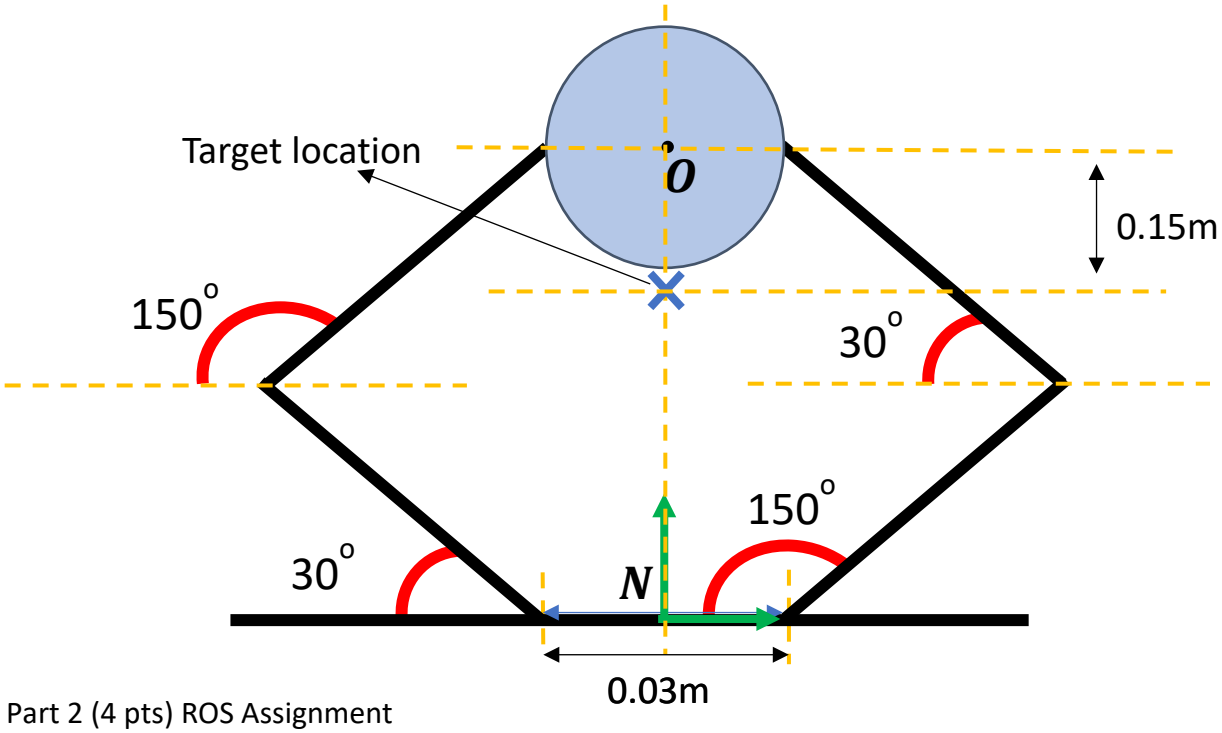
RBE 450X – Homework 1

Part 1 (6 pts) Consider the simplified model of the gripper. The object diameter is 0.03m; each gripper finger is equal length and 0.05m. The very tip points of the fingers are in touch with the object. The line that connects the contact points go through the origin of the object.

A) For this given instance, please calculate the grasp matrix numerically (This grasp matrix should consider **both** of the contact points).
B) The goal is to get the object to the target location with the same orientation to the starting pose in less than 2 seconds. Please first identify a desired twist for the target object with respect to the gripper frame. Then, calculate the twists at the contact points. (You can utilize any mathematical software for your calculations, but please explicitly explain your steps.)



Part 2 (4 pts) ROS Assignment

- Please be sure that you installed ROS 2 Humble based on the instructions on the official webpage: https://docs.ros.org/en/humble/Installation.html
- Finish the ROS beginner level tutorials at https://docs.ros.org/en/humble/Tutorials/Beginner-CLI-Tools.html and https://docs.ros.org/en/humble/Tutorials/Beginner-Client-Libraries.html
  You can choose to use Python or C++. You do not need to use both.
- Write a Service/Client pair in which
  - The client sends two force vectors to the server in 3D space (dimension: 3x1). These two vectors can be hard-coded. Please make sure that the client prints them on the screen as it launches.

- The server receives the two force vectors, sums them up and returns the result to the client (again as a 3x1 vector).
- The client prints the response to the screen.

You can leverage the "Writing a simple service and client" tutorial for implementing this part, but please be sure that you create your packages from scratch with original names; do not simply edit the package that you created in the tutorial.

Deliverable for this section:

Please attach the following packages with your submission.

- The packages that you created by implementing the tutorials.
- The packages that you created by implementing the Service/Client pair above.
- A screenshot of your terminal using the Service/Client pair above and their responses.