

ELEC-E8119 Robotics: Manipulation, Decision Making and Learning

Assignment 1: Grasp Planning

Task overview

You need to design and implement a grasp planner that automatically generates 2-finger stable grasps for a given planar object. The grasp planning problem needs to be considered only in 2-D. Contacts are point contacts with friction.

The grasp planner needs to implement the following Matlab interface:

```
function contacts = grasp_planner(shape, friction)
```

where `shape` is a $N \times 2$ matrix, each row corresponding to (x,y) -coordinates of a point so that a closed 2-D shape is obtained by connecting subsequent points by line segments (e.g. (x_1, y_1) to (x_2, y_2)) and by connecting the last point to the first ((x_N, y_N) to (x_1, y_1)). `friction` is the friction coefficient.

The function needs to return a 2×2 matrix `contacts` which includes the coordinates of two points along the edges of the shape so that the grasp on those two points is stable.

Report your work by explaining the approach taken in a 1-page report. The report should also include your name and student number. You can cite references instead of explaining any details yourself.

Rules

Your solution should be submitted through myCourses-page of the course.

The deadline for the assignment is October 2, 23:55.

You need to submit two files, `grasp_planner.m` containing your solution and `assignment1.pdf` reporting the approach.

By submitting your solution, you affirm that you have developed the solution yourself.

You are allowed to discuss the task with other students but you are not allowed to co-operate beyond discussion.

You can contact TA Rajkumar Muthusamy (rajkumar.muthusamy@aalto.fi) for clarifying the assignment or if you need support.

Grading

Maximum 20 points.

Up to 5 points based on reporting a successful approach (0 points for missing report)

+10 points for presenting a solution filling the requirements presented above

+2 points for by including visualisation of the solution in Matlab

+3 points if your approach chooses an optimal grasp according to a metric of your choice (remember to report the metric and approach) instead of any stable grasp

-1 point per each day the deadline is exceeded