

Replication of a Two-Axis Robotic Platform for Improved Ankle Characterization and Postural Stability Studies

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Research question: Replicate a two-axis robotic platform in order to provide future research ventures such as, holistic characterization of simultaneous ankle impedance and simulating mechanical environments for postural stability.

Introduction:

Previously, our lab developed a two-axis robotic platform for use in characterization of the right human ankle, rehabilitative studies involving stroke patients, and postural stability studies.

Rehabilitative studies and postural stability would be further improved if there were two platforms for each foot.

DP: Dorsiflexion-Plantarflexion
 IE: Inversion-Eversion

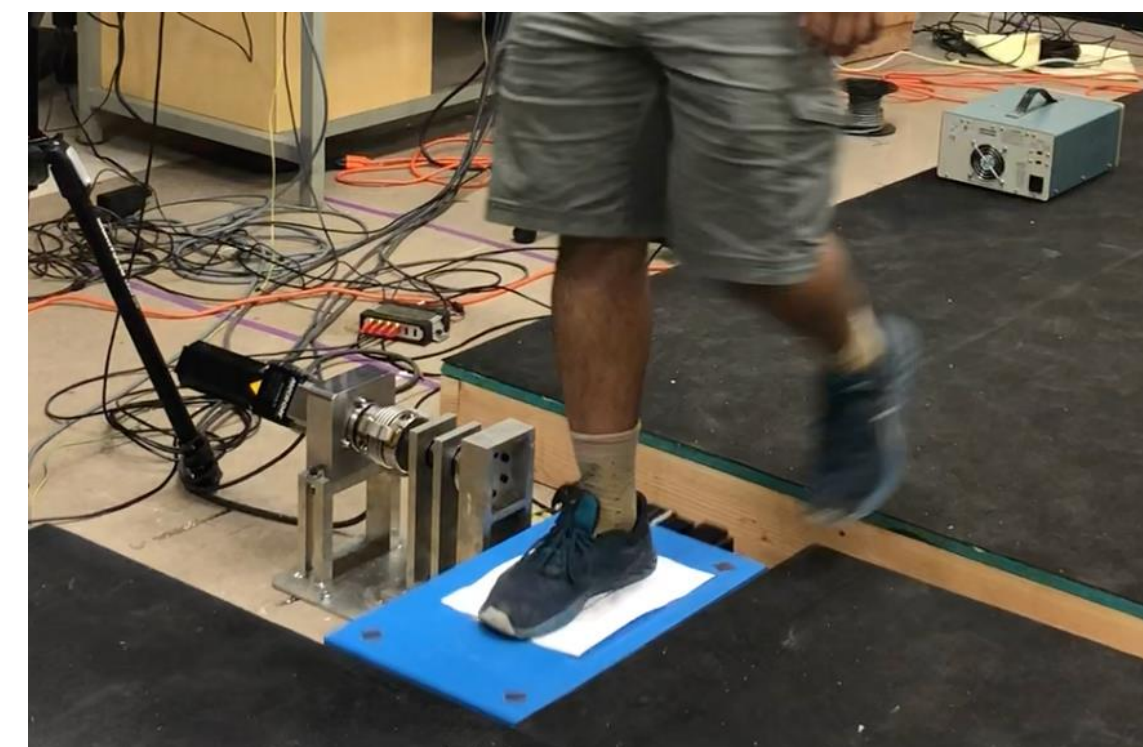


Fig 1. Image of previous platform used for right ankle characterization.

System:

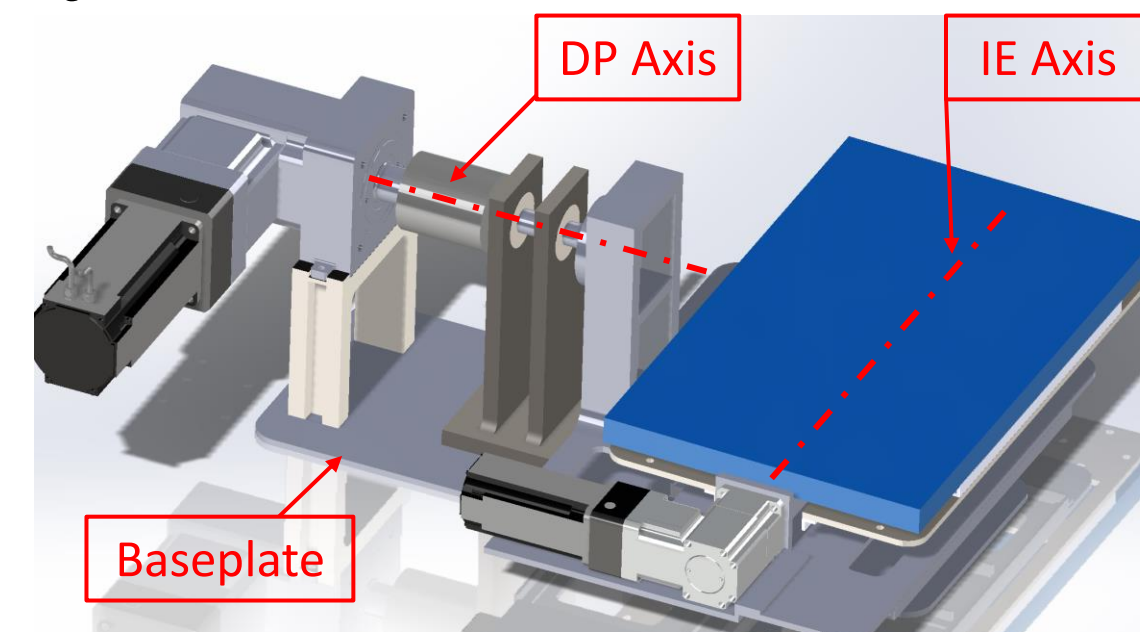


Fig 3. Full assembly DP and IE axis

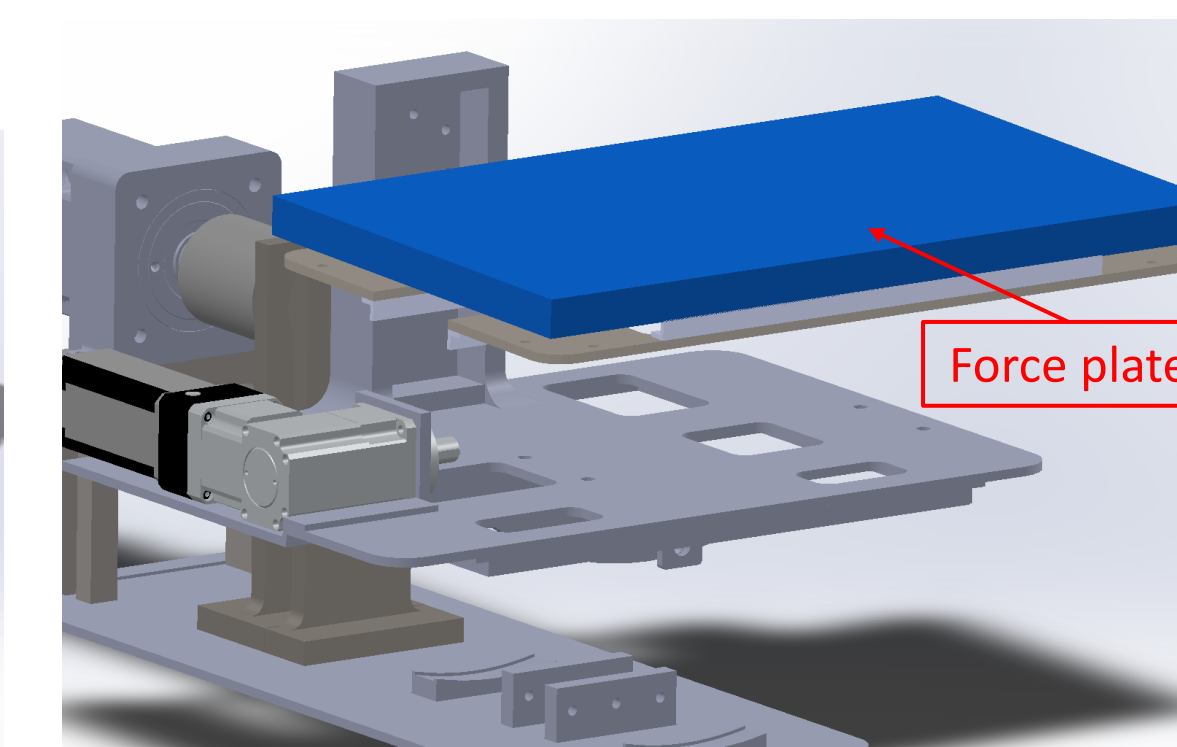


Fig 4. Exploded IE axis assembly.

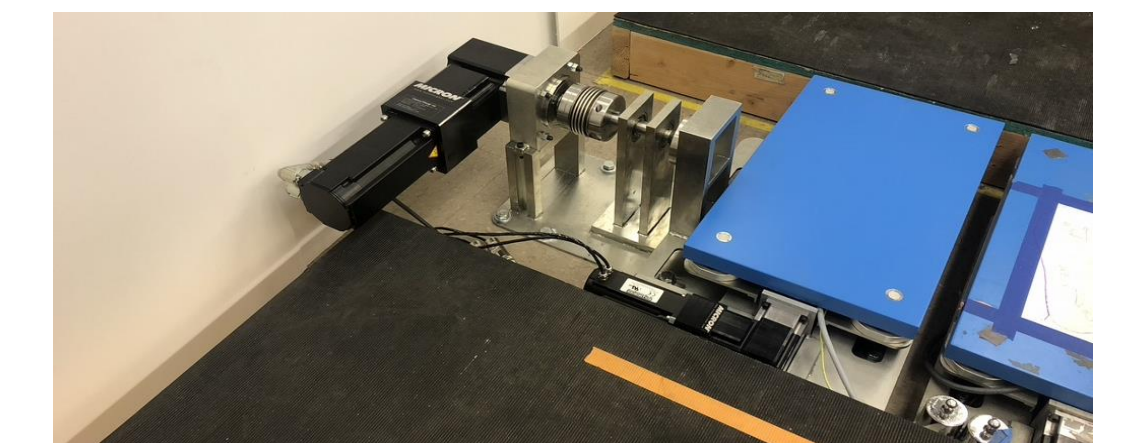


Fig 5. Left platform installed.



Fig 6. Left & right platforms.

Build Process:

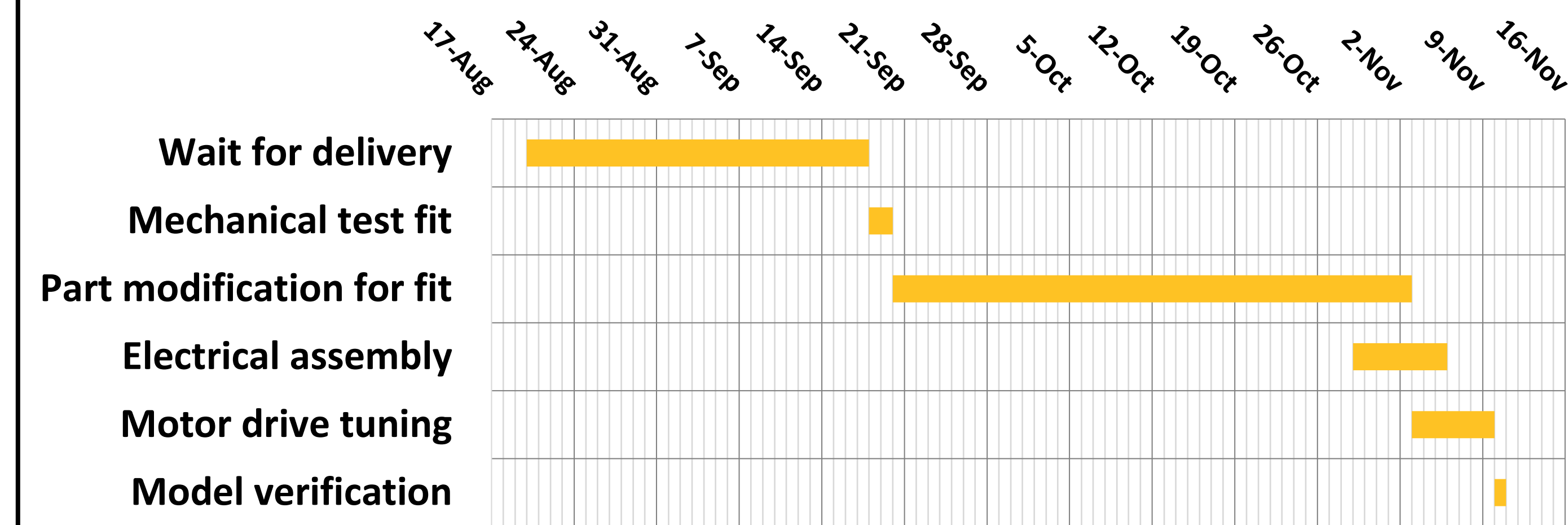


Fig 2. Project timeline and build steps covering mechanical, electrical and control.

Results:

The new platform is a tool capable of assisting in many ankle related studies. Ankle characterization, postural stability, as well as rehabilitative studies involving neuromuscular disorder like stroke.

Fig 7. demonstrates the ability to move the ankle normally.

Fig 8. shows a single platform approach to postural stability varying rotational stiffness.

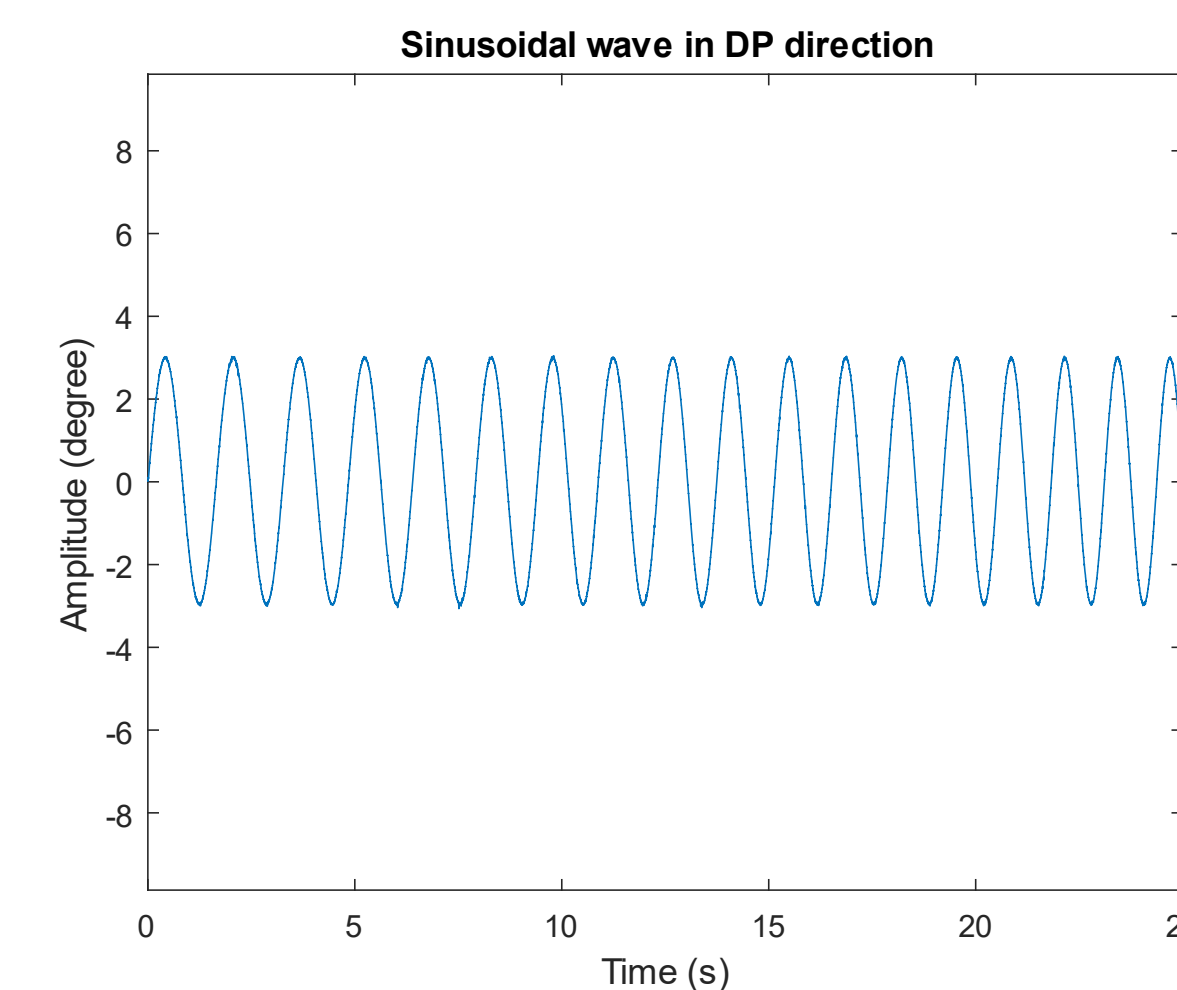


Fig 7. Sinusoidal input in degrees

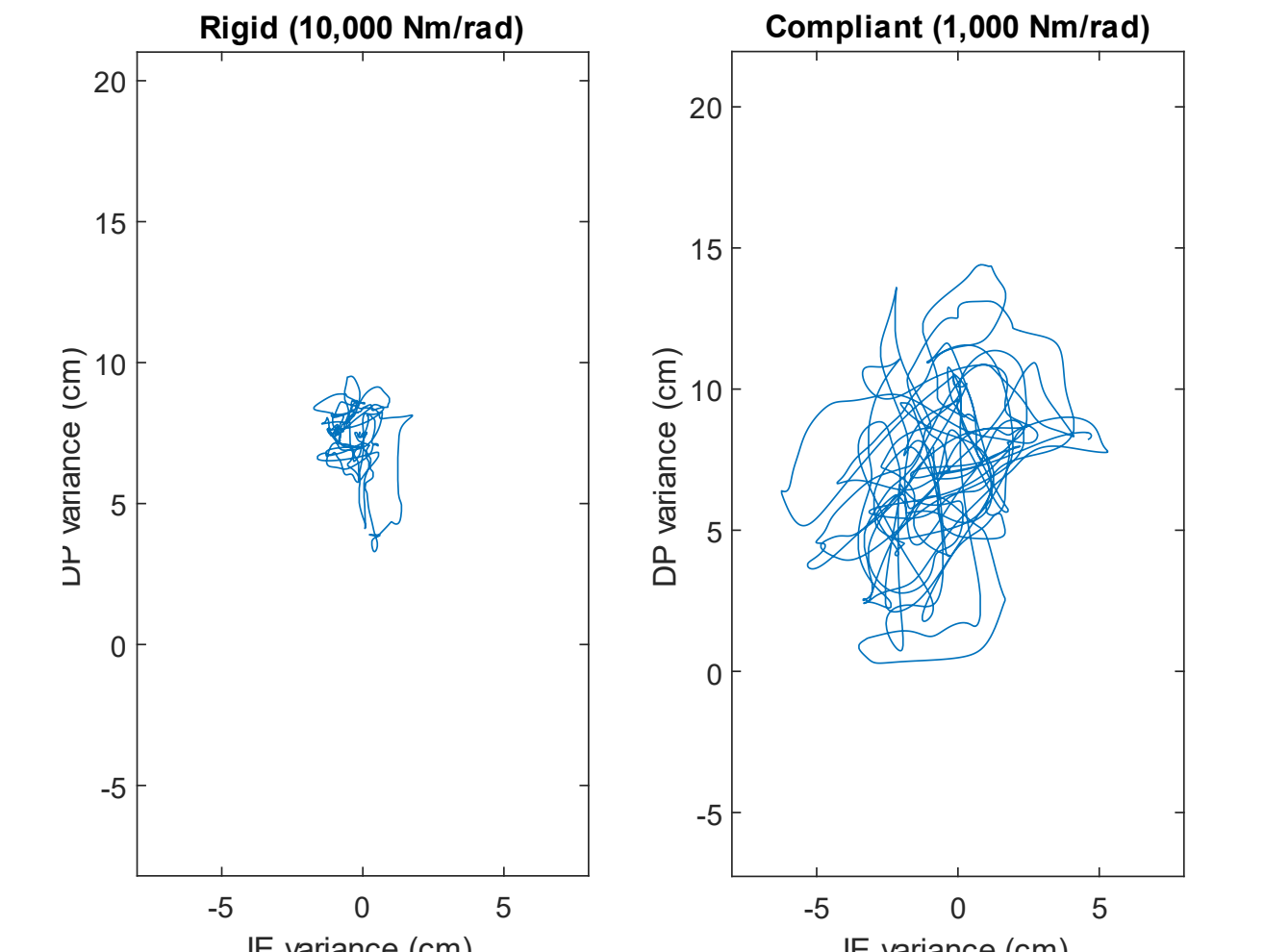


Fig 8. Center of pressure (COP) variance. Inversion-Eversion (IE) vs Dorsiflexion-Plantarflexion (DP).

Future Work: The purposes of developing the left platform is to extend postural stability studies for example, synchronous and asynchronous perturbations effect on stability and others.

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