

Checklist - Evaluating your Simulation

The following is a list of necessary, but not sufficient, questions for evaluating your simulation. You may not be able to answer "yes" to all of these questions, but if the answer is "no", you should be able to provide a plausible explanation to convince yourself (and reviewers) that your results are meaningful.

Scaling

1. If you are using any coordinates from a motion capture system, do the definitions match your model?
2. Is the maximum marker error for bony landmarks and functional joint centers less than 2 cm?
3. Is the RMS error less than ~1 cm?
4. Do the joint coordinates in the static pose match your knowledge about experimental data collection (comparison to photos, etc.)?

Inverse Kinematics

1. If you are using any coordinates from a motion capture system, do the definitions match your model?
2. Is the maximum marker error less than 4 cm?
3. Is the RMS error less than ~2 cm?
4. Is there data for similar motions in the literature or other past studies? Are your results within 1 standard deviation?

Inverse Dynamics

1. Are there any large or unexpected forces at the pelvis (how large)?
2. Is there data for similar motions in the literature or from other past studies? Are your results within 1 standard deviation?

Static Optimization

1. Are there any large or unexpected residual actuator forces?
2. Find EMG or muscle activation data for comparison with your simulated activations. Do the timings of muscle activations/deactivations match? Are the magnitudes and patterns in good agreement?

RRA

1. Is the RMS difference between experimental and simulated joint angles less than $2-5^\circ$ (or less than 2 cm for translations)?
2. Are the peak residual forces less than 10-25 N? Are the RMS residual forces less than 5-15 N?
3. Are the peak residual moments less than 75 Nm? Are the RMS residual moments less than 50 Nm?
4. Are the residual moments reduced 30-50% compared to inverse dynamics?
5. Is there joint torque data for similar motions in the literature or from other past studies? Are your results within 1 standard deviation?

CMC

1. Are the peak reserve actuator torques less than 10% of the corresponding peak joint torques?
2. Is the RMS difference between experimental and simulated joint angles less than $2-5^\circ$ (or less than 2 cm for translations)?
3. Are the peak residual forces less than 10-20 N? Are the average residual forces less than 5-10 N?
4. Are the peak residual moments less than 75 Nm? Are the average residual moments less than 50 Nm?
5. Find EMG or muscle activation data for comparison with your simulated activations. Do the timings of muscle activations/deactivations match? Are the magnitudes and patterns in good agreement?