Comparison between DFS and BFS

Dan Wang (daw1230)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | DFS | | BFS | |
| Length of path | No. of nodes expanded | Length of path | No. of nodes expanded |
| Missionaries and Cannibals | 9 | 10 | 7 | 10 |
| Farmer, Fox, Chicken, and Grain | 7 | 8 | 7 | 10 |
| 4-Disk Towers of Hanoi | 40 | 40 | 18 | 74 |

**Path found from start to goal**

(i) Missionaries and Cannibals

**DFS**

[[3, 0], [3, 0]]

[[2, 1], [2, 1]]

[[3, 0], [2, 1]]

[[0, 3], [2, 1]]

[[2, 1], [2, 1]]

[[1, 2], [1, 2]]

[[3, 0], [1, 2]]

[[0, 3], [1, 2]]

[[1, 2], [1, 2]]

[[0, 3], [0, 3]]

**BFS**

[[3, 0], [3, 0]]

[[2, 1], [2, 1]]

[[3, 0], [2, 1]]

[[1, 2], [1, 2]]

[[3, 0], [1, 2]]

[[0, 3], [1, 2]]

[[1, 2], [1, 2]]

[[0, 3], [0, 3]]

(ii) Farmer, Fox, Chicken, and Grain

**DFS**

[[1, 0], [1, 0], [1, 0], [1, 0]]

[[0, 1], [1, 0], [0, 1], [1, 0]]

[[1, 0], [1, 0], [0, 1], [1, 0]]

[[0, 1], [0, 1], [0, 1], [1, 0]]

[[1, 0], [0, 1], [1, 0], [1, 0]]

[[0, 1], [0, 1], [1, 0], [0, 1]]

[[1, 0], [0, 1], [1, 0], [0, 1]]

[[0, 1], [0, 1], [0, 1], [0, 1]]

**BFS**

[[1, 0], [1, 0], [1, 0], [1, 0]]

[[0, 1], [1, 0], [0, 1], [1, 0]]

[[1, 0], [1, 0], [0, 1], [1, 0]]

[[0, 1], [1, 0], [0, 1], [0, 1]]

[[1, 0], [1, 0], [1, 0], [0, 1]]

[[0, 1], [0, 1], [1, 0], [0, 1]]

[[1, 0], [0, 1], [1, 0], [0, 1]]

[[0, 1], [0, 1], [0, 1], [0, 1]]

(iii) 4-Disk Towers of Hanoi

**DFS**

[[4, 3, 2, 1] ,[] ,[]]

[[4, 3, 2] ,[1] ,[]]

[[4, 3] ,[1] ,[2]]

[[4, 3, 1] ,[] ,[2]]

[[4, 3] ,[] ,[2, 1]]

[[4] ,[3] ,[2, 1]]

[[4, 1] ,[3] ,[2]]

[[4] ,[3, 1] ,[2]]

[[4, 2] ,[3, 1] ,[]]

[[4, 2, 1] ,[3] ,[]]

[[4, 2] ,[3] ,[1]]

[[4] ,[3, 2] ,[1]]

[[4, 1] ,[3, 2] ,[]]

[[4] ,[3, 2, 1] ,[]]

[[] ,[3, 2, 1] ,[4]]

[[1] ,[3, 2] ,[4]]

[[] ,[3, 2] ,[4, 1]]

[[2] ,[3] ,[4, 1]]

[[2, 1] ,[3] ,[4]]

[[2] ,[3, 1] ,[4]]

[[] ,[3, 1] ,[4, 2]]

[[1] ,[3] ,[4, 2]]

[[] ,[3] ,[4, 2, 1]]

[[3] ,[] ,[4, 2, 1]]

[[3, 1] ,[] ,[4, 2]]

[[3] ,[1] ,[4, 2]]

[[3, 2] ,[1] ,[4]]

[[3, 2, 1] ,[] ,[4]]

[[3, 2] ,[] ,[4, 1]]

[[3] ,[2] ,[4, 1]]

[[3, 1] ,[2] ,[4]]

[[3] ,[2, 1] ,[4]]

[[] ,[2, 1] ,[4, 3]]

[[1] ,[2] ,[4, 3]]

[[] ,[2] ,[4, 3, 1]]

[[2] ,[] ,[4, 3, 1]]

[[2, 1] ,[] ,[4, 3]]

[[2] ,[1] ,[4, 3]]

[[] ,[1] ,[4, 3, 2]]

[[1] ,[] ,[4, 3, 2]]

[[] ,[] ,[4, 3, 2, 1]]

**BFS**

[[4, 3, 2, 1] ,[] ,[]]

[[4, 3, 2] ,[1] ,[]]

[[4, 3] ,[1] ,[2]]

[[4, 3, 1] ,[] ,[2]]

[[4, 3] ,[] ,[2, 1]]

[[4] ,[3] ,[2, 1]]

[[4, 1] ,[3] ,[2]]

[[4, 1] ,[3, 2] ,[]]

[[4] ,[3, 2, 1] ,[]]

[[] ,[3, 2, 1] ,[4]]

[[1] ,[3, 2] ,[4]]

[[] ,[3, 2] ,[4, 1]]

[[2] ,[3] ,[4, 1]]

[[2, 1] ,[3] ,[4]]

[[2, 1] ,[] ,[4, 3]]

[[2] ,[1] ,[4, 3]]

[[] ,[1] ,[4, 3, 2]]

[[1] ,[] ,[4, 3, 2]]

[[] ,[] ,[4, 3, 2, 1]]