Modeling the Trunk

The torso presents a challenge for modelling because of the definition of proximal and distal. It is straightforward to decide that the feet are distal to the pelvis and the hands are distal to the pelvis. The trunk is less clear. In order to have a “joint” created at the shoulders it is necessary to define the trunk to have the proximal end at the pelvis and the distal end at the shoulders.

Modeling the thorax separate from the abdominal

If you want a kinematic analysis for the thorax separate from the abdomen, the most repeatable approach is to define both segments with the same segment coordinate system. For example, use the acromium markers and iliac crest markers to define the segment coordinate system for each segment. The key difference here is the tracking markers for each segment. Tracking markers would be placed on the thorax for the thorax segment. Different tracking markers would be placed on the abdomen for the abdomen segment. The joint angle, joint angular velocity, etc would be computed in the normal fashion.

If you want a kinetic analysis, the job of defining the segment coordinate systems is more tricky because there aren’t a reliable set of medial and lateral landmarks on the abdomen. The most reasonable approach may be to place acromium and iliac crest markers. Place a marker on the intervertebral joint that defines the abdomen segment (e.g. you might use the lumbar/thoracic T12/L1 joint). Create a landmark by projecting this marker onto a plane defined by the Iliac Crest and acromium markers. Use this projected landmark as the segment endpoint.

Animating the trunk animation model

If the proximal markers for the RTA (Right Thorax Abdomen) are the Iliac Crest markers, and the distal markers are the shoulder markers, then the default wireframe model (obj file) will appear upside down. To fix this, switch to the Segment Properties tab and browse for a wireframe model “ThoraxAb_IliacCrestToAcromium.obj”, which should make the animation look a little better.

Another example, a user asked when building the “trunk” segment, it either attaches from the iliac facing down or the bottom of the trunk is attached to the shoulders. We were using R/L shoulder and R/L iliac markers for the segment ends. This occurs because the trunk segment can be created in many “reasonable” ways. The problem you are seeing may not be in the segment coordinate system that you created but in the wireframe model that is associated with the segment. In the Segment Properties tab you will see an edit box containing the wireframe model (.obj) file that is assigned to the segment. Browse and select a different .obj file that is more suitable. For the segment coordinate system that proposed in this example, select the file “ThoraxAb_AcromiumToIliacCrest.obj”