

CSC 420 - Assignment 2

Group 3

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1 Question 1

Determine the order of nodes visited in the graph with each of the following algorithms:

1. Breadth-First Search

(a) 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

2. Depth Limited Search (limit: 3)

(a) 1, 2, 4, 8, 9, 5, 10, 11, 3, 6, 12

3. Iterative Deepening Search

(a) Limit 1 \rightarrow 1, 2, 3

(b) Limit 2 \rightarrow 1, 2, 4, 5, 3, 6, 7

(c) Limit 3 \rightarrow 1, 2, 4, 8, 9, 5, 10, 11, 3, 6, 7

2 Question 2

2.1 Problem Formulation

Initial State: The Robot is at (1,1), 10 objects are available for pickup, 10 destinations are open for drop off.

Goal State: The Robot is at (1,1) and all objects are placed in a destination.

Transition: Go(row#, col#) moves the robot to the grid cell (row#, col#)

Action Cost: The amount of grid spaces needed to move from current to destination.

In this case, each state would represent the action of moving to an Object and then moving it to a Destination. The robot, in all cases, would also require a concluding action of returning to the start position.

As we generate each node, we would account for four values:

1. Total Distance Traveled
2. Distance between the Robot and the Object
3. Distance between the Object and its Destination
4. The heuristic value

The proposed heuristic value would be the sum of two values:

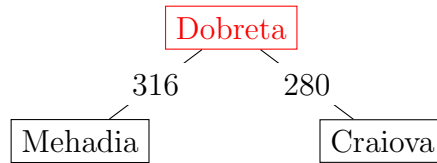
1. The sum of the distances between remaining objects and their closest open destination
2. The distance between the destination and the start position

2.2 Search Algorithm Usage

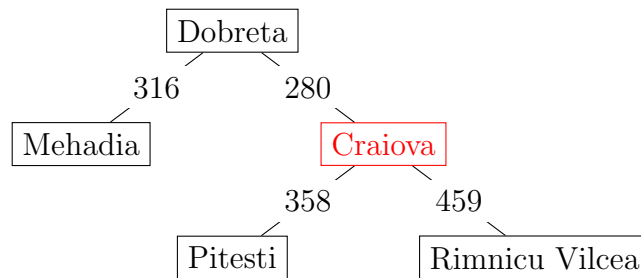
I would recommend usage of the A* algorithm in this case. If we consider that moving to an object and then moving that object to a destination to be a State, then the maximum amount of States that could be visited with n nodes would be $O((n!)^2)$.

3 Question 3

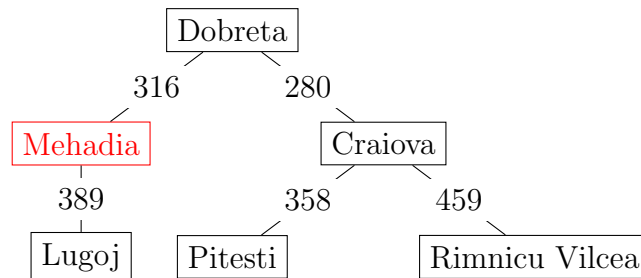
3.1 Expand Dobreta



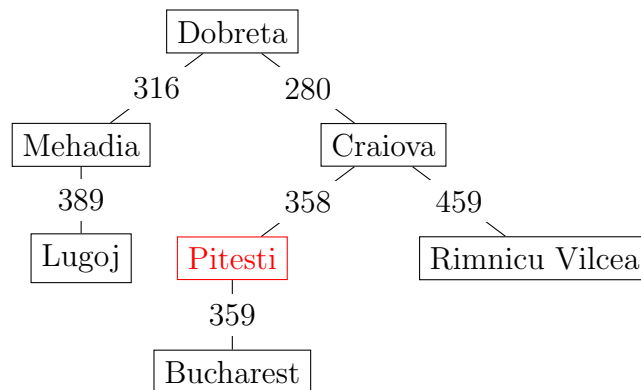
3.2 Expand Craiova



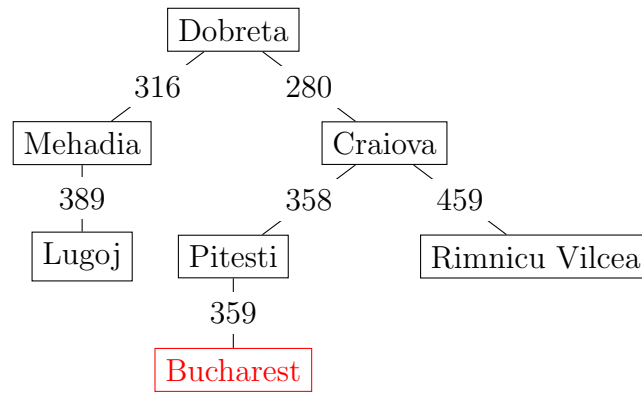
3.3 Expand Mehadia



3.4 Expand Pitesti



3.5 Expand Bucharest



Search ends here, as the expansion candidate is the goal.