

Entering Inertial Values Using Expressions

It is possible to include any regression equations for the inertia and center of mass because Visual3D allows the user to put [expressions](#) into the edit boxes.

Example: Typical Right Thigh Segment

Consider a typical right thigh segment, which is populated with the default inertial values.

Segments | Segment Properties | IK Constraints | Right Thigh

Segment Name: ☐ Kinematic Only

Segment Mass: = kgs

Segment Length: Meters

Segment Geometry:

Inertial Values*		Center of Mass (Meters)*	
Expression	Value	Expression	Value
IXX: 0.023054	0.023054	ML : 0*RTH_SEG_	0
IYY: 0.023054	0.023054	AP : 0*RTH_SEG_	0
IZZ: 0.00535207	0.00535207	Axial : 0.467053*RTI	-0.138749

*May be modified for custom geometry

Model File:

Material File:

If the user selects this segment to be a CUSTOM_SEG, the edit boxes can be edited.

Segments
Segment Properties
IK Constraints
Right Thigh

Segment Name:
Right Thigh
☐ Kinematic Only

Segment Mass:
0.1*Mass
= 2.8 kgs

Segment Length:
0.297074 Meters

Segment Geometry:
CUSTOM_SEG

Inertial Values*		Center of Mass (Meters)*	
Expression	Value	Expression	Value
IXX:	0.023054	ML :	0*RTH_SEG_ 0
IYY:	0.023054	AP :	0*RTH_SEG_ 0
IZZ:	0.00535207	Axial :	0.467053*RTI -0.138749

*May be modified for custom geometry

Model File:
rthigh.obj
Browse

Material File:
rthigh.col
Browse

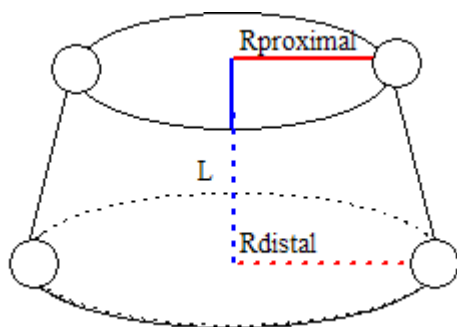
Rotate/Scale Graphic Model

Modify Segment Coordinate System

Apply

Example: Frustra of Right Cones

In this example we consider a conical segment:



We will create an expression for the Axial component of the center of mass based on the default computations described [elsewhere in the documentation](#).

$$x = \frac{R_{distal}}{R_{proximal}} \quad \text{for } R_{distal} < R_{proximal}$$

$$x = \frac{R_{proximal}}{R_{distal}} \quad \text{for } R_{proximal} < R_{distal}$$

$$\sigma = 1 + x + x^2$$

$$CG_{from\ proximal\ end} = \frac{(1+2x+3x^2)}{4\sigma} \quad \text{for } R_{proximal} < R_{distal}$$

$$CG_{from\ proximal\ end} = 1 - \frac{(1+2x+3x^2)}{4\sigma} \quad \text{for } R_{distal} < R_{proximal}$$

For convenience create a new Subject Metric X and enter the following expression:

RTH_DISTAL_RADIUS/RTH_PROXIMAL_RADIUS:

The screenshot shows a software interface with tabs for 'Segments', 'Landmarks', 'Muscles', and 'Subject Data / Metrics'. A dialog box titled 'Enter Name and Value for Subject Data' is open. It has two input fields: 'Name' with the text 'X' and 'Value or Expression' with the text 'RTH_DISTAL_RADIUS/RTH_PROXIMAL_RADIUS'. At the bottom of the dialog are 'OK' and 'Cancel' buttons. In the background, there are some 3D model icons labeled RMW, RVLW, RVMW, and RVLW.

We can then use the Subject Data Metric X that we just created in another expression. Enter the following expression into the Segment Properties Axial edit box:

$(1+2*X+3*X^2)/4/(1+X+X^2)*RTH_SEG_LENGTH$

Segments
Segment Properties
IK Constraints
Right Thigh

Segment Name:
Right Thigh
☐ Kinematic Only

Segment Mass:
0.1*Mass
= 2.8 kgs

Segment Length:
0.297074 Meters

Segment Geometry:
CUSTOM_SEG

Inertial Values*

Expression	Value
IXX:	0.023054
IYY:	0.023054
IZZ:	0.00535207

Center of Mass (Meters)*

Expression	Value
ML :	0*RTH_SEG_
AP :	EG_LENGTH
Axial :	(1+2*X+3*X^2

*May be modified for custom geometry

Model File:
rthigh.obj
Browse

Material File:
rthigh.col
Browse

Rotate/Scale Graphic Model

Modify Segment Coordinate System

Apply

Note: the edit box doesn't show the entire expression, which is a nuisance

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