CENG 460 - Introduction to Robotics
Fall 2018

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Homework 4 - Sensor-based Navigation and Potential Fields

1. Predictor-corrector approach is taken during boundary following. While the robot is moving along the polygon edges, there is no need for a correction step . So, whenever the robot has to follow a straight line (at an offset from the polygon edges), it simply takes a step in the direction of the tangent. Additionally, whenever the direction of gradient has changed (i.e. when the robot has to make a turn around the corners), a correction step needs to be taken, and in this implementation, the robot simply takes a step in the direction of the new gradient vector, to maintain the safe distance (0.5).
   Result of running **run_planner('example_obs5','e2177269_convex')**:

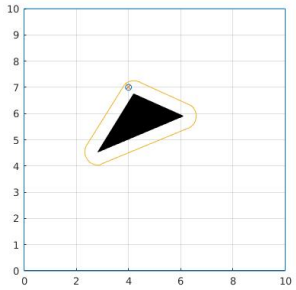

Figure 1

Result of running **run_planner('example_obs1','e2177269_convex')**
(Figure 2 and Figure 3 show the result of the script when the step_size is 0.1 and 0.5, respectively):

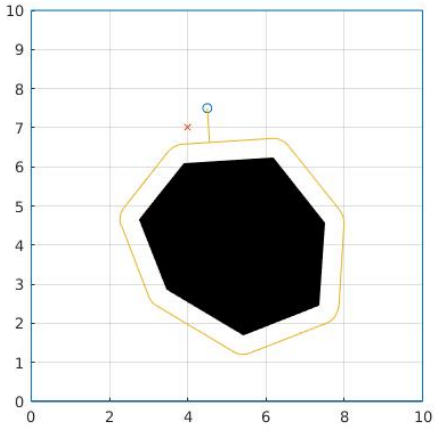

Figure 2

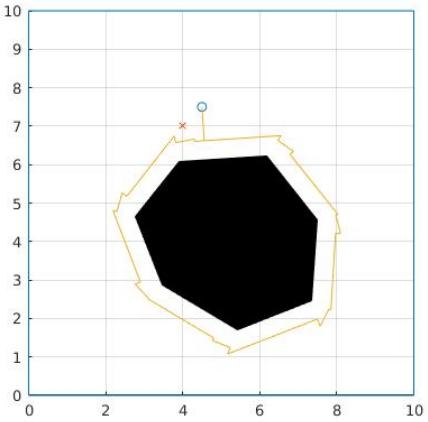

Figure 3

2. Result of running **run_planner('example_obs2','e2177269_concave')** (Figure 4 and Figure 5 show the result of the script when the step_size is 0.1 and 0.5, respectively):

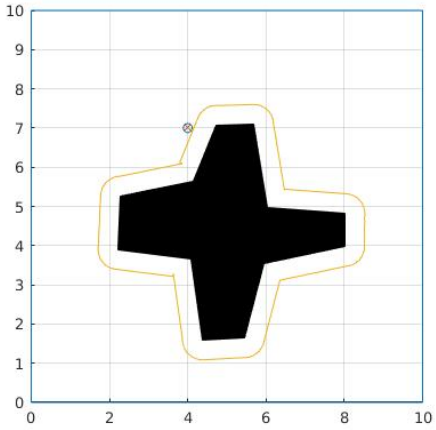

Figure 4

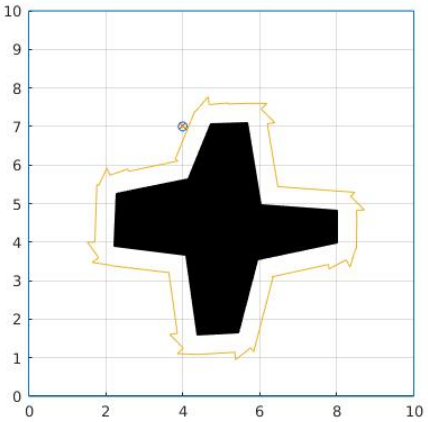

Figure 5

3. Attractive potential increases quadratically until a threshold distance from the goal, beyond that it grows linearly.
   Repulsive potential is zero beyond the safe distance from obstacles.

   Result of running **run_planner('example_obs3','e2177269_potential')**
   (Figures 6 and 7 show the result of the script for different starting positions):

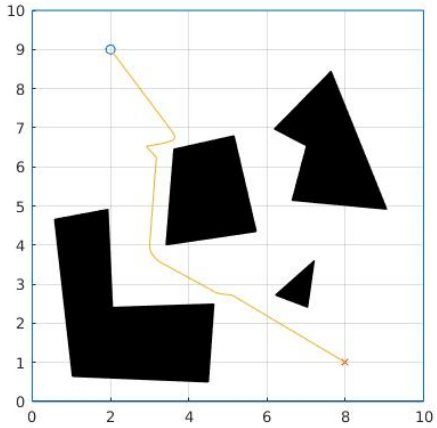

Figure 6

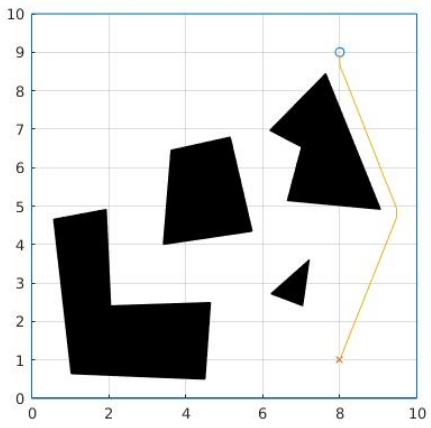

Figure 7

Result of running **run_planner('init_arena','e2177269_potential')**:

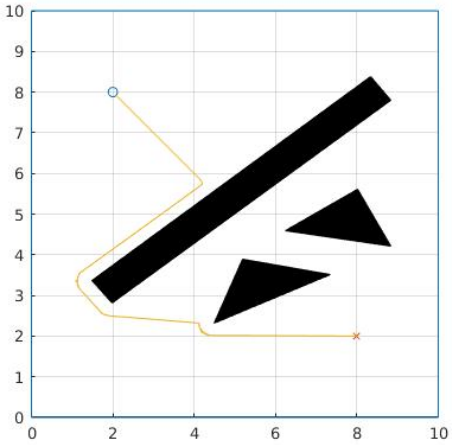

Figure 8

Result of running **run_planner('example_obs4','e2177269_potential')** (the robot gets stuck at a local minimum which does not correspond to the goal):

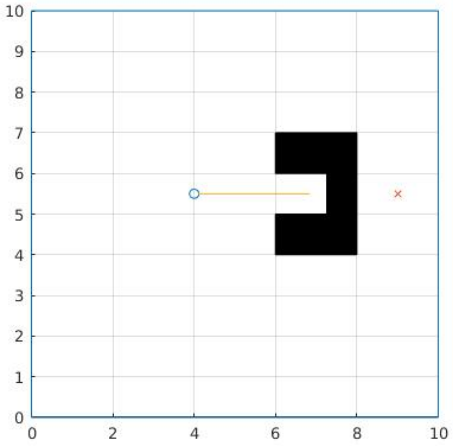

Figure 9