recommended posture for the static trial

defining the segment coordinate system for the humerus is particularly difficult because there are no bony landmarks to assist in determining the glenohumeral joint center, and medial and lateral markers on the epicondyles are close together and often do not represent the axis of rotation of the elbow.

note:: the following explanation is personal opinion and users should not accept this as a recommendation, rather as one plausible approach. further work needs to be done in this area and users must decide for themselves.

- the upper arms should be placed in the anatomical position, so as to minimize the movement of the scapula relative to the thorax.
- the head of the humerus can be estimated by placing 3 markers (one anterior, one posterior, and one lateral) on the surface. create a landmark by projecting the lateral marker on to a line defined by the anterior and posterior marker. it is a bit of a nuisance to place 3 markers at the shoulder, but the equivalent locations can be identified using a digitizing pointer.
- static markers should be placed medial and lateral on the epicondyles of the elbow. the distal end of the humerus should lie at the midpoint of these two markers.
- now that the proximal and distal ends of the humerus are defined, the orientation of the humerus must be defined. a recommendation by the international shoulder group (**isg**) is to have the forearm flexed to 90 degrees elbow flexion during the static trial, and use the long axis of the forearm to specify the anterior direction of the humerus. the forearm should not be pronated in this position, which is different than the isg recommended posture. this helps to alleviate the errors caused by the epicondyle markers being so close together. **note that this is different than the approach that was recommended by c-motion prior to visual3d version 3.25, in which we recommended that the upper arm and forearm be in the anatomical position.**
- markers should be placed on the most caudal-lateral point on the radial styloid (**rs**) and the most caudal-medial point on the ulnar styloid (**us**). the distal end of the forearm can be placed at the midpoint of these two markers, or as per the isg recommendation at the **us.**
- the long axis of the forearm is defined from the midpoint of the epicondyles (e.g. the distal end of the humerus segment) and the distal end of the forearm.
- the radius value for the proximal end of the upper arm is half the diameter of the upper arm at the level of the head of the humerus. the radius value for the distal end of the upper arm is half the diameter of the upper arm at the level of the elbow.

i have created a thorax/ab segment and an upper arm segment, but no shoulder joint has been created.

joints are a “book keeping” object in visual3d because 6 degree of freedom segments don't have an anatomical joint. ***joints*** are created to express the location at which the interaction torques and moments are applied between segments.

in visual3d, a ***joint*** is created when the distal end of one segment is in proximity to the proximal end of another segment. in visual3d, **proximity** is defined as the radius of the segment end.

in order to have a shoulder joint created you must define the proximal end of the thorax/ab segment

to be near the pelvis and the distal end near the shoulders. typically, the distal end of the thorax is defined by markers placed on the acromium.

note: for the shoulder, this is sometimes still not sufficient to have shoulder “joints” created. if the distance from head of the humerus to the distal end of the thorax is more than the radius of the distal end of the torso, a joint won't be created. moving the shoulder towards the midline slightly will often result in the shoulder joint be created.

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