Comp 450 - Project 3 (part a)

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October 2024

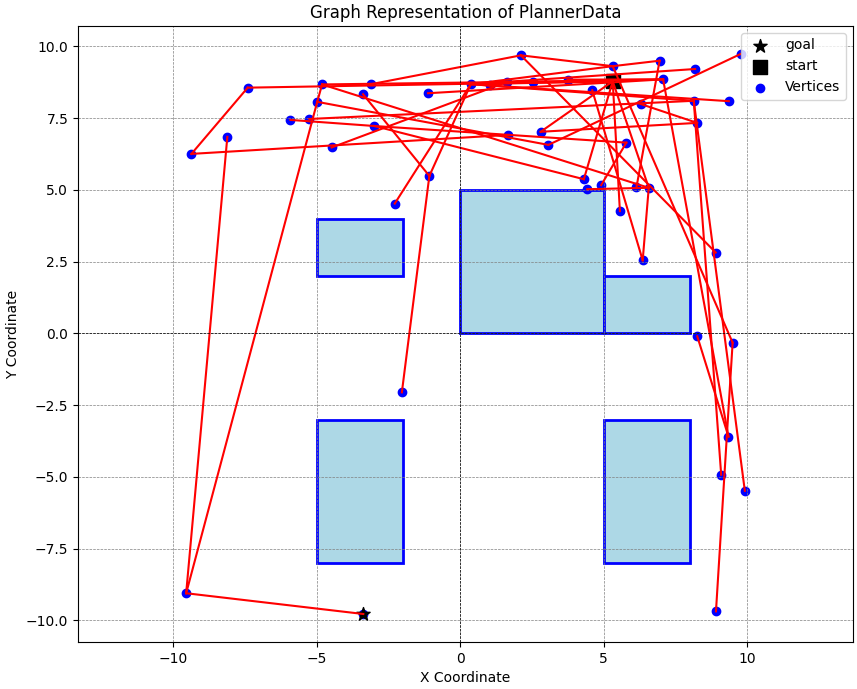
Item 1

We implemented a random tree planner for generating paths through arbitrary configuration spaces with arbitrary environments of axis-aligned rectangles.

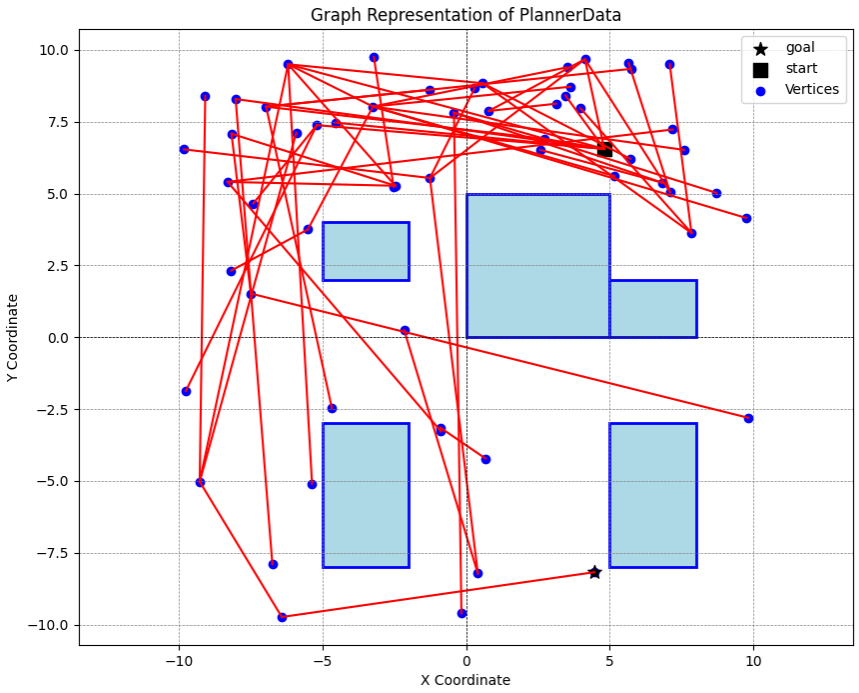
Item 2

We tested two robots, one a point robot with a configuration space in $\mathbb{R}^2$, and the other a rotating square robot with a configuration space in SE2.

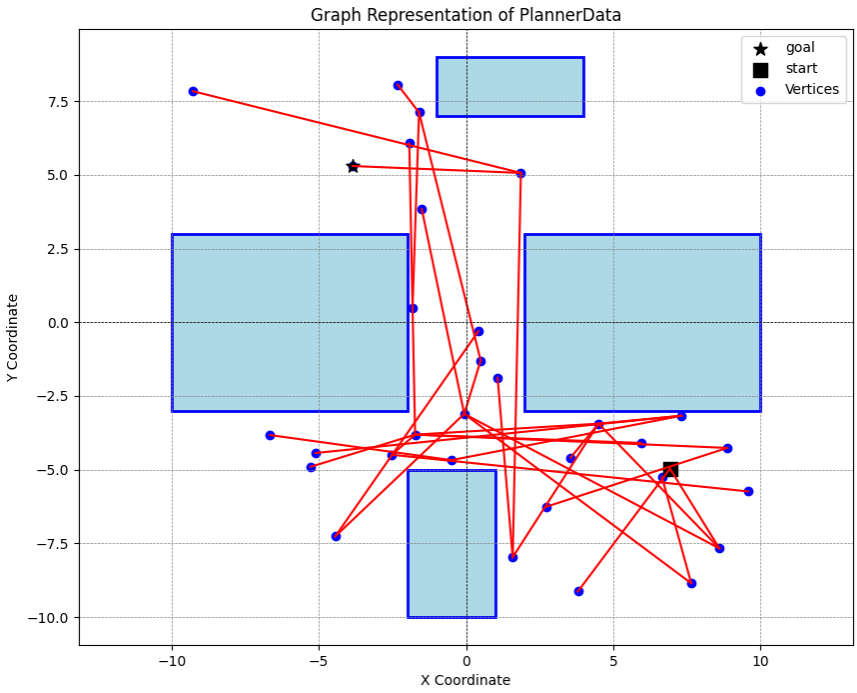
Items 3 and 4



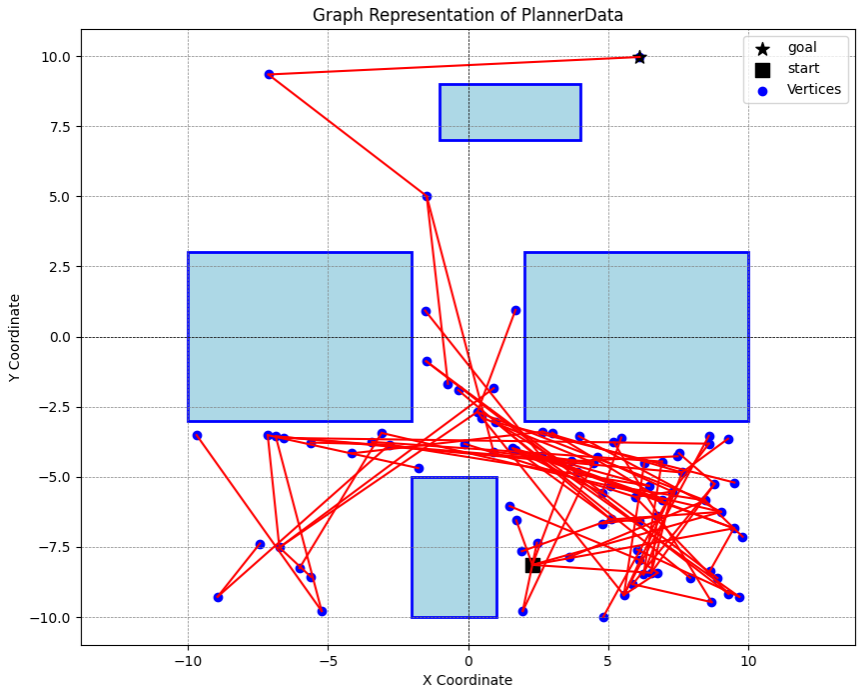
The above figure is a point robot traversing our first environment. The start point in (x, y) is $(5.31718, 8.78763)$, and the end point is $(-3.37481, -9.77697)$.



The above figure is a square robot traversing our first environment. The start point in (x, y, yaw) is $(4.80789, 6.55316, 0.496718)$, and the end point is $(4.45794, -8.17775, -2.15407)$.



The above figure is a point robot traversing our second environment. The start point is $(6.92782, -4.96663)$, and the end point is $(-3.85608, 5.30082)$.



The above figure is a square robot traversing our second environment. The start point is $(2.29839, -8.14192, -2.23593)$, and the end point is $(6.1286, 9.96771, -2.33564)$.

Item 5

Implementing the planner involved recognizing the crucial steps in RTP and adapting the code from RRT to fit these guidelines. Testing required understanding and manipulating OMPL library constructs, similarly to the code from the set-up assignment and previous projects.

The performance of the planner is decent, considering that solution paths were found, but it is far from optimal. As we can see from the visualizations, the planner tried many paths that led to dead-ends. Considering the 2D space and a 20x20 grid performance, this may not scale well. The solution paths also tend to be non-smooth and is removed from the shortest path. In a significant number of instances, the solution path goes around obstacles despite there being a more direct path.