COMP550 Project2 Report

Zhenwei Feng zf12

1.

The problem that I solved for this project is to do collision checking for three different kinds of simple geometric robots: point, circle and square. The environment contains five axis-aligned rectangular obstacles.

2.

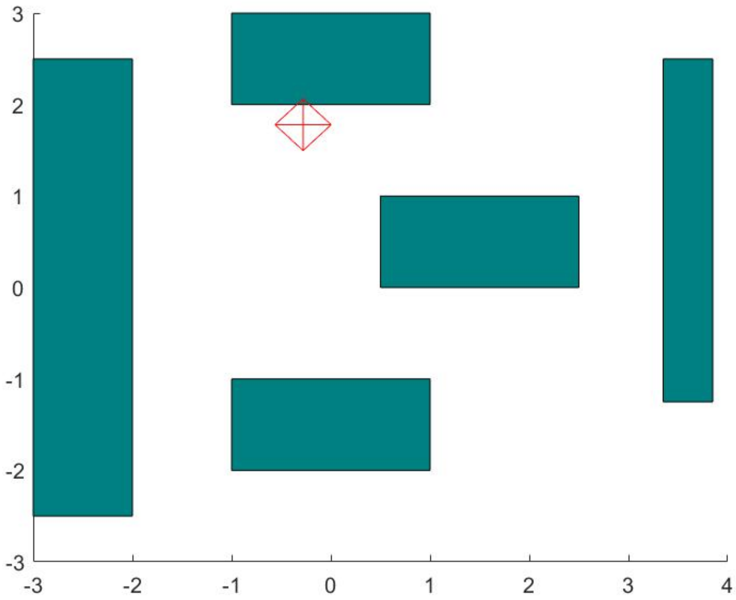
First kind of robot is just a point. Its configuration space is $\Re^2$ because we can use its coordinate in the 2D plane to represent its geometry.

Second kind of robot is a circle. Its configuration space is $\Re^2$ because we can know the position of robot by the circle center, orientation has no effect because the circle remains the same no matter what the orientation is.

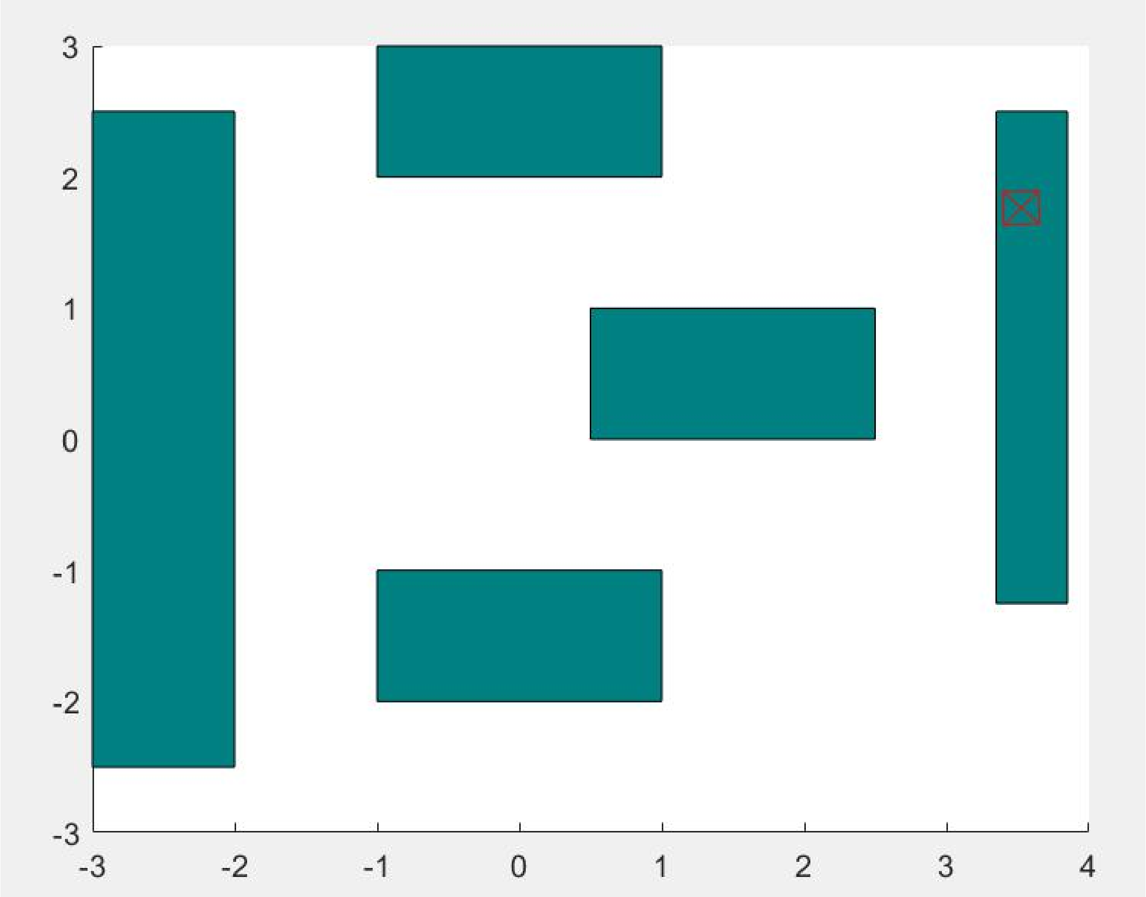
Third kind of robot is a square. Its configuration space is $\Re^2 \times S^1$, we can know the position by its center. Also, different orientation produces different geometry. Position belongs to $\Re^2$ and orientation belongs to S^1.

3.

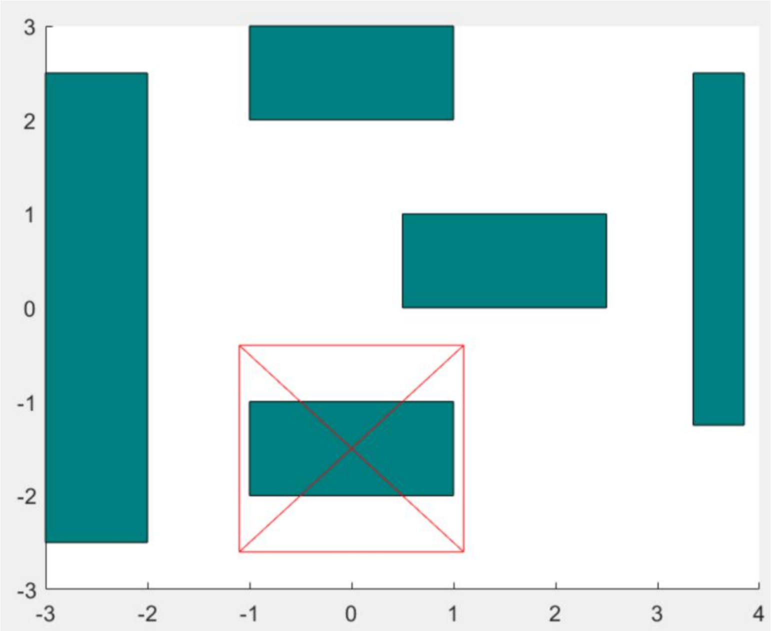
The implementation of collision checking of point robot is the easiest one: I simply check if the point is within any of the rectangular obstacles. For circular robot, the implementation is also pretty straightforward since I simply referred to the collision conditions on the project document. However, for the collision checking of square robots, I ran into a couple challenges. At the beginning, I thought that the only condition for collision is that the perimeter of square robot intersects obstacles, like this:



Since in homework1 I have written an algorithm of checking if two line segments intersect, I can simply make that algorithm into real code to solve this collision checking problem. However, I could not pass all of the tests with this implementation. To find out where I went wrong, I picked out those test cases that I failed. Then I found out that there are two corner cases that I did not cover: one is that the square robot completely lies in the obstacle like this:



or the obstacle completely lies in the robot like this:



In these two cases, the perimeter of square robot does not intersect obstacles but robot still collides with obstacles. After I add in the collision checking of these two cases, I can pass all of the tests in both configs and optional.