الأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري

Arab Academy for Science, Technology & Maritime Transport

Report on
Search Algorithms

Name: Ramy Khaled Gaber

ID: 16105915

Breadth First Search (BFS)

Breadth First Search is a horizontal based technique uninformed search for finding a shortest path in graph. It uses a Queue data structure that follows first in first out. In BFS, you visit and finish one layer then after finishing the layer you start by visiting the second layer. It explore the neighbor nodes first, before moving to next level neighbors.

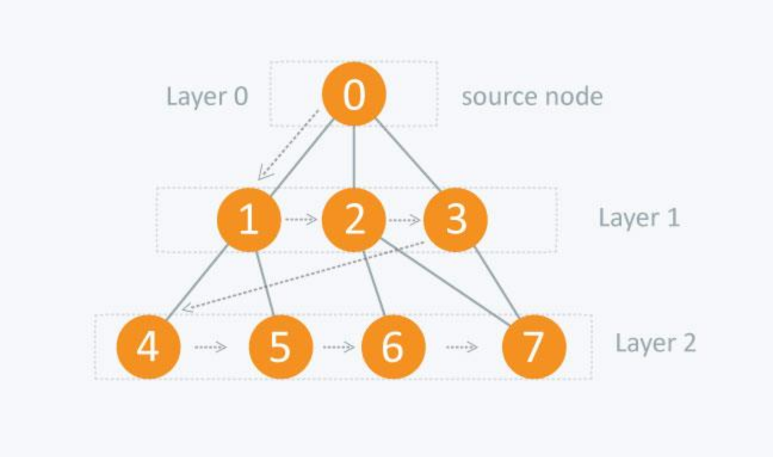

Figure 1: Breadth First Search

BFS used when you need to find the shortest path to a certain value without search all over a certain node and view its entire child's. Moreover, it is as if you need to search part of the tree for a solution.

Advantage of BFS

- Used to find the shortest path between vertices.
- Always finds optimal solutions.
- Finds the closest goal in less time.

Disadvantage of BFS

- All of the connected vertices must be stored in memory. So consumes more memory.

Depth First Search (DFS)

Depth First Search is a vertical based technique uninformed search. It uses the Stack data structure that follows last in first out. It is commonly used when you need to search the entire tree. It explore as far as possible nodes of each branch. DFS is more space-efficient than BFS, but may go to unnecessary depths.

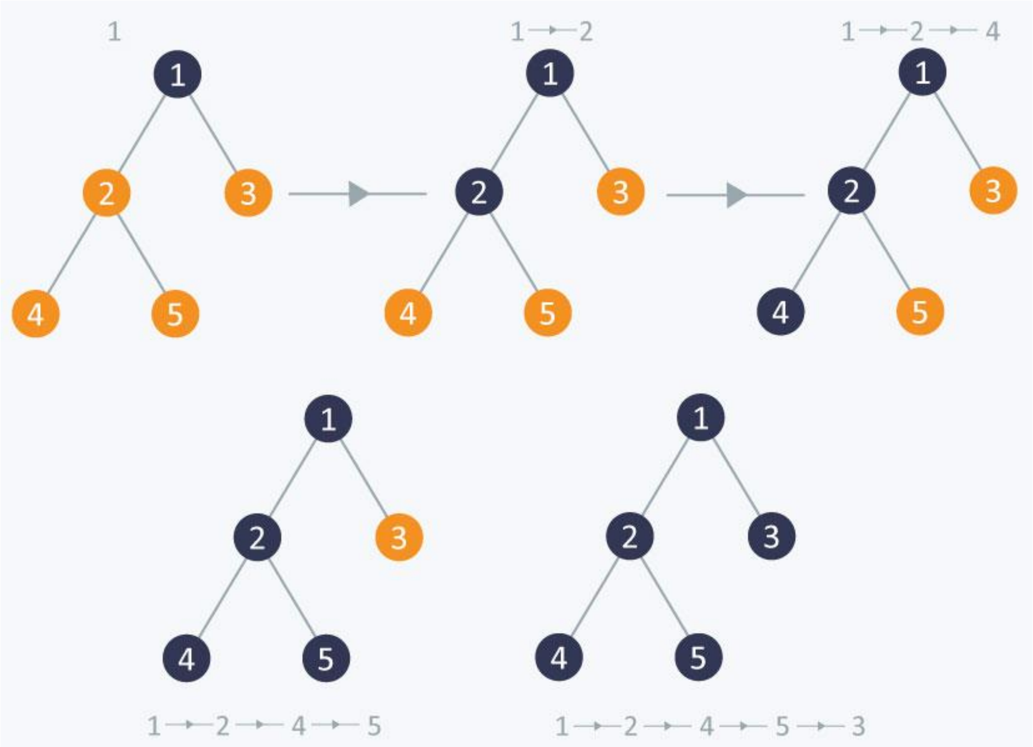

Figure 2: Depth First Search

DFS is used when the search tree is very deep and you need to restrict the search depth. Moreover, if solutions are frequent but located deep in the tree.

Advantage of DFS

- Consumes less memory
- Finds the larger distant element(from source vertex) in less time.

Disadvantage of DFS

- May not find optimal solution to the problem.
- May get trapped in searching useless path.

Best First Search

Best First Search uses the concept of a priority queue. It is an informed method by using the heuristic value in order to find the best solution. The aim is to reach the goal from the initial state via the shortest path.

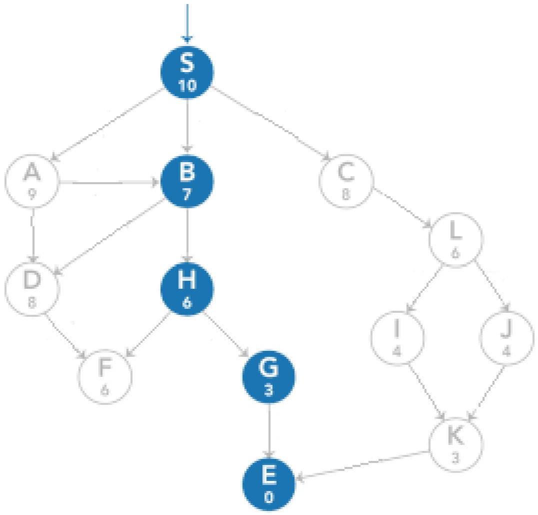

Figure 3: Best First Search

The idea of Best First Search is to use an evaluation function to decide which adjacent is most promising and then explore.

Advantage of BFS

- It is more efficient than that of BFS and DFS.
- The Best first search allows us to switch between paths by gaining the benefits of both breadth first and depth first search.

Disadvantage of BFS

- Sometimes, it covers more distance than our consideration.

A* Search

A* is an informed search algorithm meaning that it is formulated in terms of weighted graphs: starting from a specific starting node of a graph, it aims to find a path to the given goal node having the smallest cost.

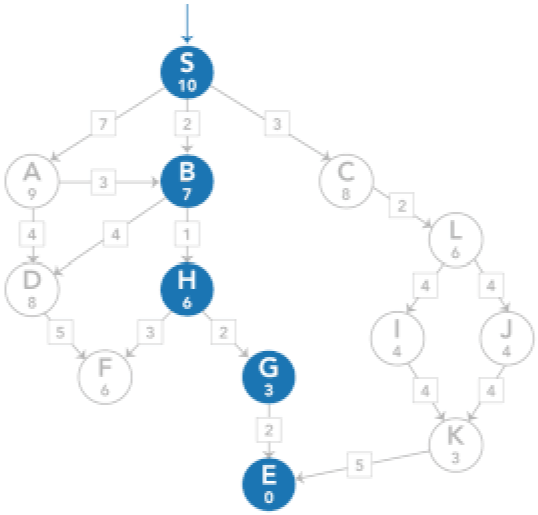

Figure 4: A Search*

In this method, we use the cost and the heuristic value to find the next optimum node.

Advantage of A* Search

- Used to solve complex problems.
- It is optimally efficient.

Disadvantage of A* Search

- It has complexity problems.
- The speed execution of A* search is highly dependent on the accuracy of the heuristic algorithm that is used to compute the heuristic value.

Uniform Cost Search

In this algorithm from the starting state we will visit the adjacent states and will choose the least costly state then we will choose the next least costly state from the all un-visited and adjacent states of the visited states, in this way we will try to reach the goal state.

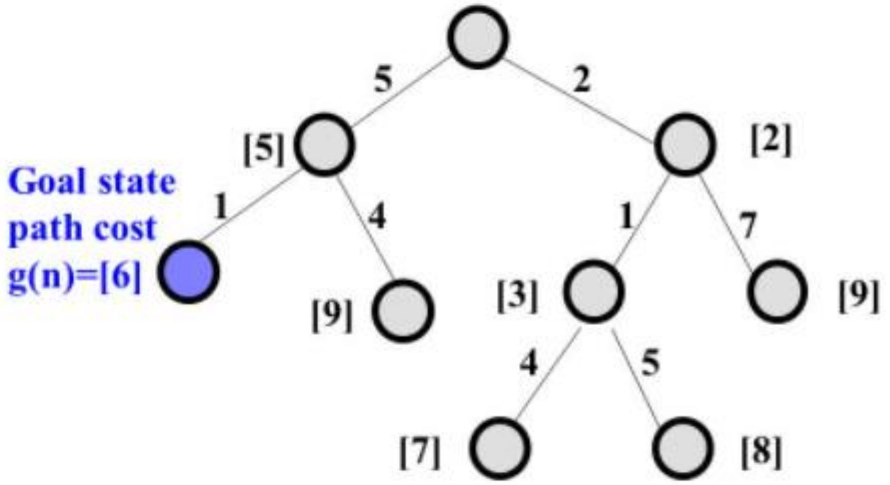

Figure 5: Uniform Cost Search

Uniform-cost search is always optimal as it only selects a path with the lowest path cost. It gives maximum priority to the lowest cumulative cost.

Advantage of Uniform Cost

- Helps to find the path with the lowest cumulative cost inside a weighted graph having a different cost associated with each of its edge from the root node to the destination node.
- Considered to be an optimal solution since at each state the least path is considered to be followed.

Disadvantage of Uniform Cost

- Storage required is exponentially large.
- It does not care about the number of steps involve in searching and only concerned about path cost. Due to which this algorithm may be stuck in an infinite loop.