Standard Search Algorithms Implementation Report

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

**Results:**

**D\* Implementation**

Chart

Description automatically generated with medium confidenceA screenshot of a game

Description automatically generated with low confidence

**RRT vs RRT\* vs Informed RRT\***

Diagram

Description automatically generated with low confidenceDiagram

Description automatically generated

RRT RRT\*

Diagram

Description automatically generated

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.

1. 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.

1. 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.

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

**Answer:**

Diagram

Description automatically generatedDiagram

Description automatically generated

**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.