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Assignment 2: Comparing DFS and BFS on puzzles

**Table 1: Efficiency Overall**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Missionaries and Cannibals | Farmer, Fox, Chicken, and Grain | 4-Disk Towers of Hanoi |
| Iterative DFS | Length of solution path: **9 edges**  **10 states** expanded | Length of solution path found: **7 edges**  **9 states** expanded. | Length of solution path found: **40 edges**  **40 states** expanded. |
| Iterative BFS | Length of solution path found: **7 edges**  **10 states** expanded. | Length of solution path found: **7 edges**  **9 states** expanded. | Length of solution path found: **18 edges**  **70 states** expanded. |

**Table 2: Solution Paths**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Missionaries and Cannibals | Farmer, Fox, Chicken, and Grain | 4-Disk Towers of Hanoi |  |
| Iterative DFS | M on left:3  C on left:3  M on right:0  C on right:0  boat is on the left.  M on left:2  C on left:2  M on right:1  C on right:1  boat is on the right.  M on left:3  C on left:2  M on right:0  C on right:1  boat is on the left.  **… (continued)**  M on left:1  C on left:1  M on right:2  C on right:2  boat is on the left.  M on left:0  C on left:0  M on right:3  C on right:3  boat is on the right. | Left of River: Farmer: 1 fox: 1 Chicken: 1 Grain: 1  Right of River: Farmer: 0 fox: 0 Chicken: 0 Grain: 0  The boat is on the left.  Left of River: Farmer: 0 fox: 1 Chicken: 0 Grain: 1  Right of River: Farmer: 1 fox: 0 Chicken: 1 Grain: 0  The boat is on the right.  Left of River: Farmer: 1 fox: 1 Chicken: 0 Grain: 1  Right of River: Farmer: 0 fox: 0 Chicken: 1 Grain: 0  The boat is on the left.  Left of River: Farmer: 0 fox: 1 Chicken: 0 Grain: 0  Right of River: Farmer: 1 fox: 0 Chicken: 1 Grain: 1  The boat is on the right.  **… (continued)**  Left of River: Farmer: 1 fox: 0 Chicken: 1 Grain: 0  Right of River: Farmer: 0 fox: 1 Chicken: 0 Grain: 1  The boat is on the left.  Left of River: Farmer: 0 fox: 0 Chicken: 0 Grain: 0  Right of River: Farmer: 1 fox: 1 Chicken: 1 Grain: 1  The boat is on the right. | [[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] ,[]]  **…**  [[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]] |  |
| Iterative BFS | M on left:3  C on left:3  M on right:0  C on right:0  boat is on the left.  M on left:2  C on left:2  M on right:1  C on right:1  boat is on the right.  M on left:3  C on left:2  M on right:0  C on right:1  boat is on the left.  M on left:1  C on left:1  M on right:2  C on right:2  boat is on the right.  M on left:3  C on left:1  M on right:0  C on right:2  boat is on the left.  M on left:0  C on left:1  M on right:3  C on right:2  boat is on the right.  M on left:1  C on left:1  M on right:2  C on right:2  boat is on the left.  M on left:0  C on left:0  M on right:3  C on right:3  boat is on the right. | Left of River: Farmer: 1 fox: 1 Chicken: 1 Grain: 1  Right of River: Farmer: 0 fox: 0 Chicken: 0 Grain: 0  The boat is on the left.  Left of River: Farmer: 0 fox: 1 Chicken: 0 Grain: 1  Right of River: Farmer: 1 fox: 0 Chicken: 1 Grain: 0  The boat is on the right.  Left of River: Farmer: 1 fox: 1 Chicken: 0 Grain: 1  Right of River: Farmer: 0 fox: 0 Chicken: 1 Grain: 0  The boat is on the left.  Left of River: Farmer: 0 fox: 1 Chicken: 0 Grain: 0  Right of River: Farmer: 1 fox: 0 Chicken: 1 Grain: 1  The boat is on the right.  Left of River: Farmer: 1 fox: 1 Chicken: 1 Grain: 0  Right of River: Farmer: 0 fox: 0 Chicken: 0 Grain: 1  The boat is on the left.  Left of River: Farmer: 0 fox: 0 Chicken: 1 Grain: 0  Right of River: Farmer: 1 fox: 1 Chicken: 0 Grain: 1  The boat is on the right.  Left of River: Farmer: 1 fox: 0 Chicken: 1 Grain: 0  Right of River: Farmer: 0 fox: 1 Chicken: 0 Grain: 1  The boat is on the left.  Left of River: Farmer: 0 fox: 0 Chicken: 0 Grain: 0  Right of River: Farmer: 1 fox: 1 Chicken: 1 Grain: 1  The boat is on the right. | [[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]] |  |