

16-811 Homework 6

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Q1:

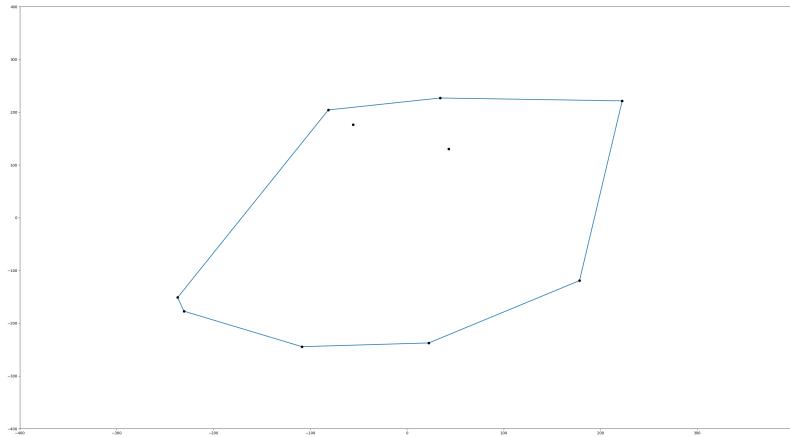


Figure 1: 10 points

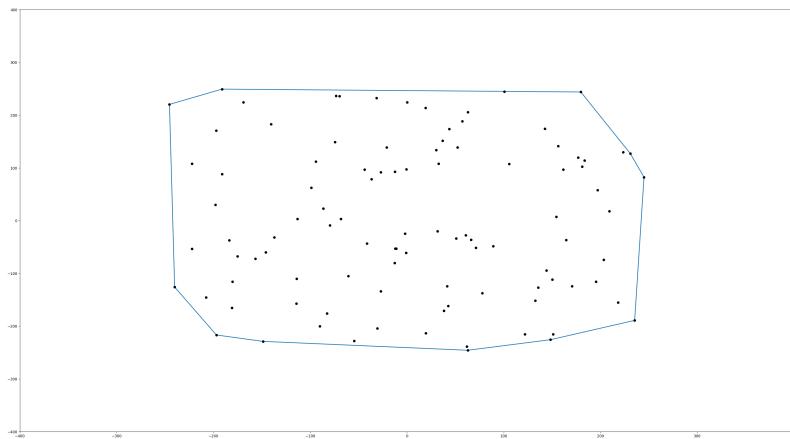


Figure 2: 100 points

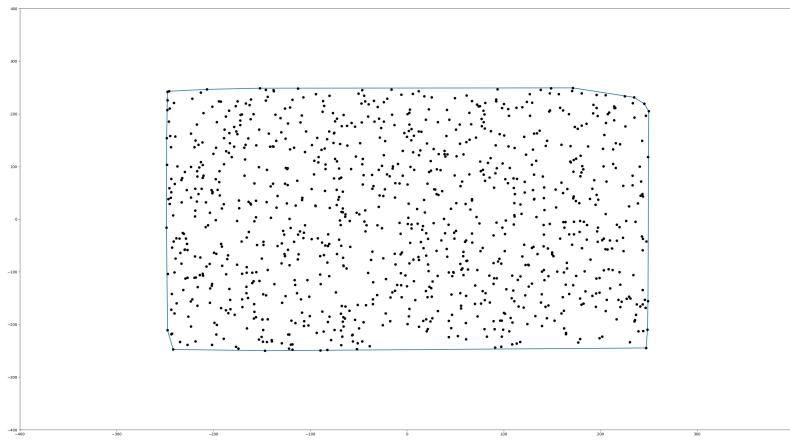


Figure 3: 1000 points

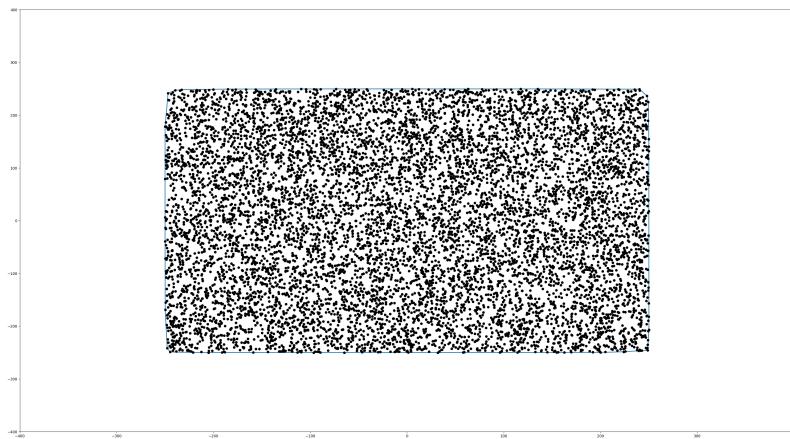


Figure 4: 10000 points

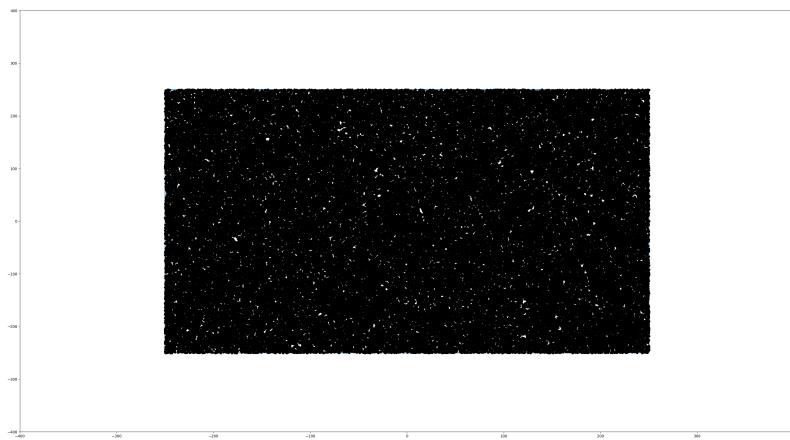


Figure 5: 100000 points

Q2:

All the polygons are randomly generated with some offset, such that they do not overlap with each other too much. Start and goal are randomly sampled with bias such that they tend to be far away from each other, with obstacles in between.

First, I generated a visibility graph. Then I searched on the graph using Dijkstra algorithm.

The found path is shown in blue.

Start and goal are shown in red.

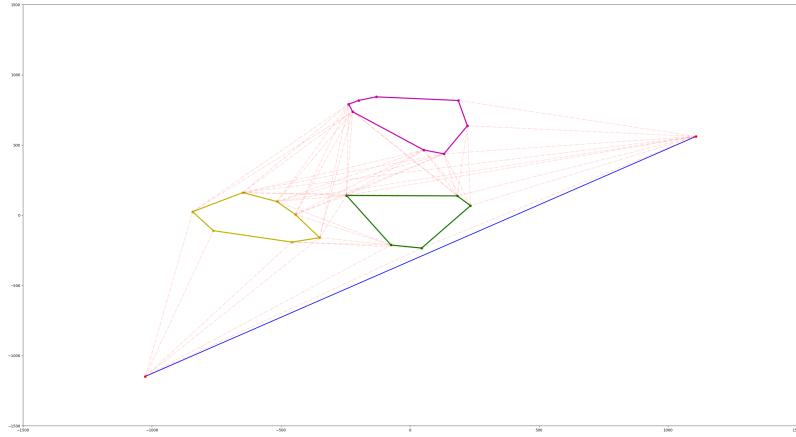


Figure 6: 3 polygons where goal is directly reachable

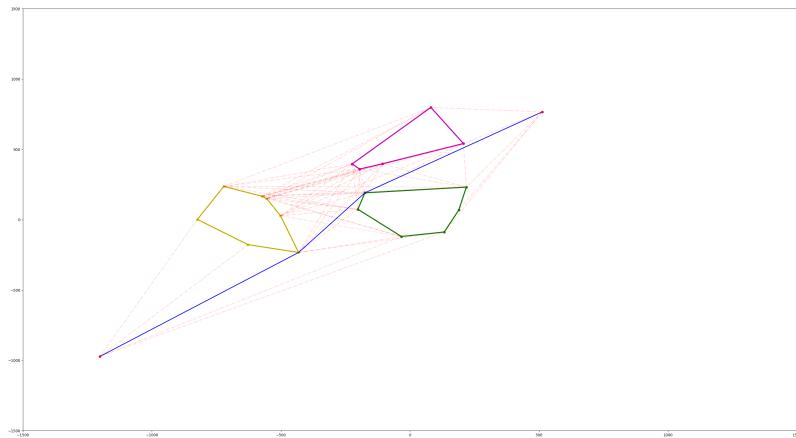


Figure 7: 3 polygons

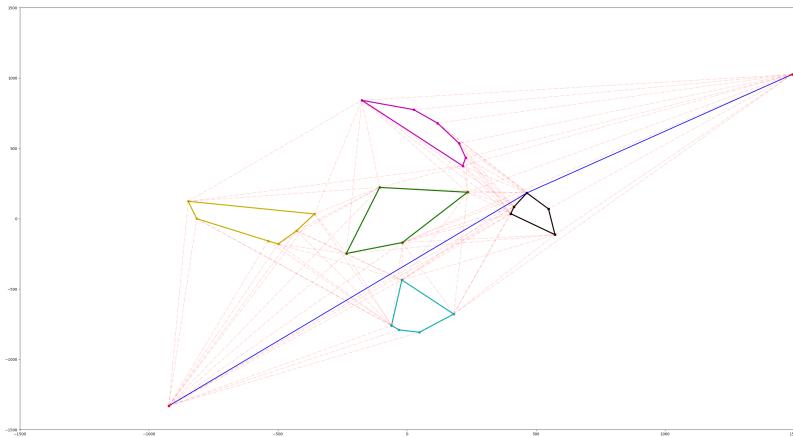


Figure 8: 5 polygons

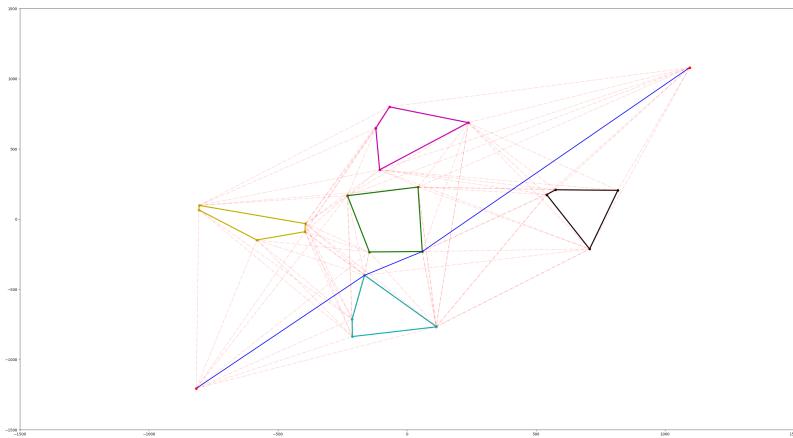


Figure 9: 5 polygons

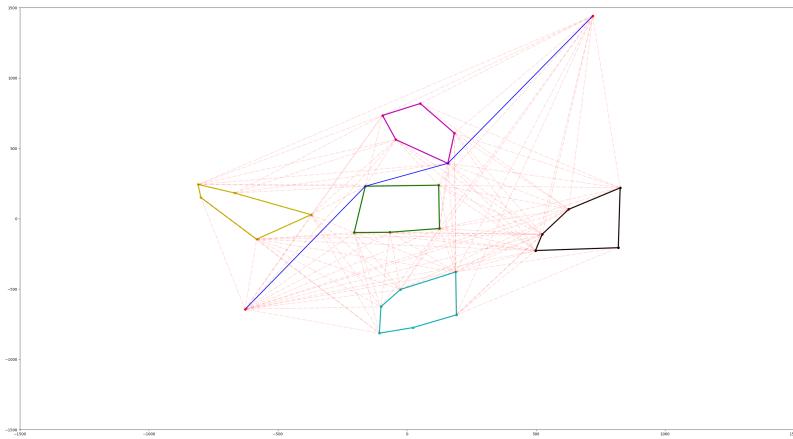


Figure 10: 5 polygons

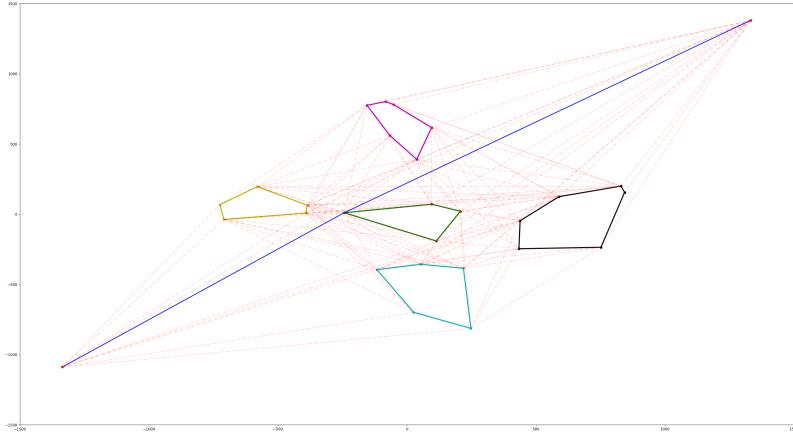


Figure 11: 5 polygons

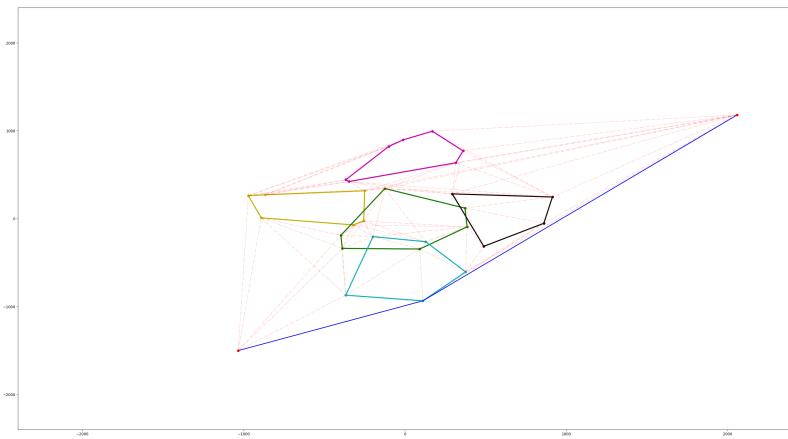


Figure 12: 5 polygons with overlapping

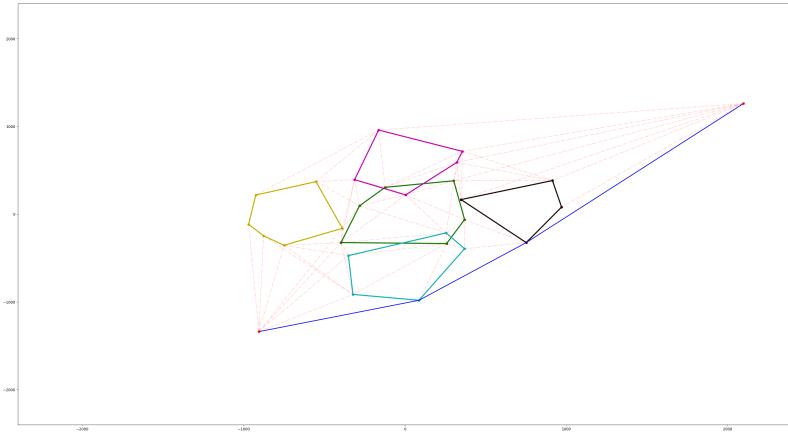


Figure 13: 5 polygons with overlapping

Q3:

Similar to Q2, except all the polygons are expanded by applying the Minkowski sum with the shape of the robot (flipped). Then construct a visibility graph with the inflated polygons, and search the graph with Dijkstra.

All the polygons and the robot footprint are randomly generated. Start and goal are randomly sampled with bias such that they tend to be far away from each other, with obstacles in between. The vertices of robot footprint is randomly sampled around the start position.

The found path is shown in blue.

Start, goal and robot shape are shown in red.

Inflated polygons are shown in dashed lines.

Intermediate robot footprints are shown along the path, with red dashed lines.

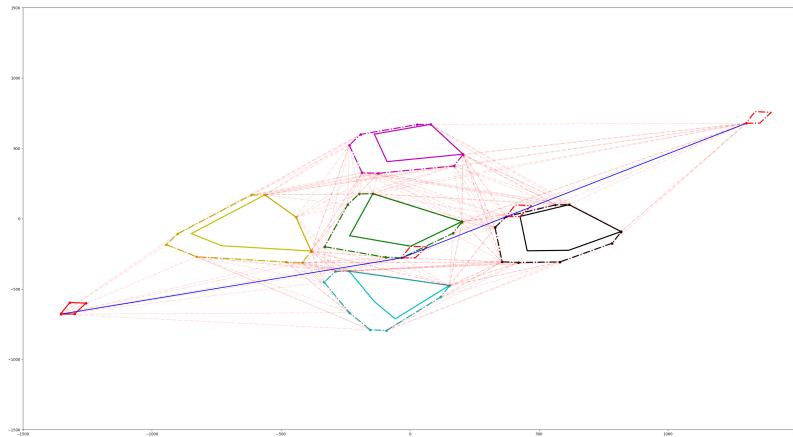


Figure 14: Example 1

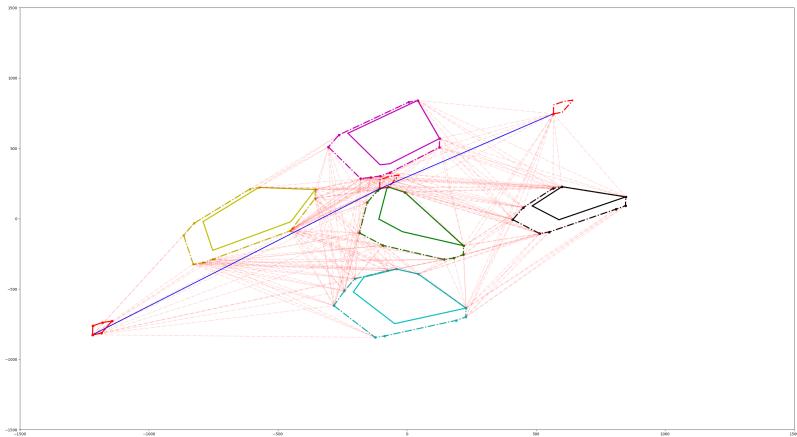


Figure 15: Example 2

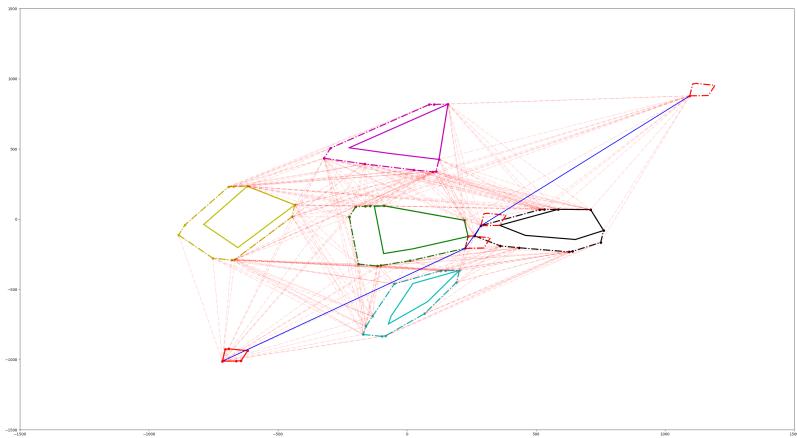


Figure 16: Example 3

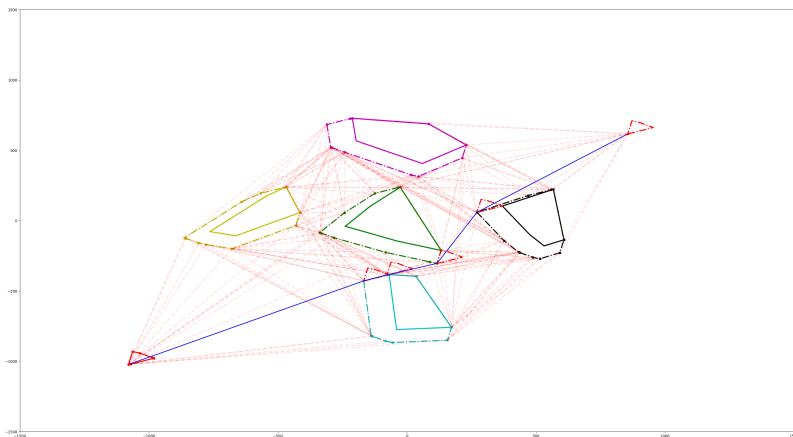


Figure 17: Example 4