

Standard Search Algorithms Implementation Report

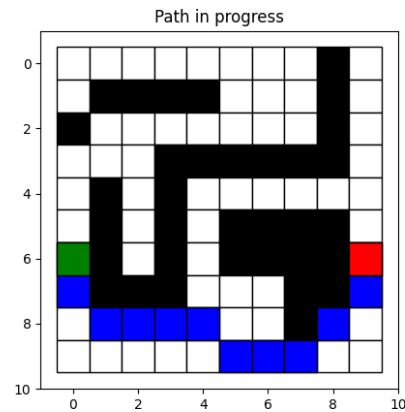
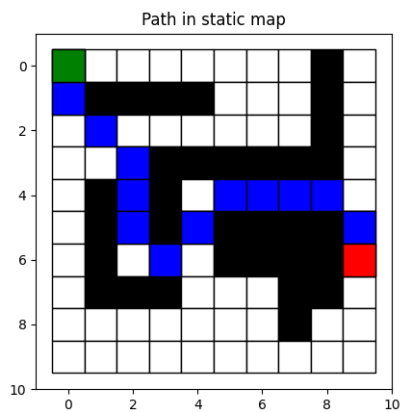
Name: Aniket Patil

Email: apatil2@wpi.edu

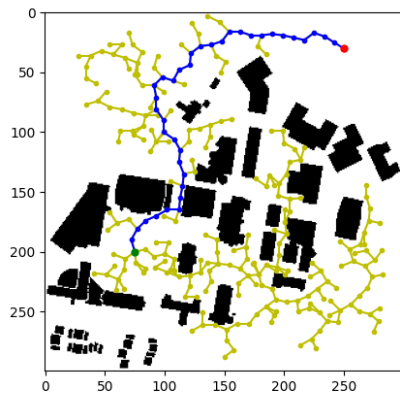
Important: Results are also saved as .png images in the “results” folder

Results:

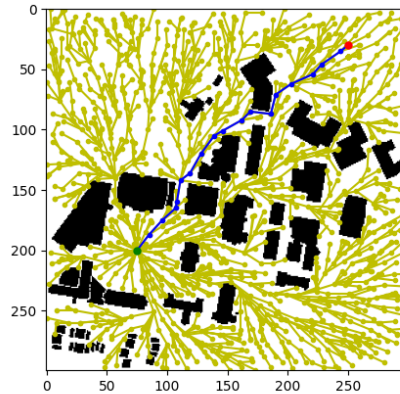
D* Implementation



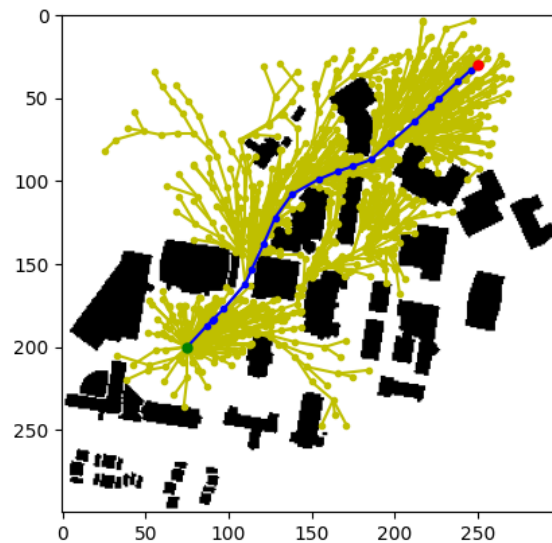
RRT vs RRT* vs Informed RRT*



RRT



RRT*



Informed RRT*

Questions and Answers:

1. Explain in your own words, how does D* replan a path by updating the cost?

Answer:

D* implements a dynamic process where it updates the obstacle field if a new obstacle is found in the path. It changes the state to RAISE if $k(G, X) < h(G, X)$ and LOWER state if $k(G, X) = h(G, X)$ and inserts the node to the open list. It also updates the cost information to the neighbors and replans a new path.

2. Why does D* can replan faster than A* or Dijkstra?

Answer:

When there is a new obstacle, the A* or Dijkstra algorithms would plan the whole path to the goal again from scratch. This is an ineffective and highly time-consuming process. D* propagates the information about a new obstacle in the path to its neighbors to replan instead of recomputing the whole path.

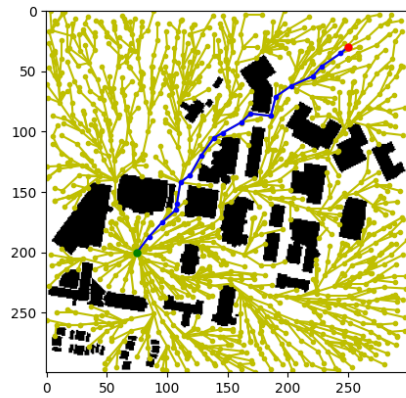
3. What are the key differences between regular RRT* and informed RRT*?

Answer:

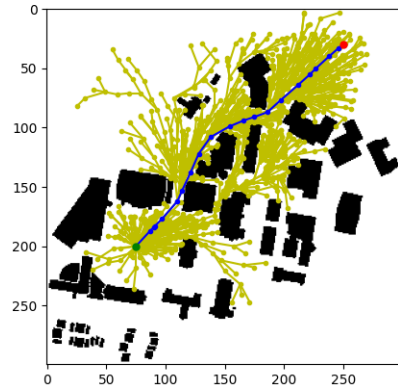
- the process used by RRT* and informed RRT* are same for finding an initial path.
- In RRT* rewiring step, we consider a random sample anywhere in the configuration space. In comparison to this, in informed RRT* we use the best path as a parameter to fit a ellipse around the start and the goal locations and find a random sample within that sphere.

4. By showing and comparing the results of RRT* and informed RRT*, what is the advantages of using the latter?

Answer:



RRT*



Informed RRT*

Informed RRT* is a more efficient process as it uses less number of samples than RRT* and still manages to give a the shortest path. The images above show that the RRT* samples points in whole C space whereas in case of informed RRT* the samples are focused between the start and goal locations using the ellipsoid to constrain the points.