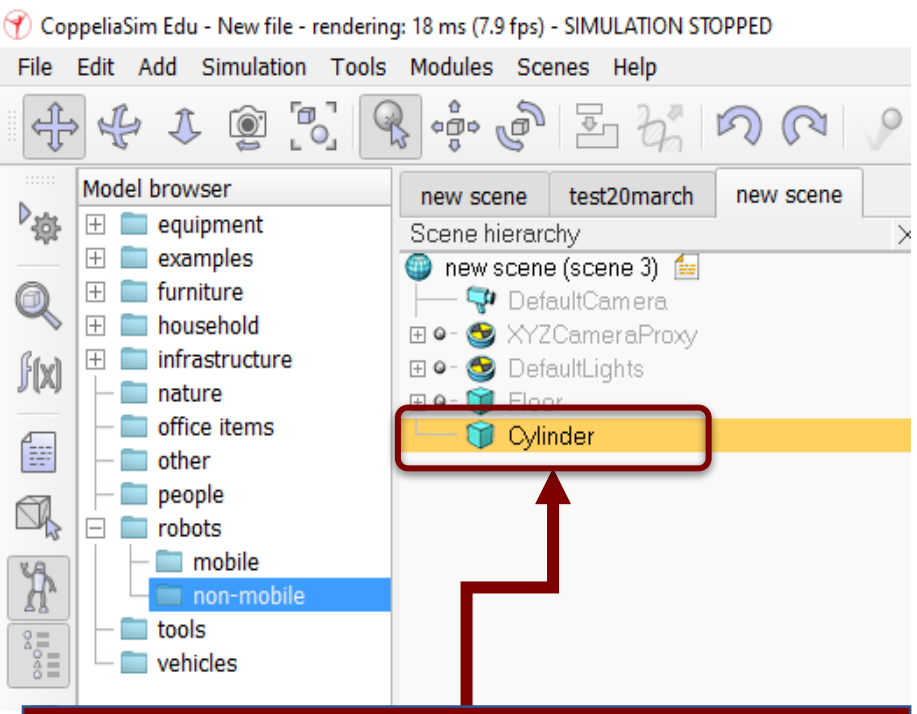


We set the cylinder's absolute orientation to (-90,0,0)

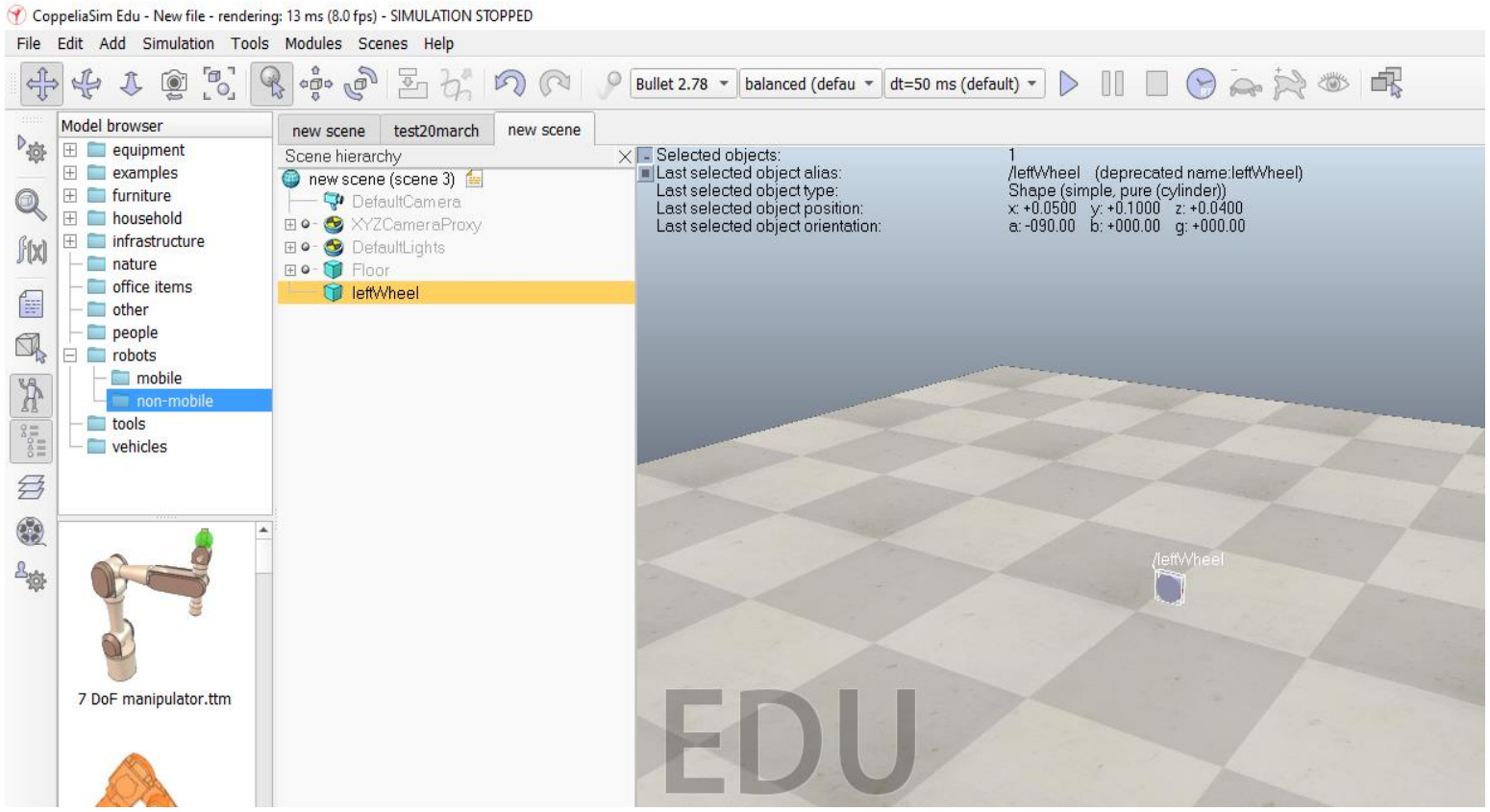


STEP 9

Rename the cylinder as leftWheel

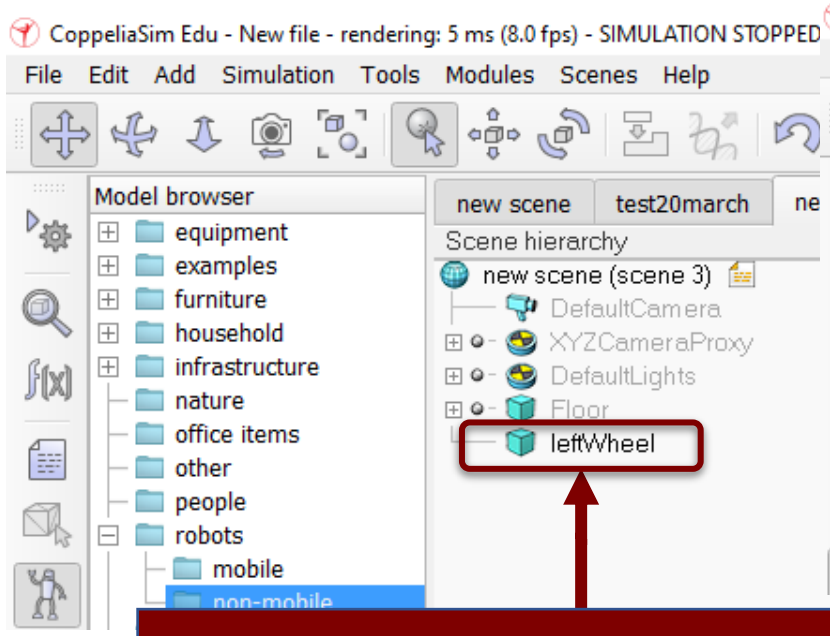


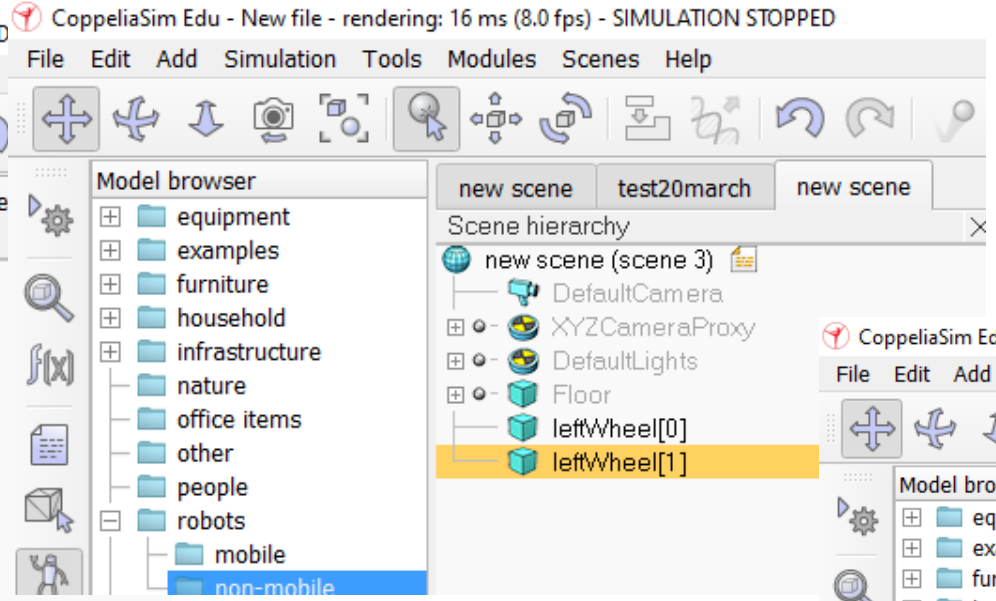
Double Click on this and rename it to leftWheel and Press ENTER

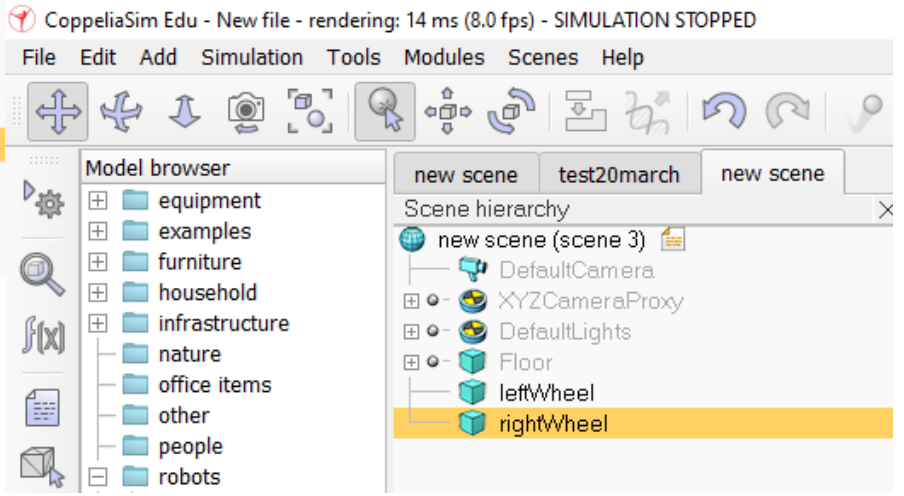


STEP 10

Copy and paste the leftWheel,
and
Rename the copy to rightWheel.

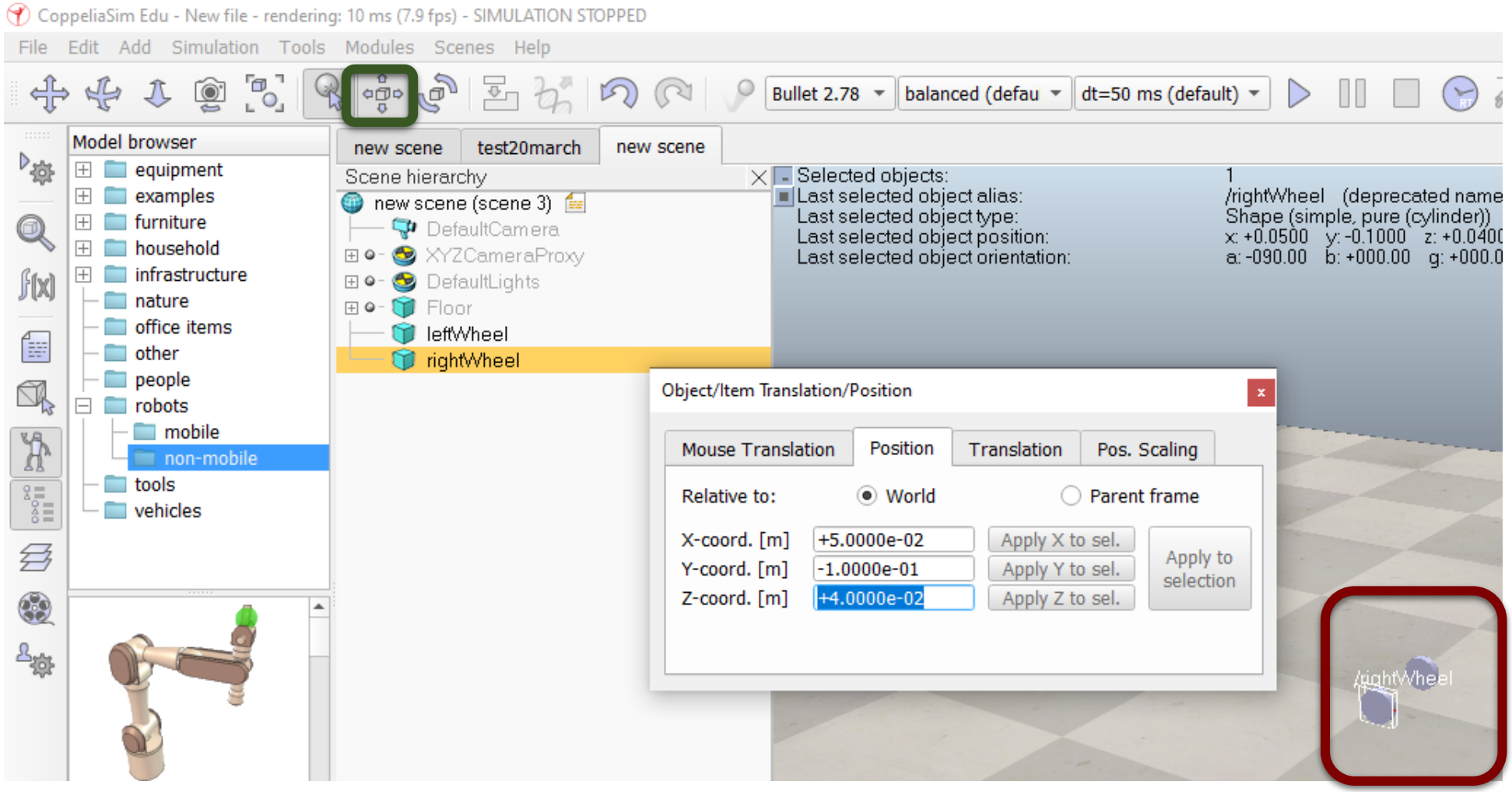






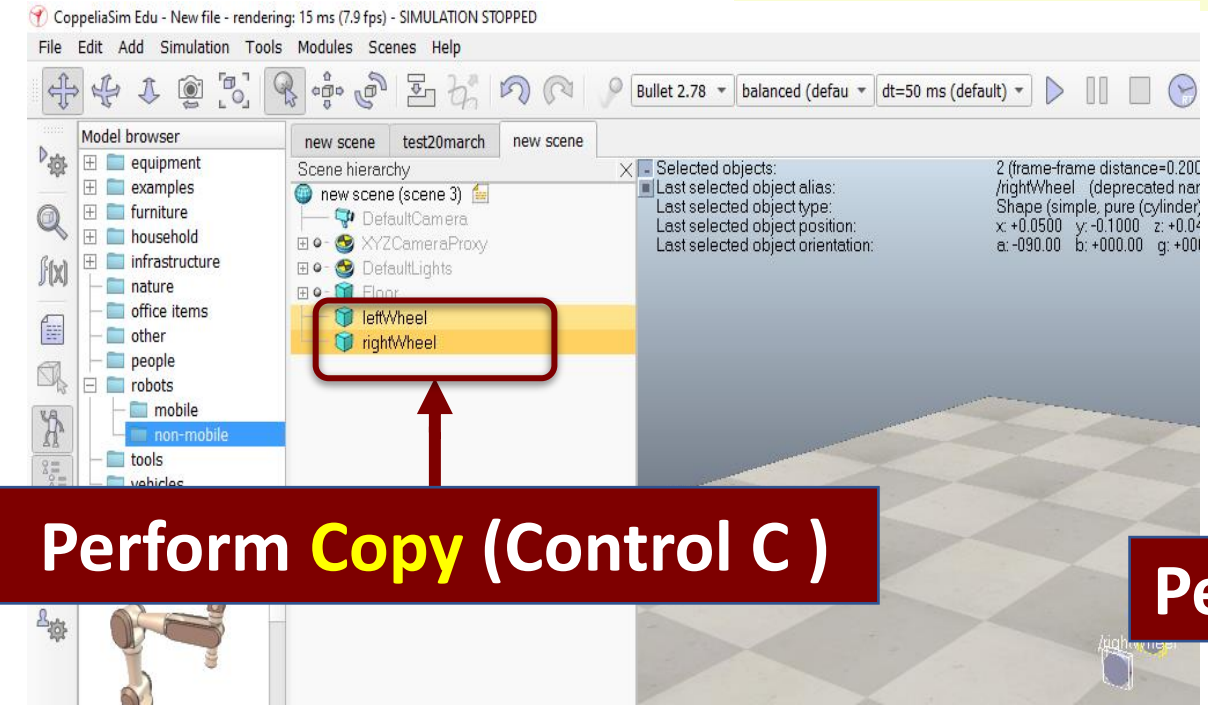
Perform Copy (Control C) and Paste (Control V) it.

Select rightWheel, and set the absolute Y coordinate of the copy to -0.1.

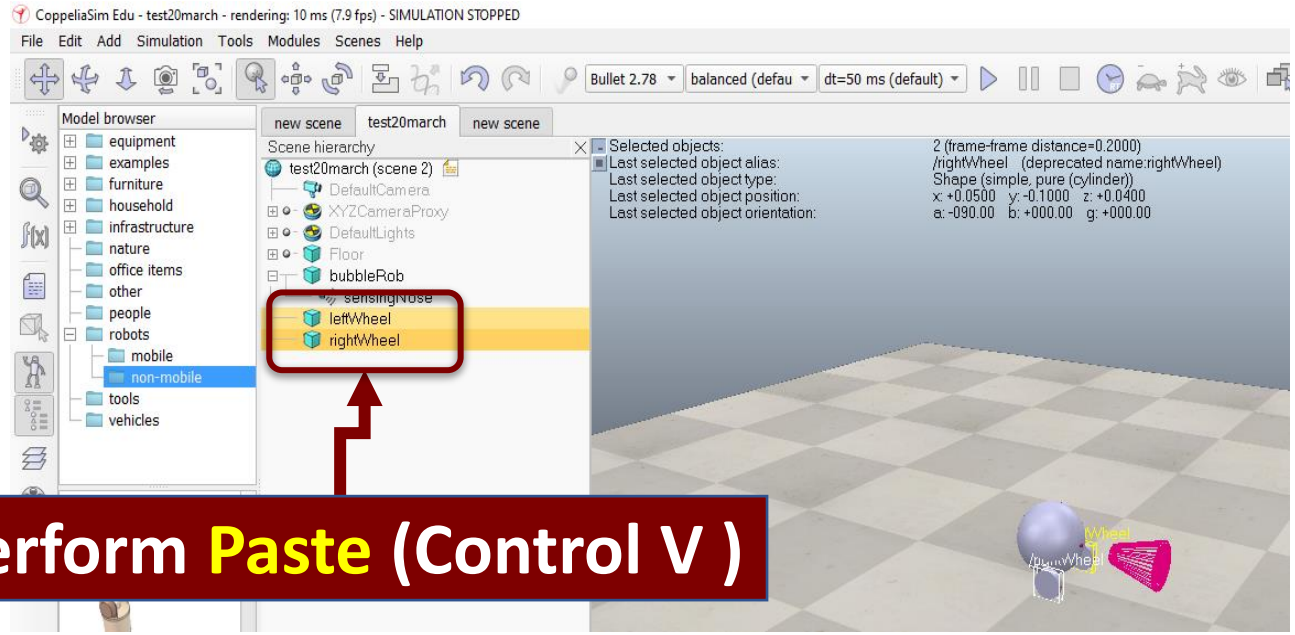


STEP 11

We select the two wheels, copy them, then switch back to scene 1, then paste the wheels.



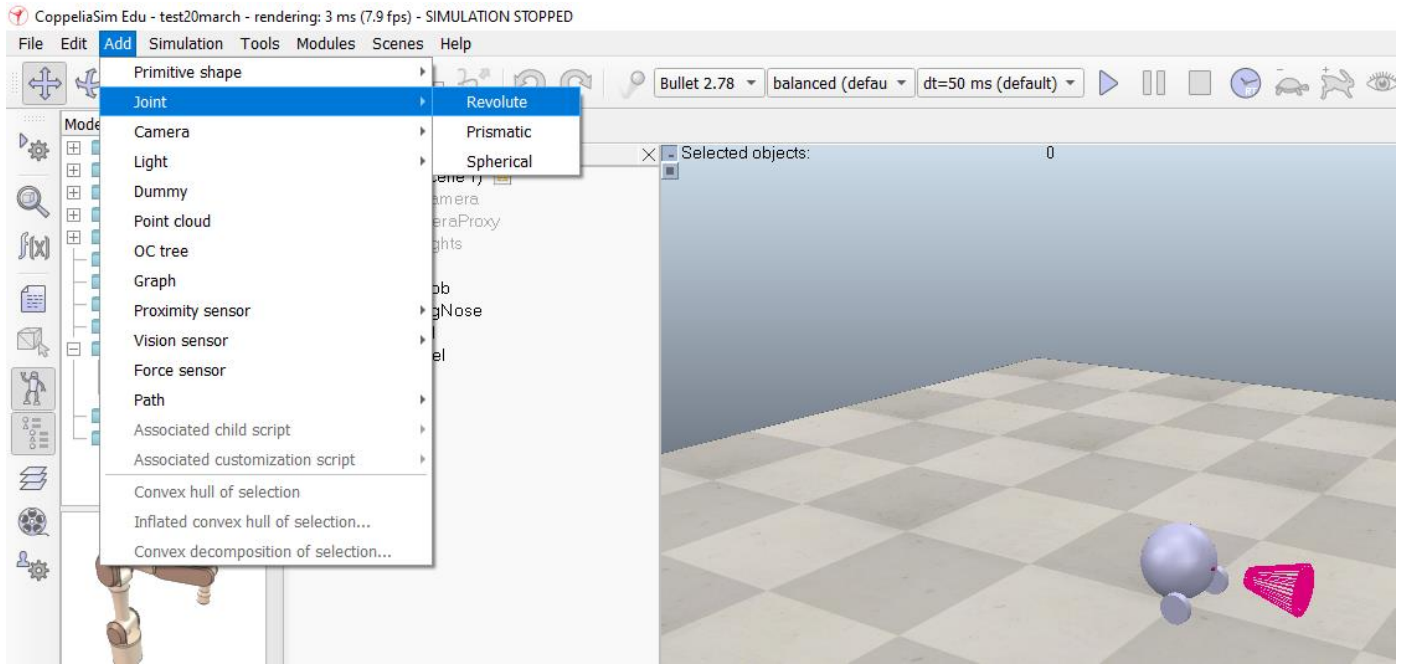
Perform Copy (Control C)

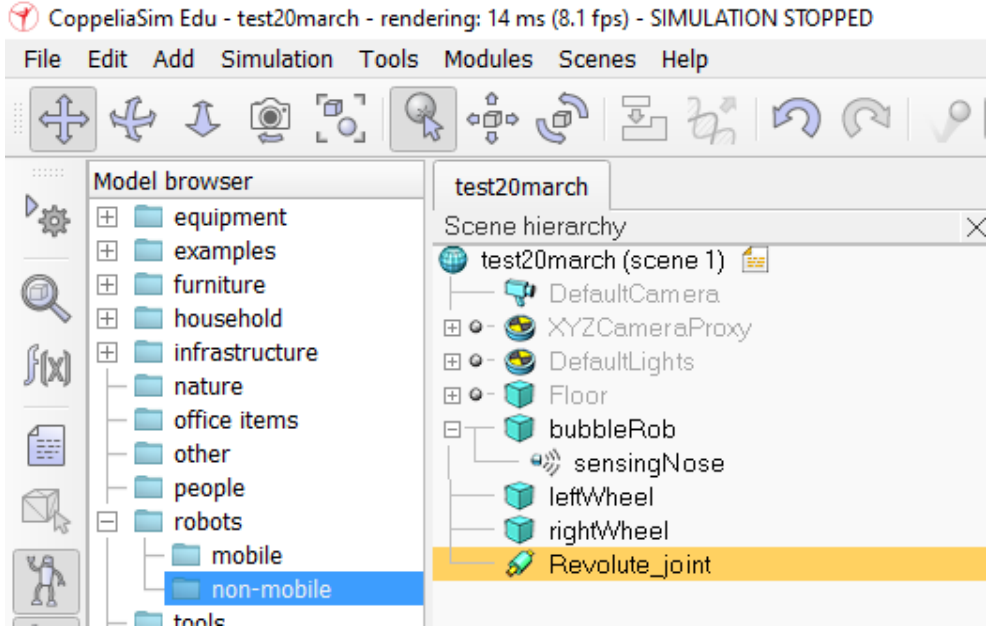


Perform Paste (Control V)

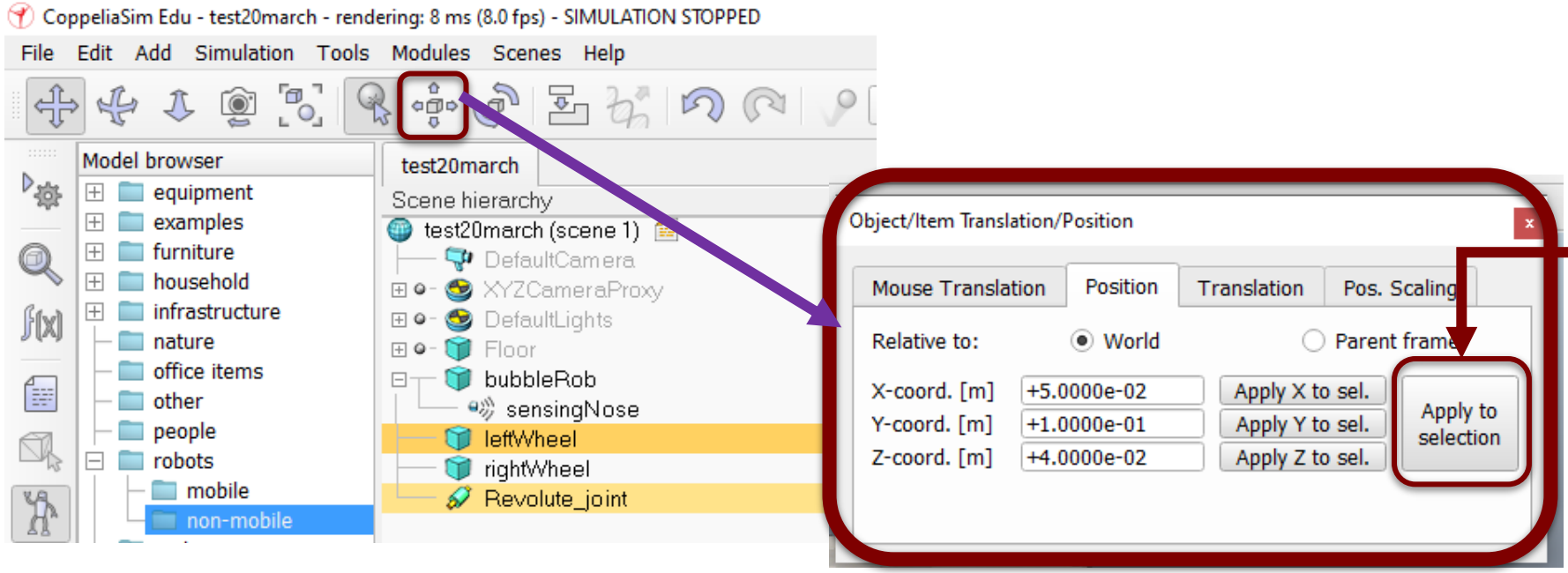
STEP 12

We now need to add joints (or motors) for the wheels. We click [Menu bar --> Add --> Joint --> Revolute]

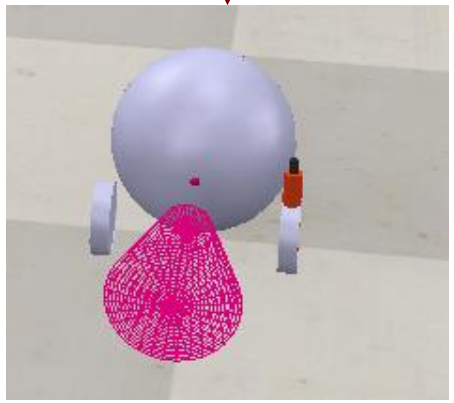




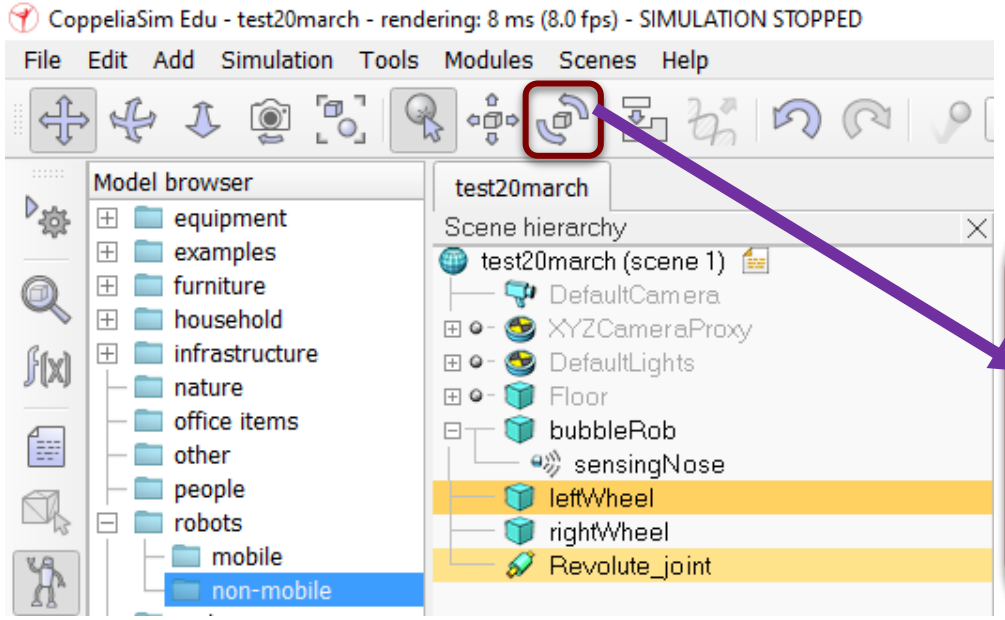
Keep the joint selected, then control-select leftWheel.

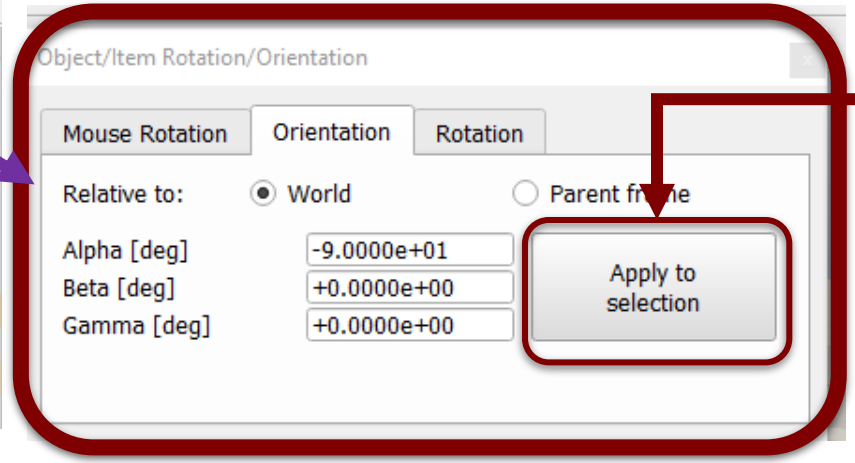


Click on Apply Selection

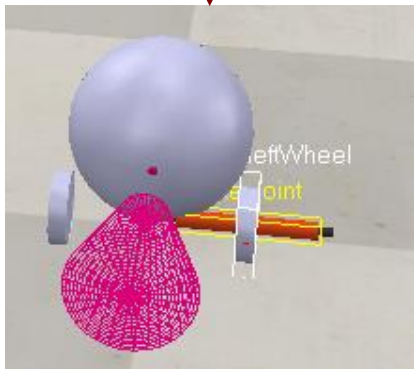


Keep the joint selected, then control-select leftWheel.



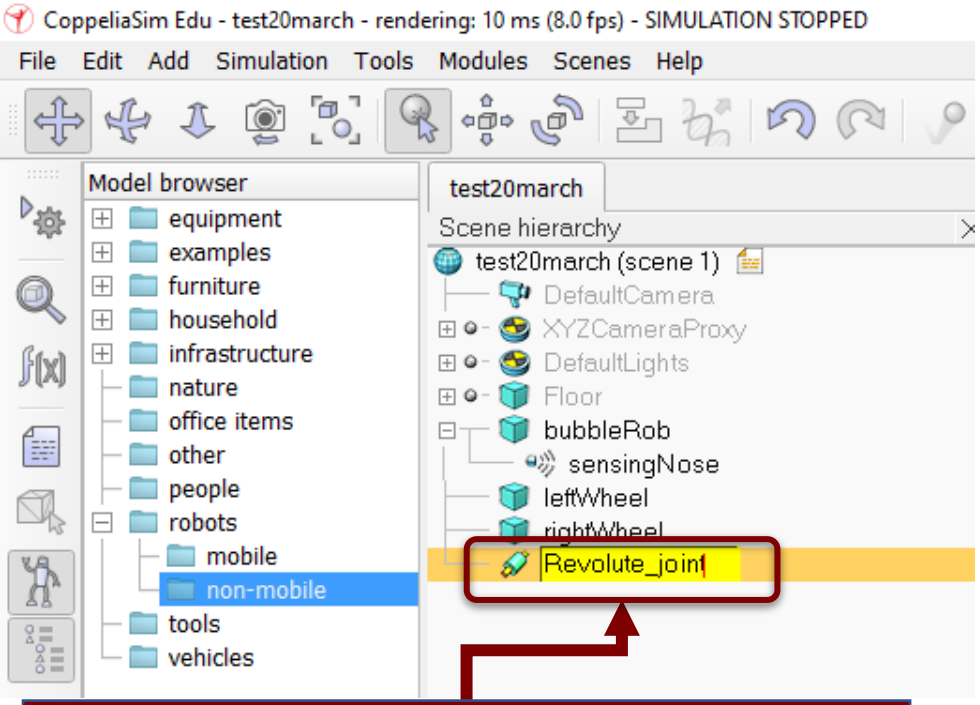


Click on Apply Selection

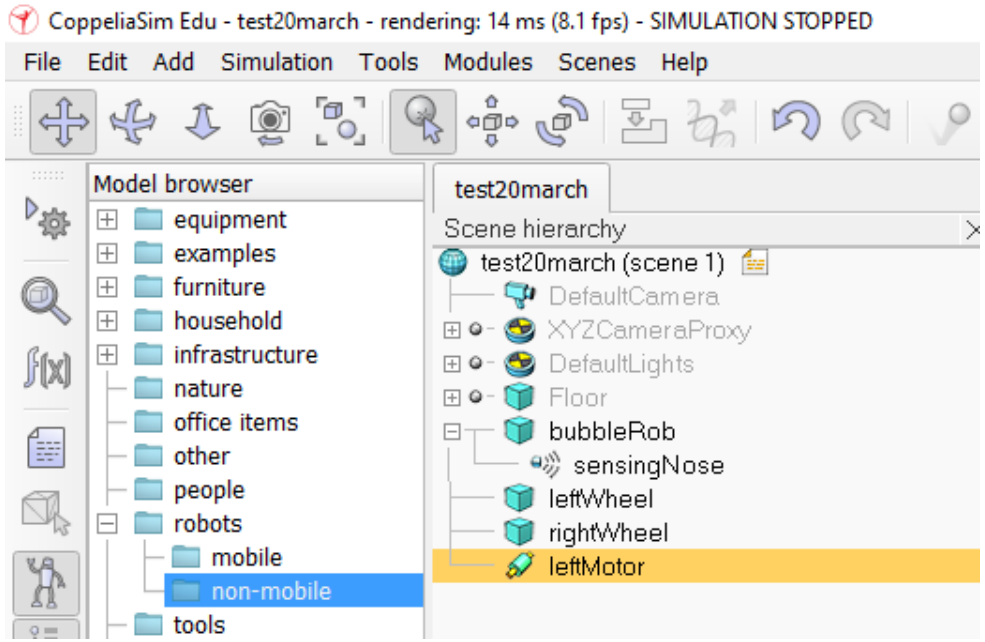


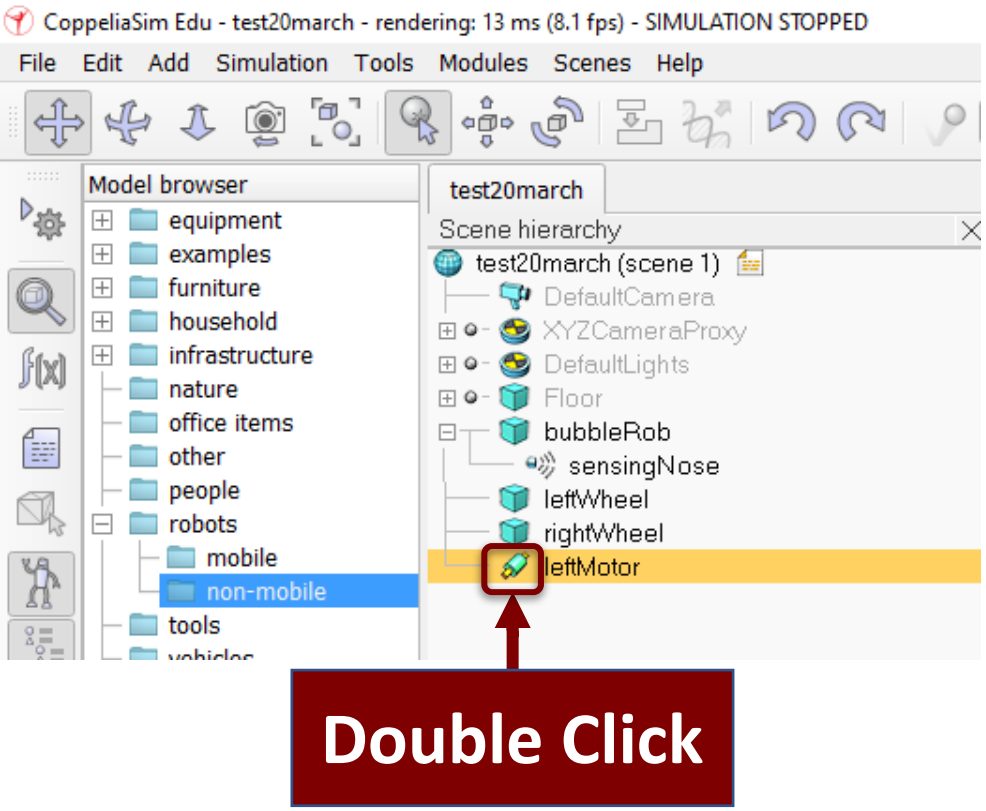
STEP 13

Rename the joint to leftMotor

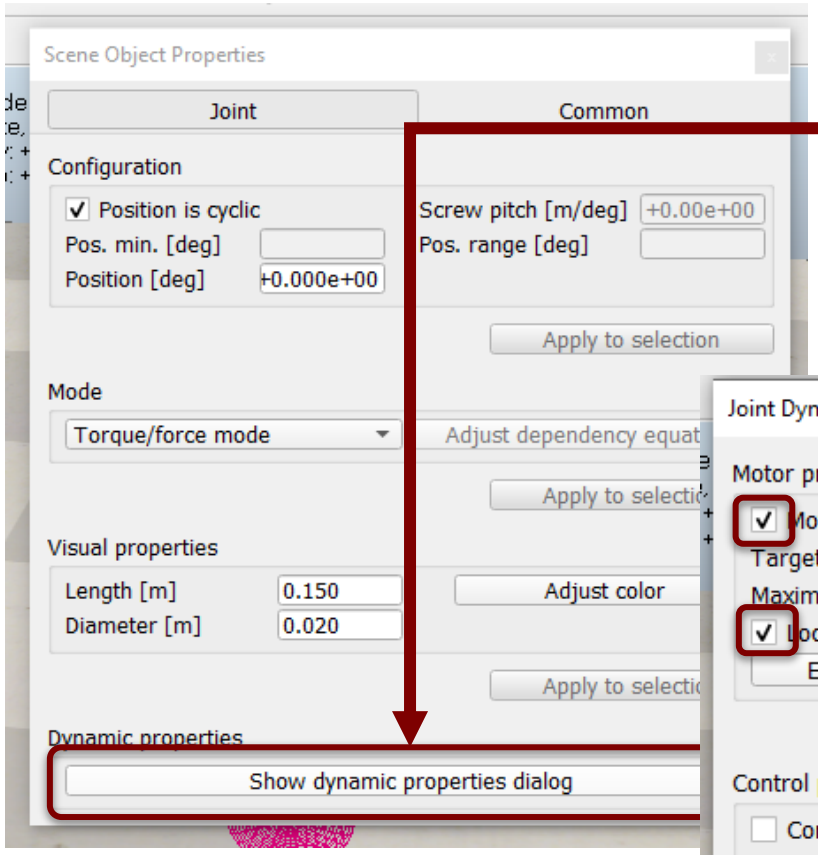


Double Click on this and rename it to leftMotor and Press ENTER

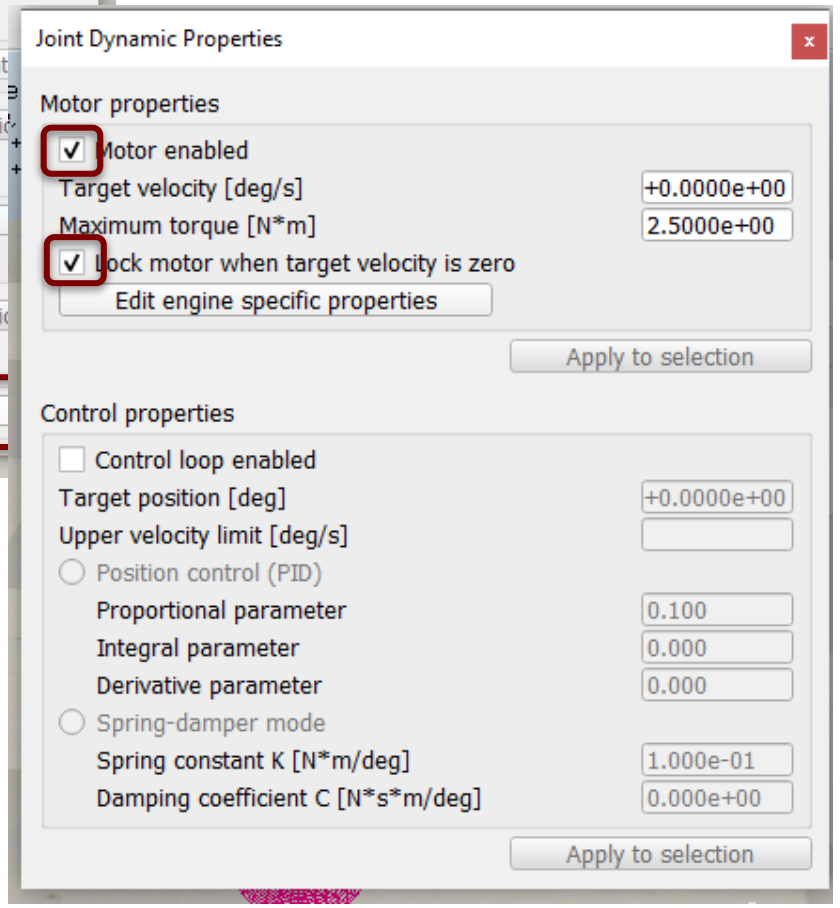




Double Click



Click on this



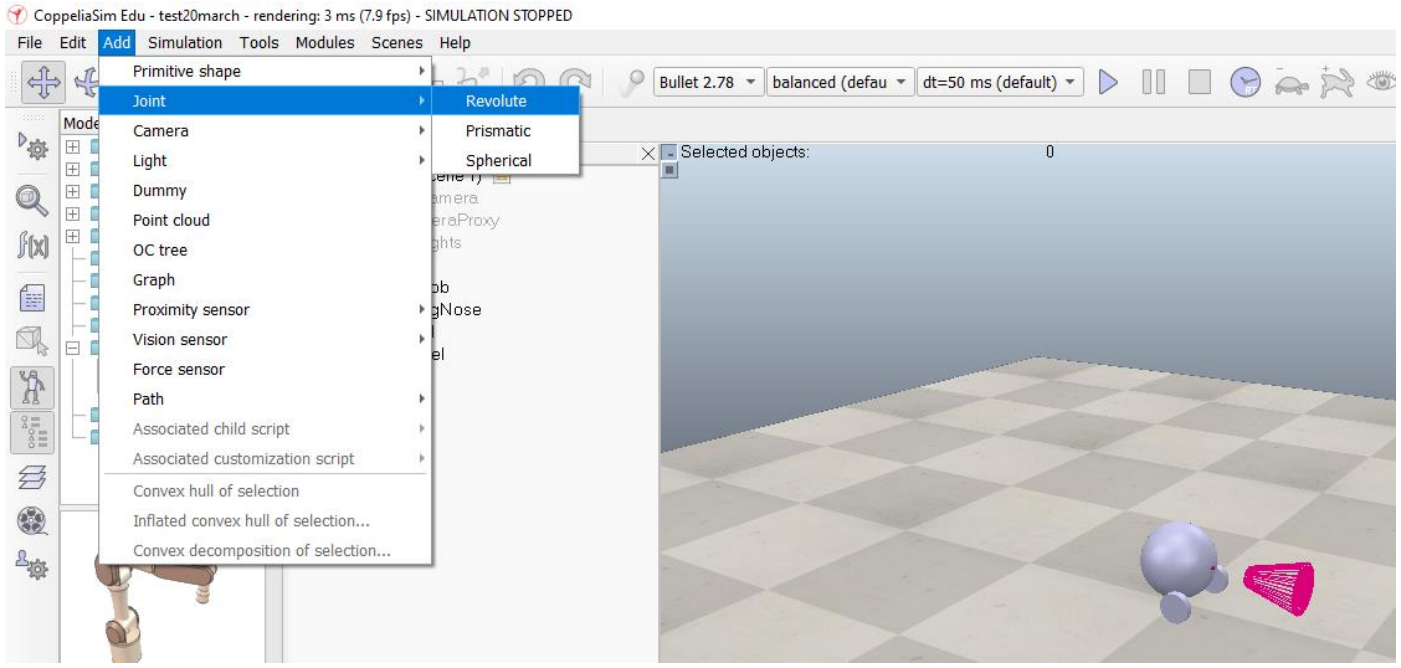
We enable the motor, and check item Lock motor when target velocity is zero.

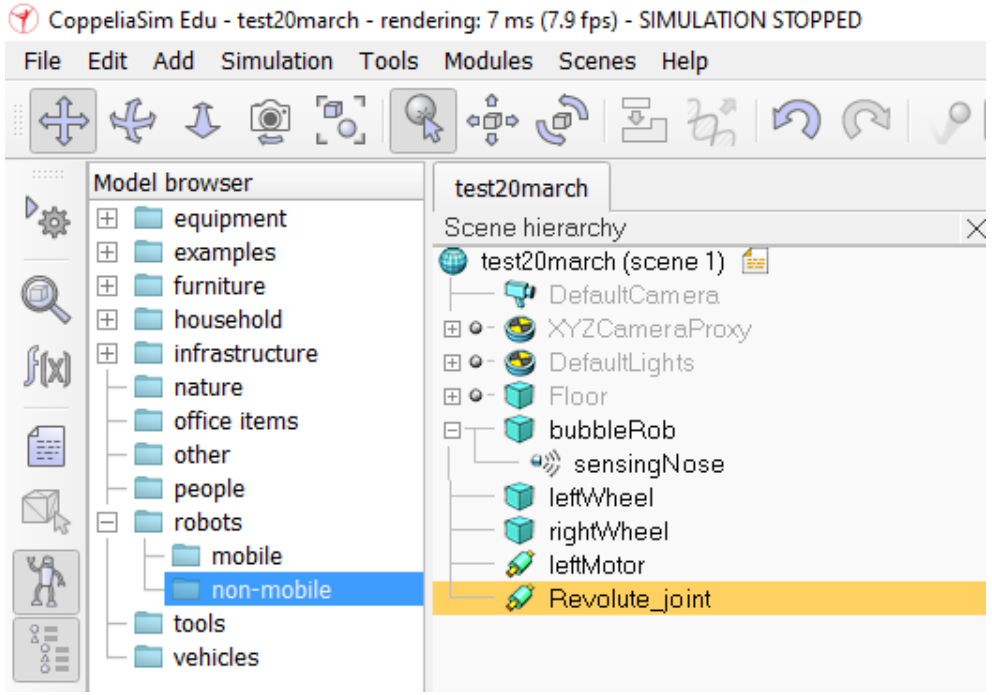
Repeat Step 12 and Step 13:

RightMotor

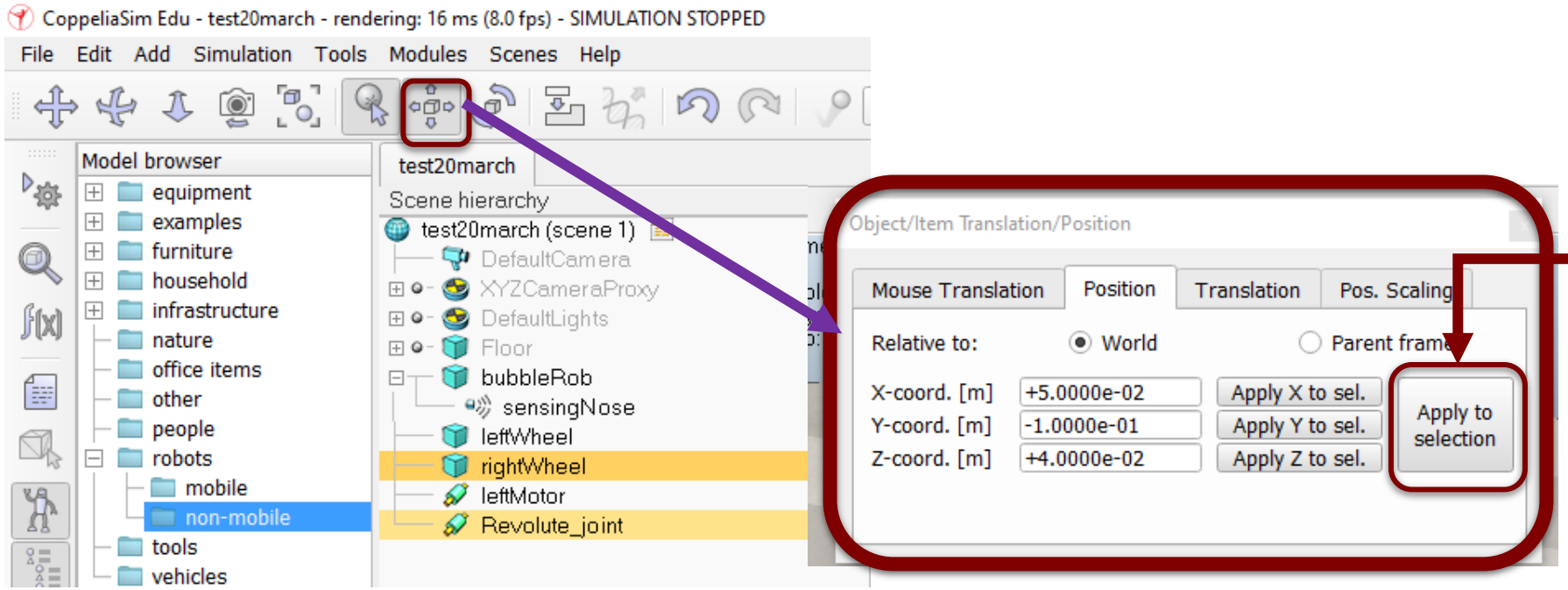
STEP 14

We now need to add joints (or motors) for the wheels. We click [Menu bar --> Add --> Joint --> Revolute]

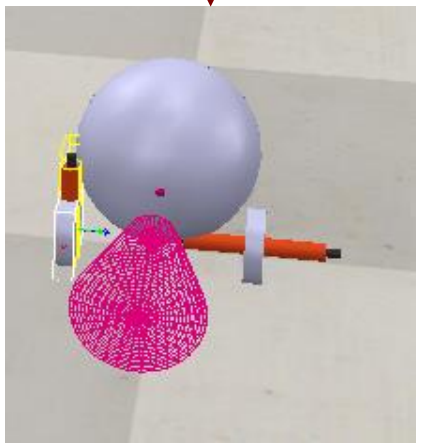




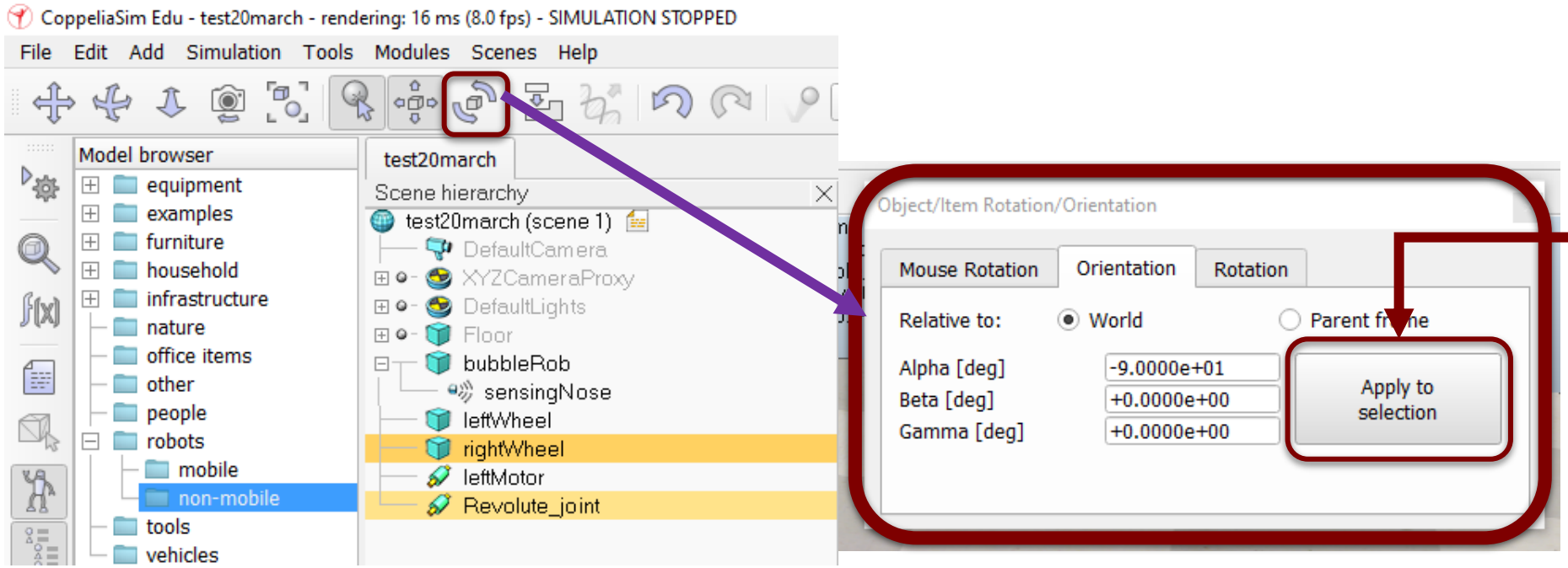
Keep the joint selected, then control-select rightWheel.



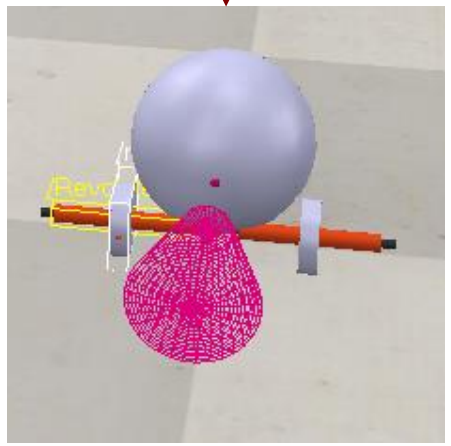
Click on Apply Selection



Keep the joint selected, then control-select rightWheel.

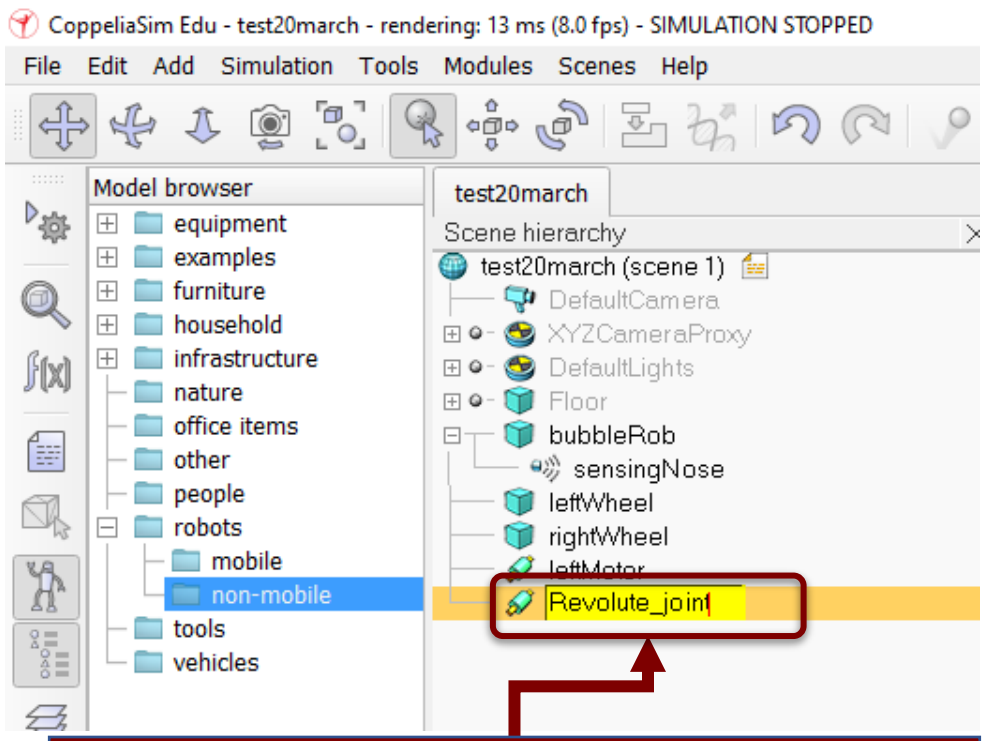


Click on Apply Selection

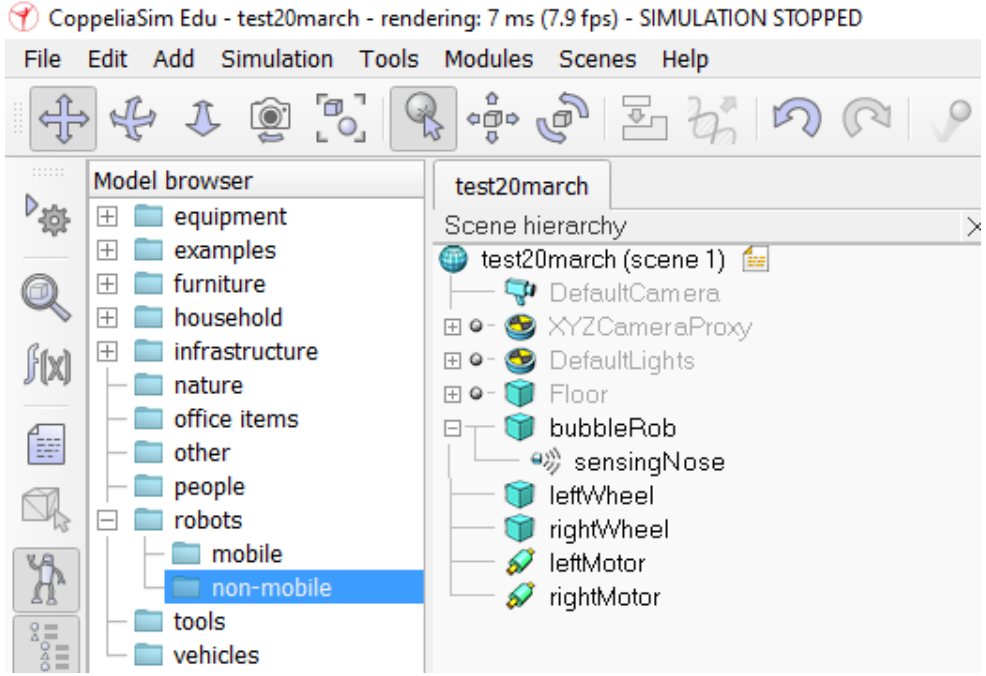


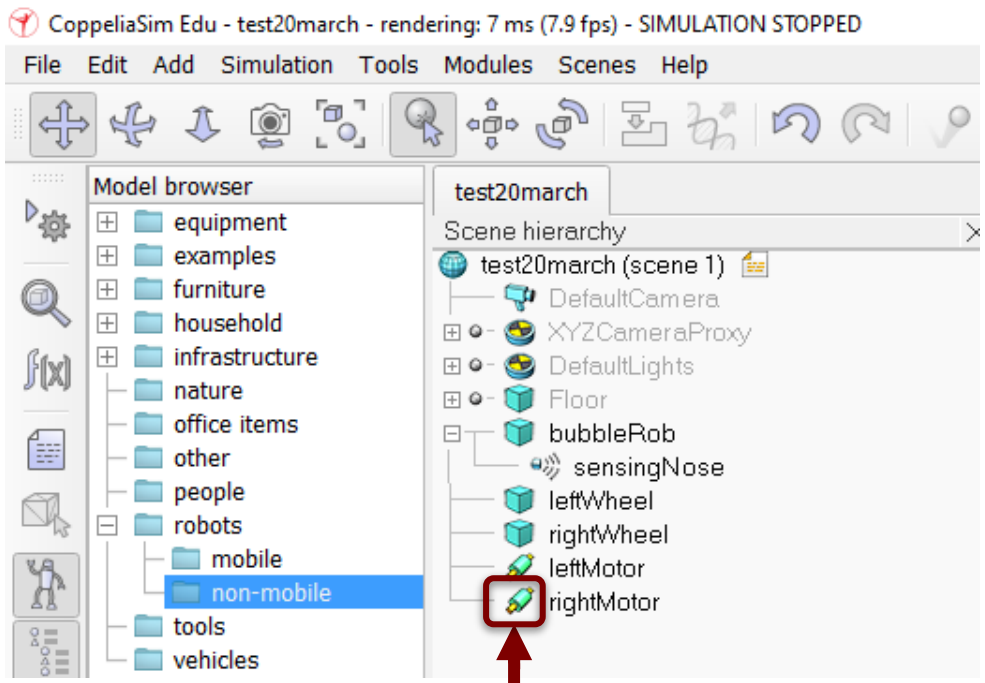
STEP 15

Rename the joint to rightMotor

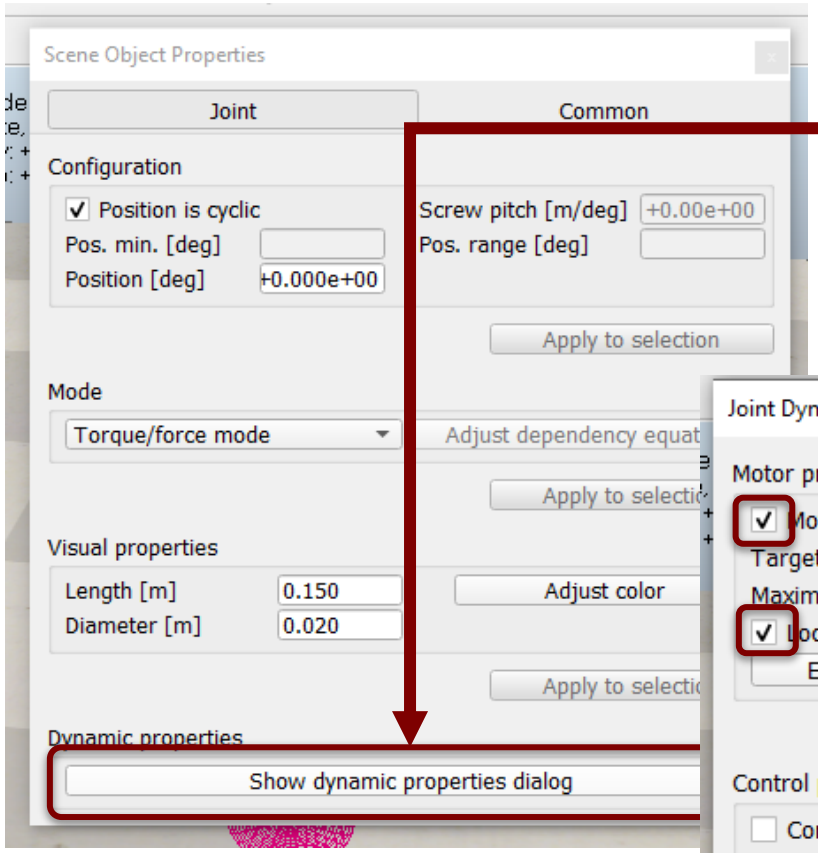


Double Click on this and rename it to rightMotor and Press ENTER

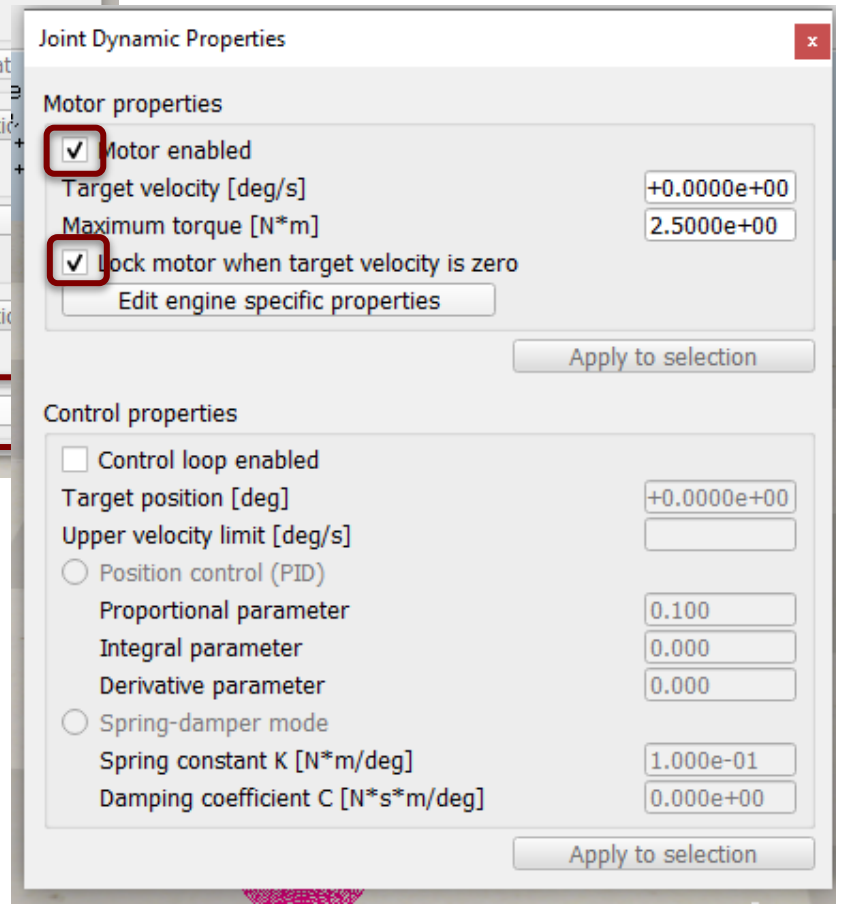




Double Click



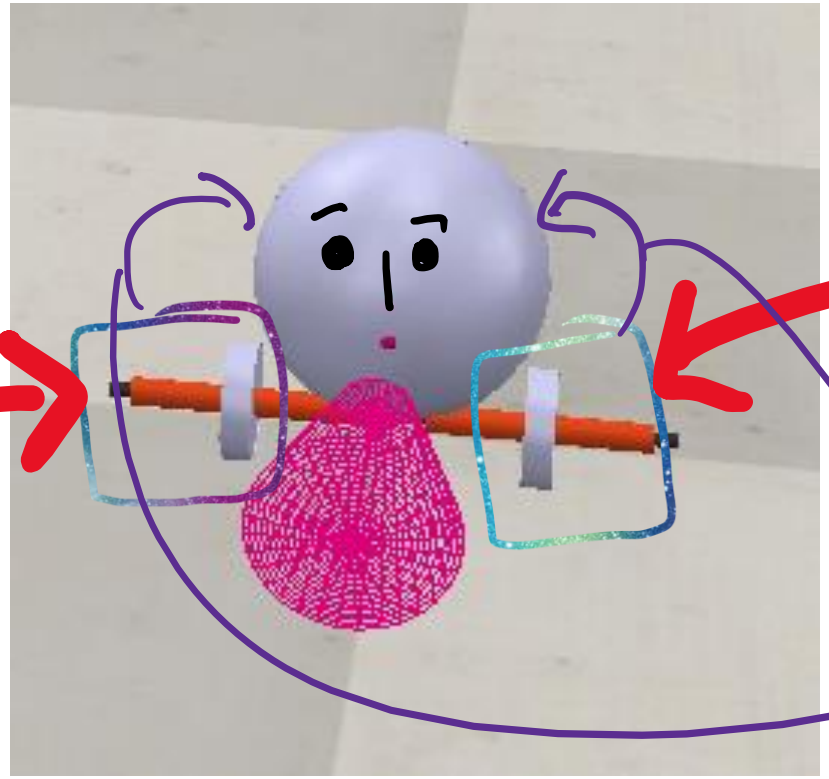
Click on this



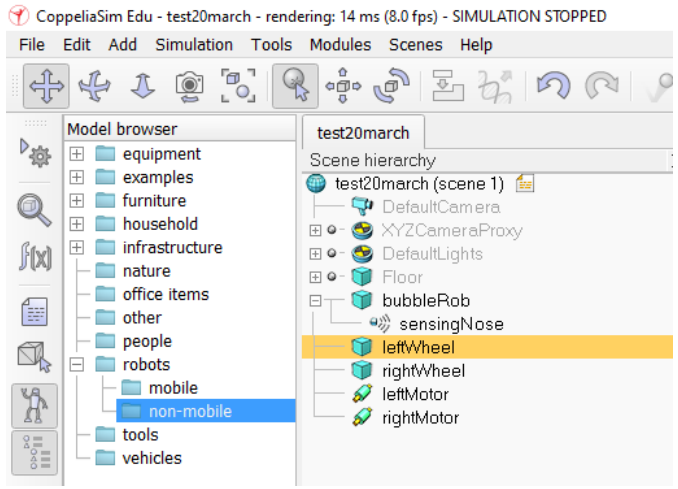
We **enable the motor**, and check item **Lock motor when target velocity is zero**.

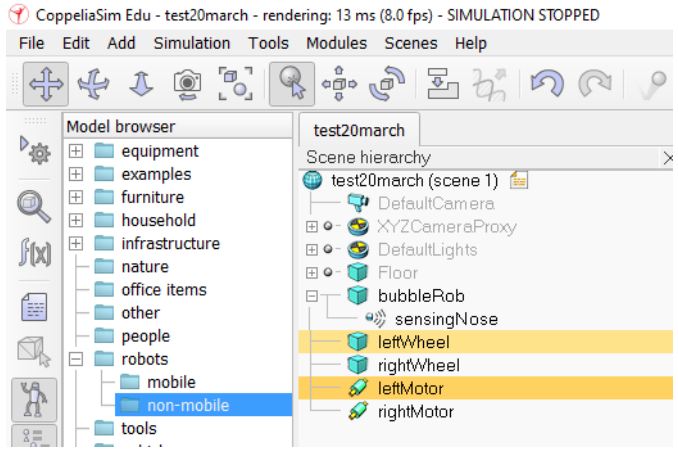
STEP 16

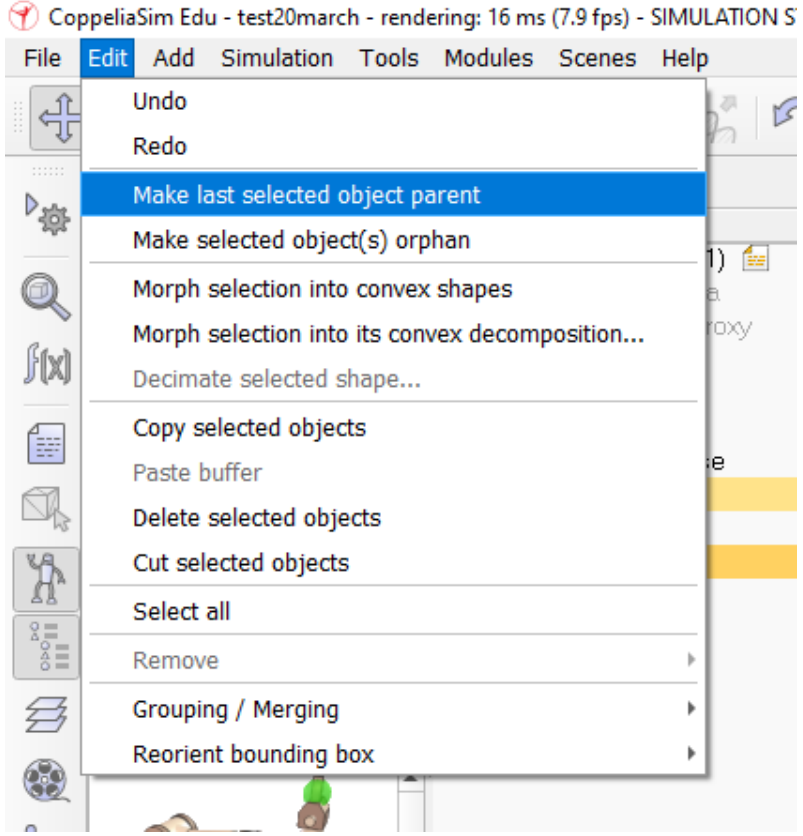
Now we attach the left wheel to the left motor, the right wheel to the right motor, then attach the two motors to bubbleRob.

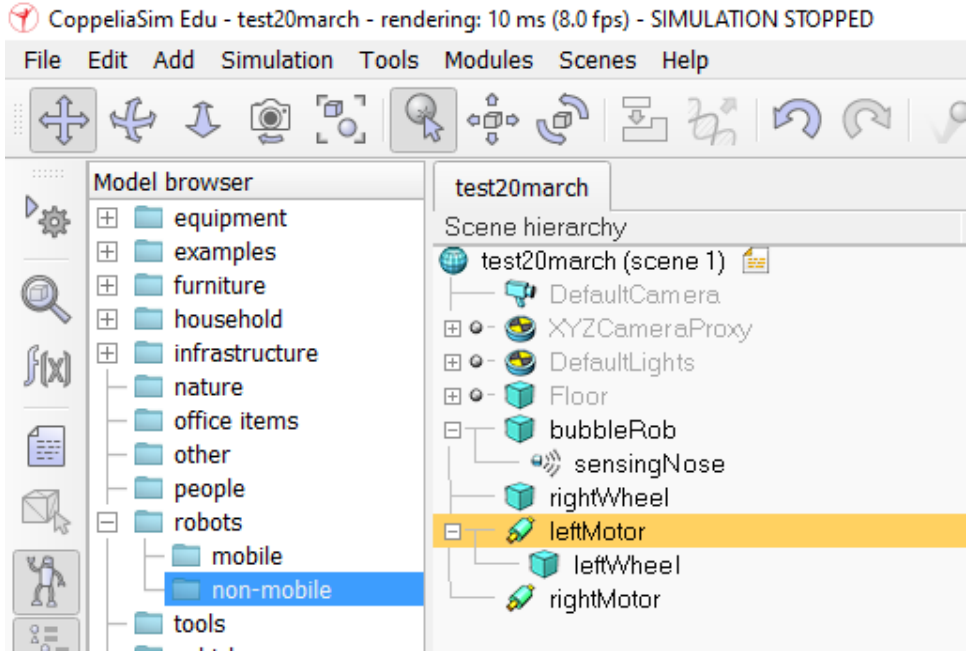


Select leftWheel, then control-select leftMotor, then click [Menu bar --> Edit --> Make last selected object parent].

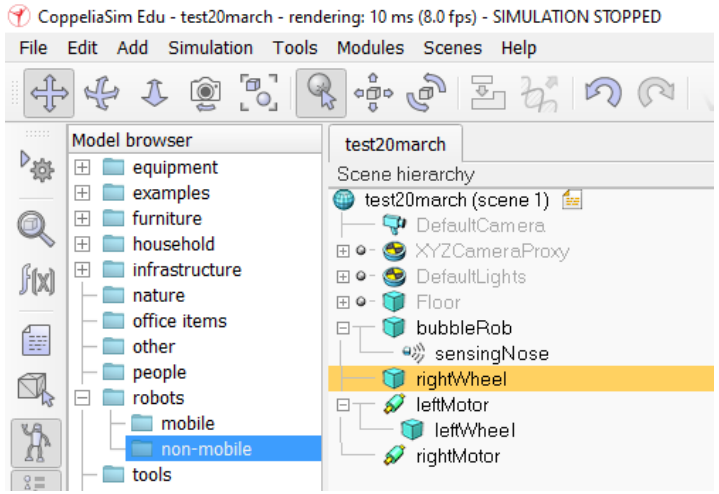


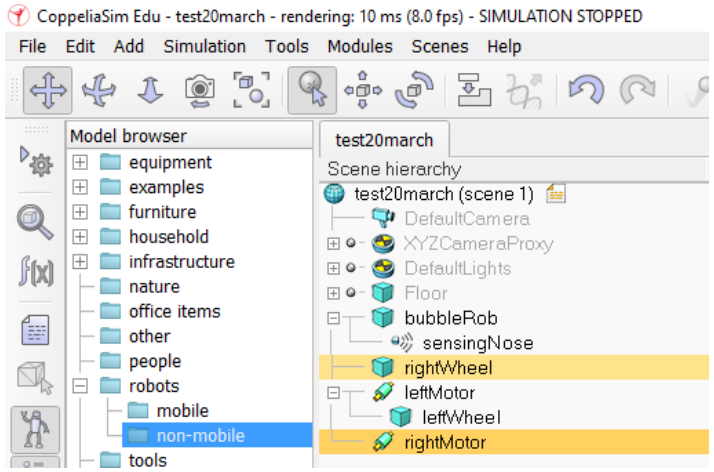


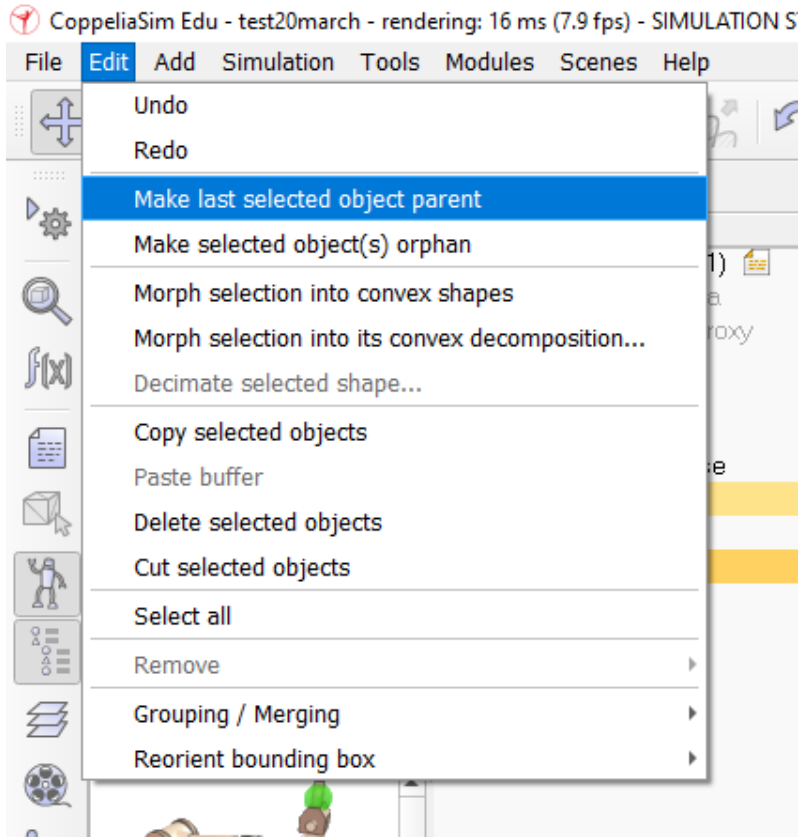


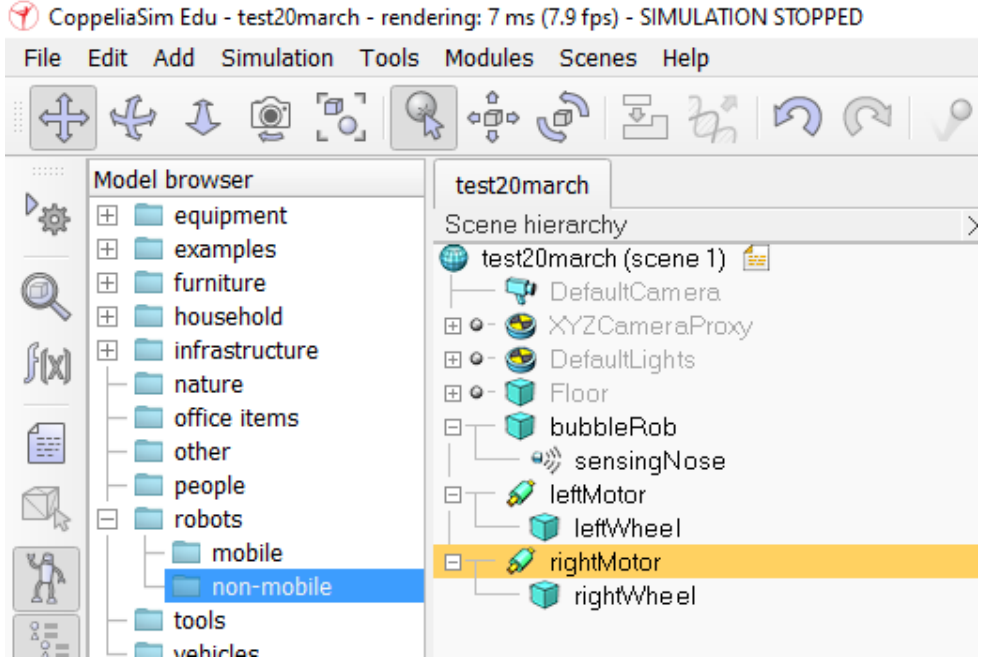


Select rightWheel, then control-select rightMotor, then click [Menu bar --> Edit --> Make last selected object parent].



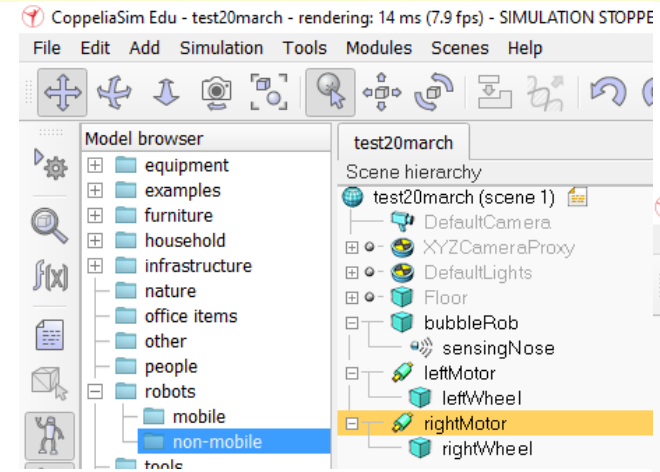


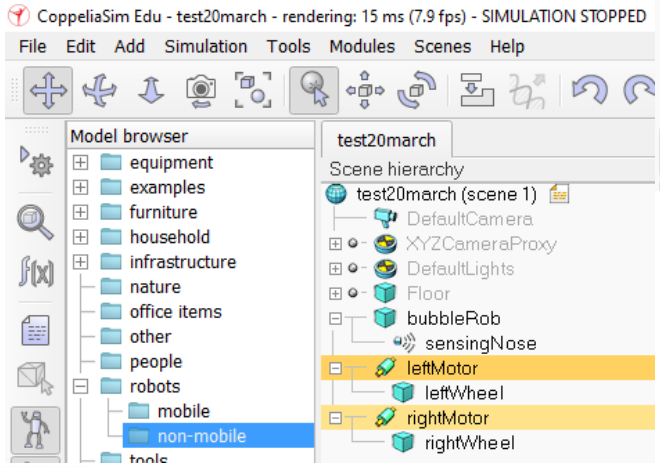


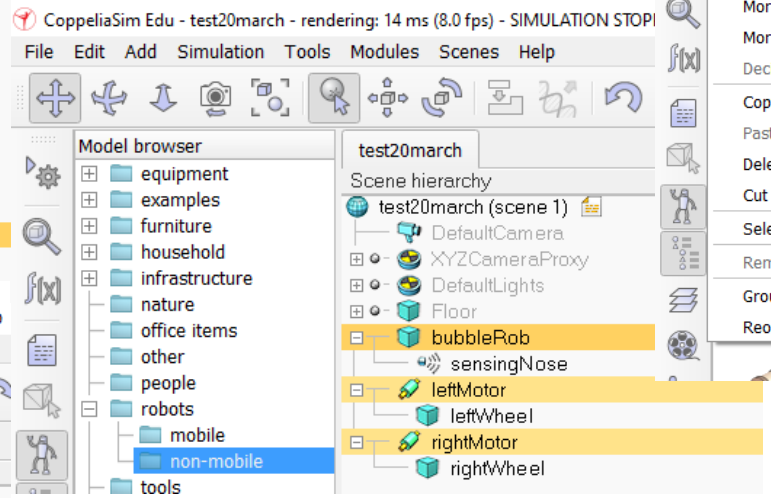


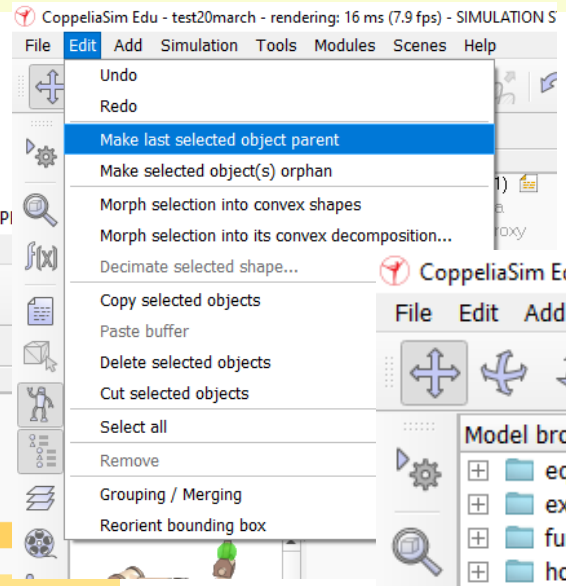
Attach the two motors to bubbleRob.

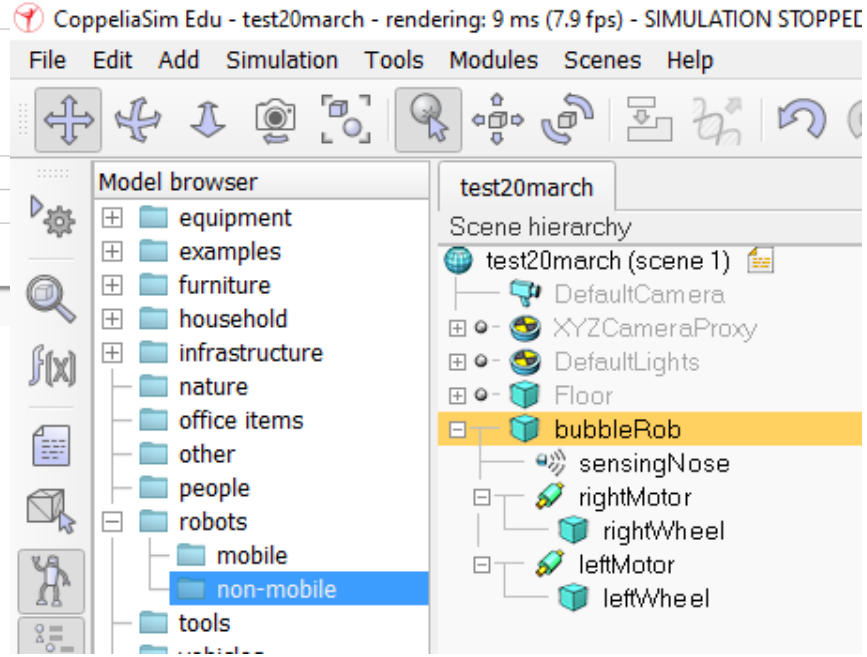
Select rightMotor, then control-select leftMotor, then bubbleRob click [Menu bar --> Edit --> Make last selected object parent].











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Mb: 9411047357

Thank You!