**Lab 2: Uniformed Search in Pac-Man**

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1. **Implement the depth-first search algorithm in the depthFirstSearch function in search.py. Although DFS and BFS ignore the costs, you'll need them for later search methods**

Function Depth first search

**A screen shot of a computer program

AI-generated content may be incorrect.**

Implement

tinyMaze

**A screen shot of a computer

AI-generated content may be incorrect.**

mediumMaze

A screen shot of a computer

AI-generated content may be incorrect.

bigMaze

A screen shot of a computer

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1. **Implement the breadth-first search algorithm in the breadthFirstSearch function in search.py. Use the same algorithm as shown in the above pseudocode. Test your code the same way you did for depth-first search**

Function Breadth first search

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Implement

**t**tinyMaze

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1. **Implement the uniform-cost search algorithm in the uniformCostSearch function in search.py. Does UCS find a least cost solution? How many nodes are expanded?**

Yes, Uniform-Cost Search (UCS) always finds the least-cost solution when all step costs are positive. This is because it expands the lowest-cost node first, ensuring that once a node is expanded, the shortest path to it has been found.

Function Uniformed cost search

**A computer screen shot of a program code

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Implement

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1. **Compare table**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Depth-First Search** | | | **Breadth-First Search** | | | **Uniform-Cost Search** | | |
| **Maze** | Nodes explored | Solution length | Is it optional | Nodes explored | Solution length | Is it optional | Nodes explore | Solution length | Is it optional |
| **Tiny** | 15 | ~10 | No | 15 | 9 | Yes | ~15 | 9 | Yes |
| **Medium** | ~146 | 130 | No | ~269 | 68 | Yes | ~269 | 68 | Yes |
| **Big** | ~390 | 210 | No | ~620 | 210 | Yes | ~620 | 210 | Yes |

* **DFS:** Expands fewer nodes quickly in some cases, but can wander around and produce a suboptimal (longer) path
* **BFS:** Guarantees the shortest path in number of actions for uniform step costs, typically expands more nodes than DFS on these mazes but yields an optimal solution
* **UCS:** Identical path length to BFS under uniform cost = 1, but more general (handles varying step costs). It also expands about the same or sometimes slightly more nodes than BFS