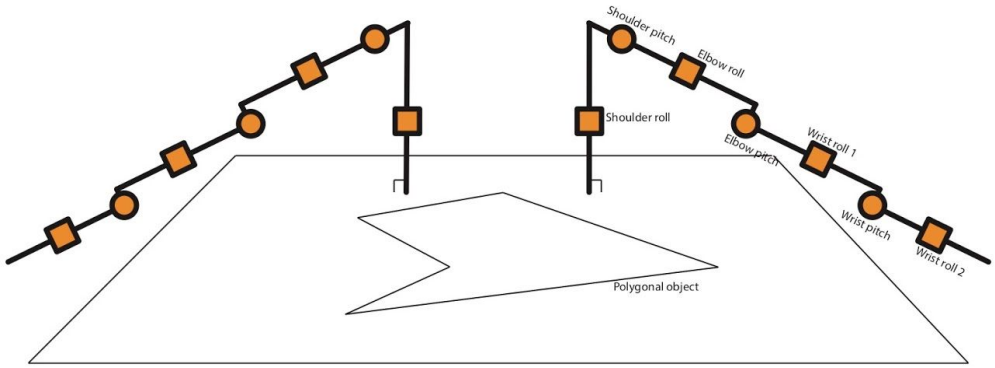
MECH4000J/ELEC4010M Robotic Manipulation and Mobility 2018/2019 Spring
Project #2 - Robotic Grasping DUE 20 May

Project policy: Work individually. This is not a group project. Upload your zip package to Canvas due 11:59pm, 20 May. Late packages can be turned in until 11:59pm on 24 May with a 25% penalty. After that, none will be accepted. Extensions are available for certain conflicts including illness (email the instructor). Collaboration with other students is allowed. But you MUST turn in your own work. Failure to do so constitutes plagiarism and may nullify your score.

(Optional) ***Make-up of Project #1*** You can optionally make up Project #1 by resubmitting your revised work. Upload your zip package to Canvas, as you did for Project #1. There will be a separate link in Canvas. Make sure to include an one-page report summarizing your make-up efforts. Note that this will be added to the evaluation of your Project #1.

Develop MATLAB software for finding quality grasps on planar parts, modeled as a polygon, with two point contacts with friction by implementing the following requirements:

1. Ask the user to input the shape of a polygonal object of interest, for example, a sequence of the vertices of the polygon.
2. Visualize the shape of the polygon connecting the vertices, with the right aspect ratio.
3. Ask the user to input the coefficient of friction.
4. Find all the grasps of two frictional contact points that can be in force-closure by doing the following:
    a. Consider possible contact points in the interior of each edge (for example, by dividing each edge of the polygon into, let's say, 10 segments). However, exclude the vertices of the polygon in that a point contact on the vertices might not be stable.
    b. For each pair of such contact points, check if it is possible to attain force-closure by making contact at the points. Establish the set of all force-closure grasps.
5. On the plane of the polygon, also bring two stick-figure baxter arms you created in Project #1 such that the most proximal links are perpendicular to the plane and the distance between them is 350mm. Refer to the figure below and the rubric of Project #1.



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6. Among the force-closure grasps, find one that is reachable by the dual-arm robot. The reachability means that the two tips of the arms reach the two contact points of the grasp, one for each. It may be necessary to repeat this with different configurations of the object relative to the robot. Visualize the reachable grasp with the corresponding configuration of the arms.

Instruction for online submission:

Upload a single zip file containing the functions you have implemented, a “readme.txt” file briefly describing how to run your codes, and slides showing a grasp founded by your software (the position of the two contacts of the grasp and the configuration of the arms reaching the contact positions should be specified).