ME570 Assignment 5

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Contents

1 Question 1.1

Extended Space Tree uses the tree structure to explore the environment and find a feasible path from the start location to the end location. Comparing to the Probabilistic Roadmap, it doesn't require the model of the environment as well as a $A*$ planner to plan the path. Therefore, it is favorable for the single query task. Also, it is complete but non-optimal. Table 1 lists the parameter values tried in sampleTree _search_test(), while NTrials is fixed to 1000 and maxDistEdgeCheck is fixed to 0.1.

Decreasing goalDistThreshold and radius will make the agent traversing around the obstacles easier, with a trade-off of an increasing computational time. Normally, if an environment is complex, the parameters values should be small, with a large number of NTrials. Here, since NTrials is fixed, the optimality of path is sacrificed. A small value of parameter will make the agent hard to find a feasible path within the time limit. So set 7 is chosen.

Set	goalDistThreshold	radius	Performance
1	5	5	fast with large and sharp step
2	5	4	better but still sharp
3	4	4	fast but sharp step
4	4	3	fast with some zigzag steps
5	3	3	not very fast with zigzag steps
6	3	2	slow and not find a path with starting point 1
7	4	2.6	fast, acceptable shape

Table 1: Parameter Values for EST

Figure 1 shows the trajectories from 5 different start locations to 2 goals. Figure 2 and Figure 3 illustrate the extended space tree from each start location to the goal location, the legend is consistent with Figure 1. And red cross and diamond are the start and end node in the graph plot.

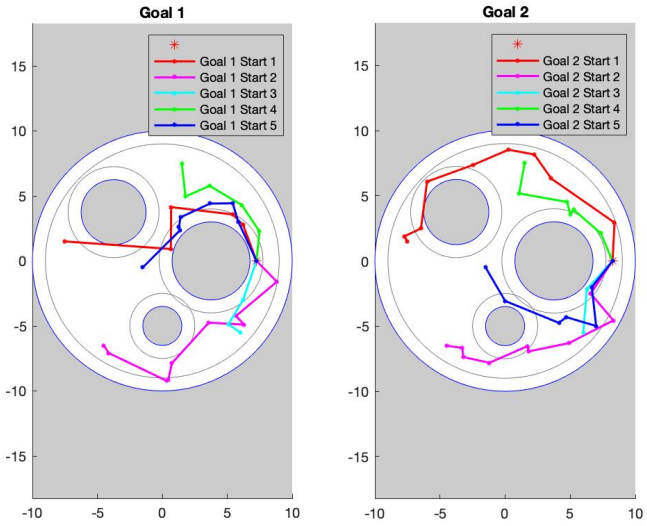

Figure 1: Trajectories using EST

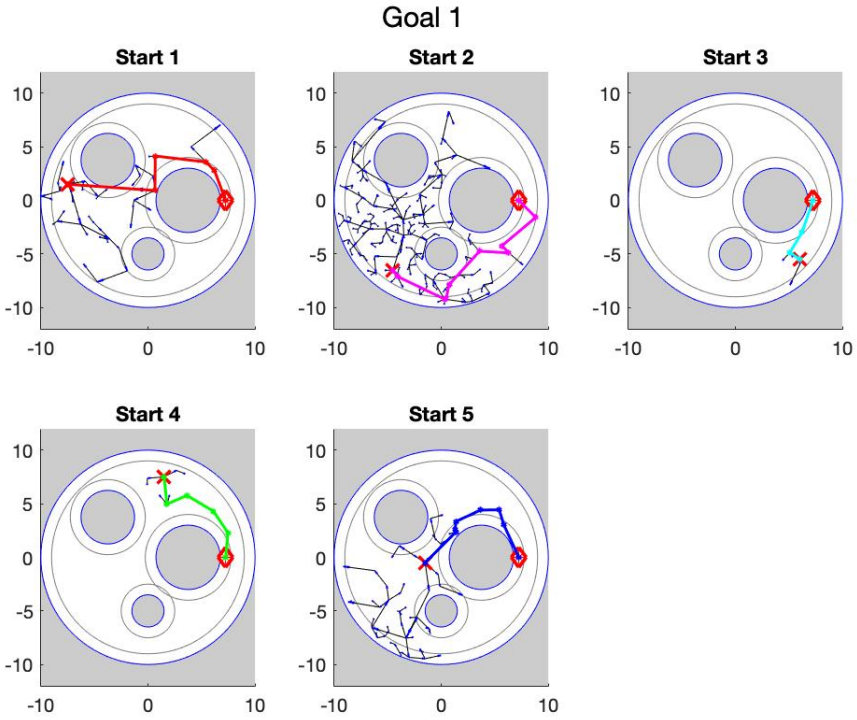

Figure 2: Graph Plot with Goal 1

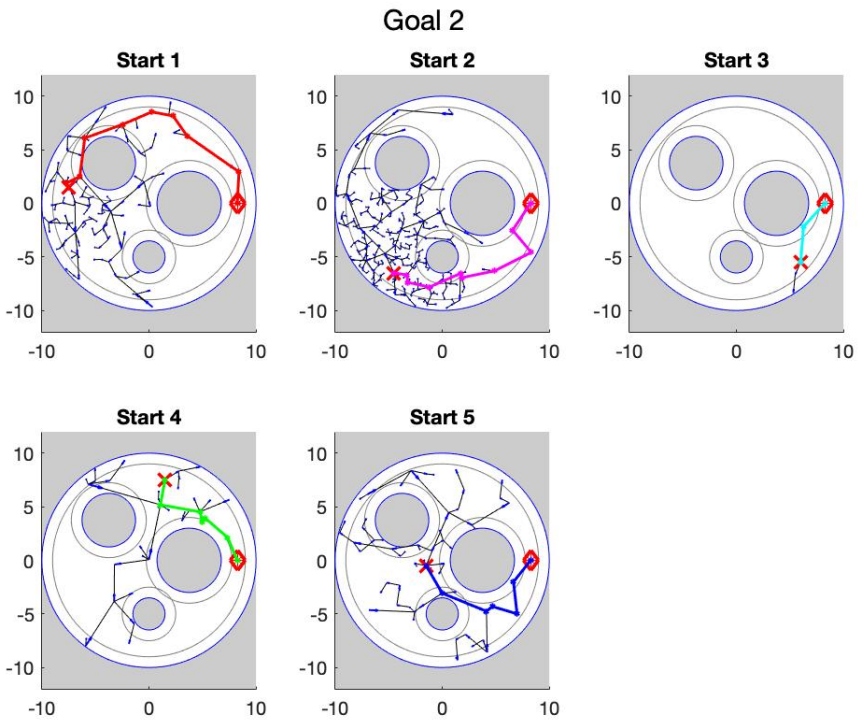

Figure 3: Graph Plot with Goal 2

2 Question 2

- Code and Debug: 3 hours
- Report: 1 hours
- Total: 4 hours
- Simple Part: Some implementations are based on previous homework, the instructions are straight-forward
- Difficult Part: in the instruction, it says starting the parameters around 1. When I start from 1 and decrease it, it cannot return a feasible path, which makes confused and to try larger value.