

Assignment-1: Graph Searches and Implementation

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DV2618: APPLIED ARTIFICIAL INTELLIGENCE

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Title	Maze problem
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Submission/change history (latest entry on top)	
Date	Changes made
2023-09-22	Initial submission.

1 Manual implementation of BFS algorithm

When utilizing the Breadth-First Search algorithm will look for the nodes that are one away from the initial state. It keeps on continuing and searching till it reaches the final goal. If it encounters a decision point then also it will try to travel both the ways and the path it was travelling as shown in the below figure. We might also travel to some unwanted spaces but we will get an optimal path which is the shortest way to get the goal.

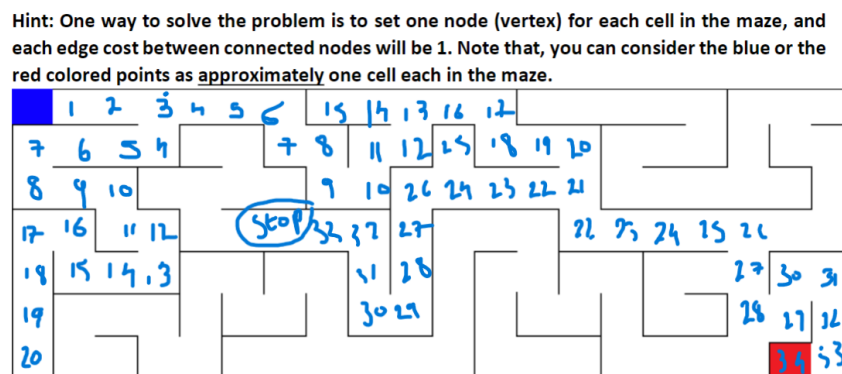


Figure 1. Maze.

Figure 1: Maze problem solved using the BFS algorithm

Assuming that for every decision point, the algorithm may choose the wrong path to reach the goal. The possible step which is generally assumed is shown in the above figure indicating the same number which it travelled to reach the goal.

2 Manual implementation of DFS algorithm

When utilizing the Depth First Search algorithm, it chooses to follow a single path until it reaches the goal. If there are multiple paths to choose from at a decision point, it randomly selects one to travel down. If it encounters further decision points while traversing the chosen path, it will again choose one path until it reaches the goal otherwise it will backtrack to the previous decision point and continue to travel the other path till it reaches the Goal.

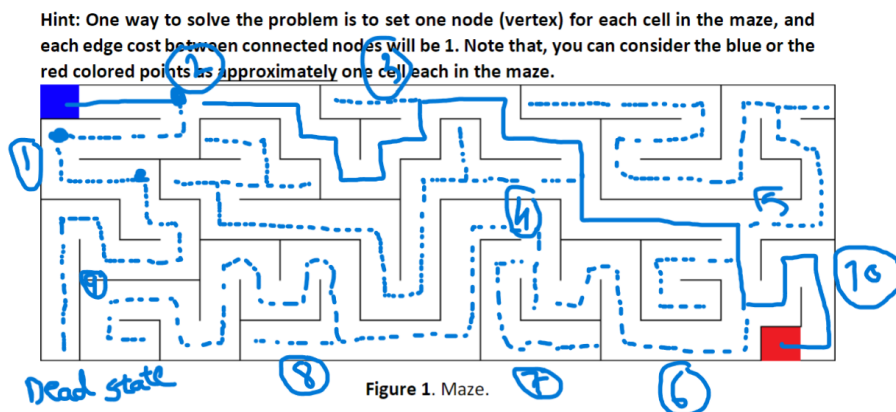


Figure 1. Maze.

Figure 2: Maze problem solved using the DFS algorithm

Assuming that for every decision point, the algorithm chooses the wrong path there is a possibility that it traversed in 10 different ways to reach the goal as shown in the above figure. The dots represent a decision point where it can move in multiple directions.

3 Explanation about the search algorithms

Below is the generalised working algorithm of the Breadth First Search and Depth First Search algorithms. The data structure used to solve this problem is Node which is a kind of data structure that stores values and can reference to another node. The Breadth First Search algorithm always expands to the shallow node whereas the Depth First Search algorithm always expands to the deepest node in the frontier. The Breadth First Search algorithm uses a queue data structure whereas the Depth First Search algorithm uses a stack data structure.

Algorithm:

- Take a frontier that contains the initial state as a starting point.
- Start with an empty explored set.
- Repeat:
 - If the frontier is empty, then there is no solution.
 - Remove a node from the frontier.
 - If the node contains a goal state then return the solution.
 - Add the node to the explored set.
 - Expand the node and add resulting nodes to the frontier if they aren't already in the frontier or the explored set.