Albert Item

Mazen Al Borno

March 11th, 2024

Computational Motor Control

Simulating American Sign Language

My project aims to use OpenSim and Python to simulate hand and arm movements to communicate simple phrases in American Sign Language. This would be done using inverse kinematics and inverse dynamics. I will have to create 2 arms with approximately 24 dofs for both arms. There will be a set of phrases that the arms will act out. This narrows the scope of the project a bit, so that I won't have to create a large dictionary for the Python script. The phrases will include things like greetings, farewells, as well as common sayings and idioms. Below are the resources I will use for the project.

Papers & Resources

Yang, Feng et. al. "An algorithm for simulating human arm movement considering the comfort level." *Simulation Modelling Practice and Theory*. Elsevier, December 2004.

Koga, Yoshihito et. al. "Planning Motions with Intentions." Association for Computing Machinery, July 1994.

Flash, T. "The Control of Hand Equilibrium Trajectories in Multi-Joint Arm Movements" *Biological Cybernetics.* Springer Link. 1987

Beamish, D. "Speed-accuracy trade-off in planned arm movements with delayed feedback" *Neural Networks.* Vol. 19, issue 5, Elsevier. June 2006.

Modeling a hand and arm in OpenSim Creator: https://youtube.com/watch?v=EWcMT99_nf0

OpenSim Tutorial #1 Introduction to Musculoskeletal Modeling

https://simtk.org/projects/arms_hand_model