HW2 – sphere grasping

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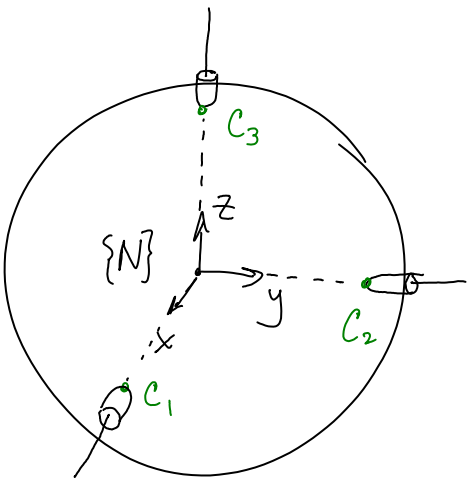
2:12 PM



We want to grasp a sphere of radius 1. The origin of the inertial frame is coincident with the center of the sphere.

For your analysis, assume there are three contacts at:

$$c_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \quad c_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \quad c_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

Provided Matlab code may be helpful.

(A) Choose contact models such that a sufficiently dexterous hand could impart any twist and net wrench to the object.

(B) Does the initial grasp have form closure? Why?

(C) How could you change the number and/or

locations of the contacts to reverse your answer to question (B)?

(D) Assume all contacts are of type HF with identical friction coefficient, μ. Determine the minimum μ such that the grasp has force closure.

(E) Design fingers such that all object twists and wrenches (net and internal) could be controlled.

(F) Remove contact 3 from consideration. Does the grasp with only 2 fingers have force closure? Why or why not?