Advanced Search Algorithms

By Chinmayee Prabhakar

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

Ans: D* is Dynamic A*. And as the name implies it finds the shortest path between two points in a dynamic environment.

D* tends to recalculate the path cost as it explores the graph by maintaining the current cost and the estimated cost of reaching the goal. When changes in the environment occur, D* updates the cost of the affected nodes by recalculating the path cost from those nodes to the goal. If the new cost is lower than the current cost, D* updates the current cost and re-plans the path from the affected node to the goal. This process repeats until the best path to the goal is found.

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

Ans: D* only modifies the parts of the graph that have been affected by environmental changes, whereas A* and Dijkstra must re-evaluate the entire graph from the beginning. As a result, D* examines fewer nodes and edges, which speeds up the replanning process.

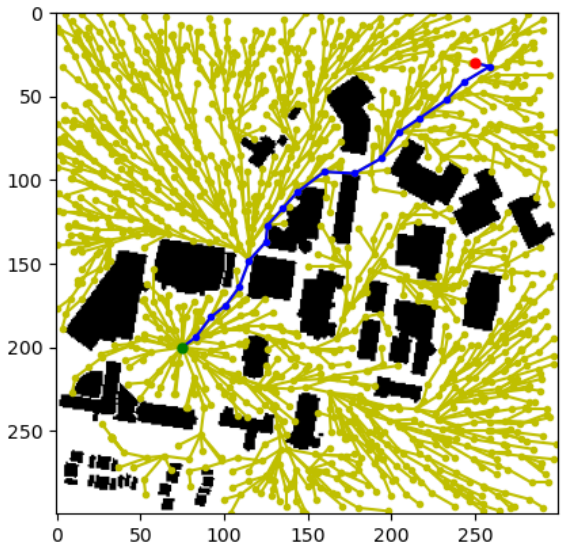
Q What is the key differences between regular RRT* and informed RRT*?

Ans: RRT* selects sample points randomly and uniformly across the configuration space, whereas Informed RRT* uses a targeted sampling approach to concentrate on areas of the space that are more likely to provide a solution.

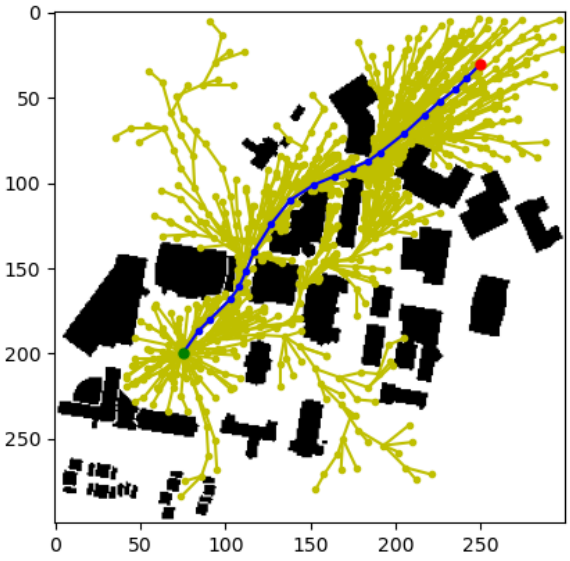
Q By showing and comparing the results of RRT* and informed RRT*, what is the advantages of using the latter?

Ans: Compared to RRT*, Informed RRT* can converge to a near-optimal solution with fewer samples and in less time. This is because Informed RRT* focuses the search on regions more likely to contain a solution. Therefore, Informed RRT* offers advantages over RRT* such that it can lead to more accurate and efficient motion planning.

RRT*

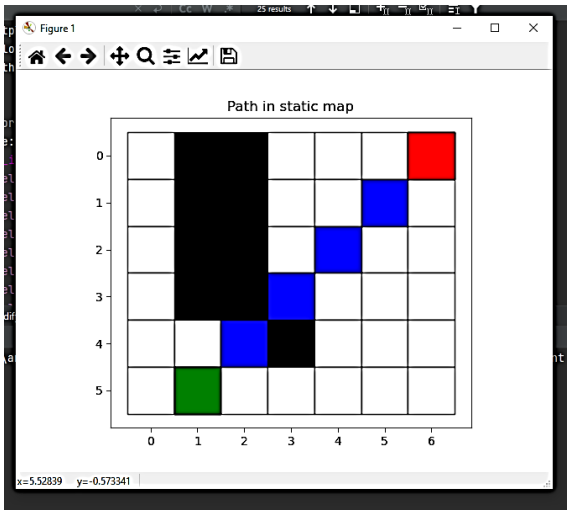


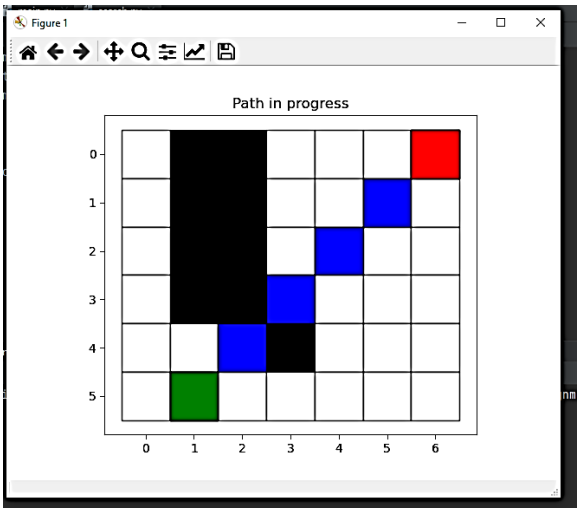
Informed RRT*



Results

D*





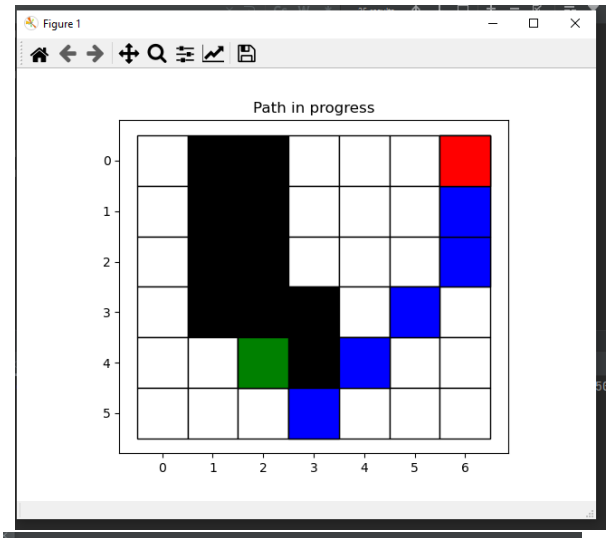


Figure 1
Path in progress

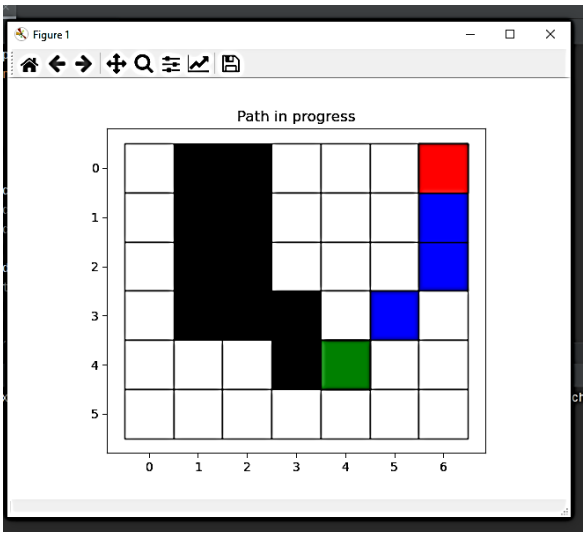
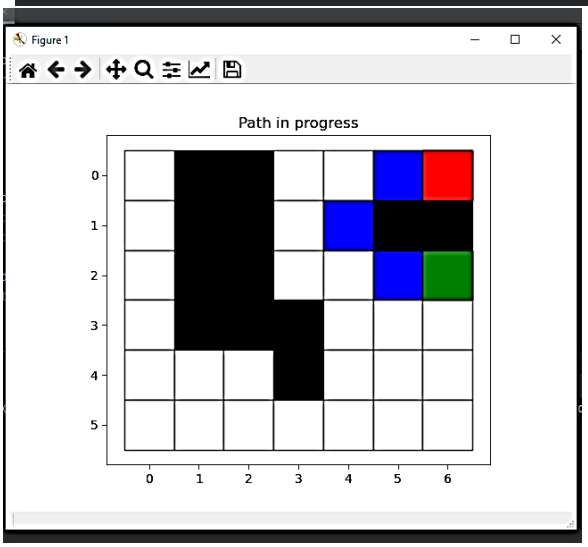


Figure 1
Path in progress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Path in progress

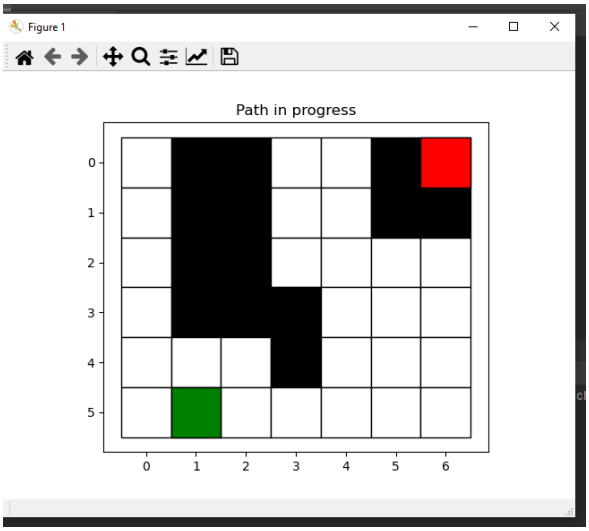
Figure 1
Path in progress


DStar › modify_cost()
Run: main
C:\Users\Admin\anaconda3\python.exe "C:/Users/Admin/Desktop/WPI/Motion Planning
No path is found
Process finished with exit code 0
Structure

*Informed RRT**