

Nome: Caio Lima RA: 11074012

Tutorial 3

II. Scaling A Musculoskeletal Model

The purpose of scaling a generic musculoskeletal model is to modify the anthropometry, or physical dimensions, of the generic model so that it matches the anthropometry of a particular subject. Scaling is one of the most important steps in solving inverse kinematics and inverse dynamics problems because these solutions are sensitive to the accuracy of the scaling step. In OpenSim, the scaling step adjusts both the mass properties (mass and inertia tensor), as well as the dimensions of the body segments. Scaling can be performed using a combination of two methods:

(1) *Measurement-based Scaling*: This type of scaling determines scale factors for a body segment by comparing distance measurements between specified landmarks on the model, known as *virtual markers*, and the corresponding *experimental marker* positions.

(2) *Manual Scaling*: This type of scaling allows the user to scale a segment based on some predetermined scale factor. Manual scaling is sometimes necessary when suitable marker data are not available, or if the scale factors were determined using an alternative algorithm.

To scale the generic model:

- Click the **Tools** menu and select **Scale Model**.
- At the bottom of the *Scale Tool* dialog, click **Load** to input a settings file.
- In the file browser, ensure that you are in the **Gait2354_Simbody** folder, select the file **subject01_Setup_Scale.xml** and click **Open**.

This *xml* file contains pre-configured settings to scale the generic musculoskeletal model to the dimensions of the subject. Notice all of the textboxes in the dialog were filled in appropriately.

Questions

1. Based on information in the *Scale Tool* dialog, what is the mass of the generic musculoskeletal model? What was the mass of the subject?
2. To see the loaded scale factors, click on the **Scale Factors** tab. Which body segments were scaled manually?
3. Based on information in the *Inverse Kinematics Tool* dialog, at what frequency was the experimental motion data captured? Hint: Look for the box titled *Marker Data*.

To complete the scale step:

- In the *Scale Tool* dialog, click **Run**. Then click **Close**.
- To save the scaled model, click **File** and select **Save Model**.

- Ensure that you are in the **Gait2354_Simbody** folder, type **gait2354_scaled.osim** into the **File name** textbox, and click **Save**.

When complete, a new, scaled model entitled *subject01* will appear in *View* window. Notice the pink markers around the new model. The blue spheres graphically represent the *experimental markers* from the motion capture data used in the measurement-based scaling.

At this point, you may close the generic model (right-click the model name in the Navigator window, and select "close") or hide the model (right-click the model name, and select Display >> Hide).

