

Segment Properties

Segment properties include the segment's inertial properties as well as its decorations.

General Properties

Property	Description
Segment Name	Every segment has a name. See Visual3D's default segment names .
Kinetic/Kinematic	Indicates whether or not the segment should be included in the kinetic chain for inverse dynamics . "Kinematic-only" segments are also called virtual segments .

Inertial Properties

Property	Description
Segment Mass	The default segment masses are relative to total body mass according to Dempster's regression equations.
Segment Length	Defined exclusively by the segment definition and not editable by the user.
Segment Geometry	Visual3D models segments as cones, cylinders, spheres, and ellipsoids and uses this geometry to calculate the segment's mass, moments of inertia (IXX, IYY, IZZ) and center of gravity.
Inertial Values	By default the moment of inertia of a segment is computed from the segment mass, the proximal and distal radii, and the Segment Geometry. The default Visual3D segments are treated as geometric objects that have inertial properties based on their shape according to Hanavan.
Center of Mass	The segment's centre of mass is determined automatically from the segment geometry.

Segment and laboratory coordinate systems [can be modified](#) to suit your preferred model.

Animation Properties

A surface mesh can be associated with each segment as an [animation surface model](#). This surface mesh should be stored as a [Wavefront .obj file](#) and [transformed](#) as necessary to align with the segment's coordinate system.

Segment Properties Interface

The **Segment Properties** portion of Visual3D's [model-builder mode](#) allows users to inspect and modify segment properties which are common to most segments.

Segments
Segment Properties
IK Constraints

Segment Name:
Right Thigh

☒ Kinetic
☐ Kinetic But No Force Assignment
☐ Kinematic Only

Segment Mass:
0.1*Mass
= 6.59 kgs

Segment Length:
0.433071 Meters

Segment Geometry:
CONE

Inertial Values*		Center of Mass (Meters)*	
Expression	Value	Expression	Value
IXX:	0.108779	ML :	0*RTH_SEG_ 0
IYY:	0.108779	AP :	0*RTH_SEG_ 0
IZZ:	0.0187941	Axial :	0.439456*RTI -0.190316

*May be modified for custom geometry

Model File:
rthigh.v3g
Browse

Material File:
Browse

☐ Override Color
Black

Rotate/Scale Graphic Model
Copy Override Color to Active Subject

Modify Segment Coordinate System
Apply
Build Model

1. Select the segment name in the **Segment Name** combo box. The selected segment's properties will be displayed in the dialog.
2. Make the desired changes in the dialog to any of the following properties:
 1. **Segment Geometry** - The segment may be represented internally as a CONE, .CYLINDER, SPHERE, ELLIPSOID or CUSTOM SEG (ment). The geometry of a segment affects the segment's inertial properties and center of mass location. This also affects the segment geometry drawn when view segment geometry is selected in the animation/model builder window.
 2. **Segment Mass** - The segment mass is defaulted based on the type of segment and the subject mass. To change this value, you may type in a specific value for the mass (in kilograms), or use a formula using existing Subject Data (such as a percentage of the subject mass).
 3. **Inertial Values** - These values may be modified only for segments with a CUSTOM SEG (ment) selected for the Segment Geometry.
 4. **Distance from CM (Center of Mass) to Proximal end** - This is a multiplier used to modify the distance from the center of mass from the segment's proximal end. This field is only used when CUSTOM SEG (ment) is selected for the Segment Geometry.
 5. **Model File/Material File** - This is the graphic model file (.obj or .wrl) used to draw the segment in the animation/model window.
3. Click the **Apply** button.

Note that some properties cannot be modified directly:

1. **Segment Length** - This is computed based upon the calibration of the segment proximal and distal endpoints.

2. **Inertial Values** - This is computed based upon the segment mass and geometry. These values may be modified only for segments with a CUSTOM SEG (ment) selected for the Segment Geometry.

Pipeline Command

Users can define and modify segment properties using the [Set_Segment_Properties](#) pipeline command. As of Visual3D v5.01.20, users are able to enter equations into the depth measurements for the Pelvis and Thorax.

References

1. Dempster W.T. (1955) Space requirements of the seated operator : geometrical, kinematic, and mechanical aspects of the body, with special reference to the limbs. Technical Report, Wright-Patterson Air Force Base.
2. Hanavan E. (1964) A Mathematical Model for the Human Body. Technical Report, Wright-Patterson Air Force Base

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