Artificial Intelligence Report

I have taken the following Node Pairs for the analysis of all four Algorithms DFS, BFS, GBFS and A-Star.

These are the 5 pairs of node used for analysis;

1. ('Sitamarhi', 'Lucknow')
2. ('Sitamarhi', 'Delhi')
3. ('Lucknow', 'Mirzapur')
4. ('Kota', 'Patna')
5. ('Gaya', 'Calicut')

Note: Time is changing every time I run the algorithm. That's why I Have not included a time column.

Nodes	Algorithms	Memory (in byte)	Path length	Remarks
Sitamarhi To Lucknow	DFS	112	7	BFS is taking more space than the other three algorithms.
	BFS	288	29	
	GBFS	88	3	
	A*	88	3	

Nodes	Algorithms	Memory (in byte)	Path length	Remarks
Sitamarhi To Delhi	DFS	288	29	DFS is taking more space than the other three algorithms.
	BFS	128	9	
	GBFS	72	2	
	A*	72	2	

Nodes	Algorithms	Memory (in byte)	Path length	Remarks
Lucknow To Mirzapur	DFS	376	40	DFS is taking more space than the other three algorithms.
	BFS	288	29	
	GBFS	88	3	
	A*	88	3	

Nodes	Algorithms	Memory (in byte)	Path length	Remarks
Kota To Patna	DFS	160	13	DFS is taking more space than the other three algorithms.
	BFS	152	12	
	GBFS	72	2	
	A*	72	2	

Nodes	Algorithms	Memory (in byte)	Path length	Remarks
Gaya To Calicut	DFS	232	22	DFS is taking more space than the other three algorithms.
	BFS	128	9	
	GBFS	88	2	
	A*	88	2	

These are the Pros and Cons of All the four Algorithms:

1. **DFS (Depth-First Search):**

- **Pros:**
- **DFS finds paths quickly in some cases, as it explores deeply before backtracking.**

- **Cons:**
- **DFS may not find the shortest path, as it tends to follow one branch until it reaches the end.**

2. **BFS (Breadth-First Search):**

- **Pros:**
- **BFS guarantees the shortest path in an unweighted graph but It explores all possible paths uniformly.**

- **Cons:**
- **BFS may consume more memory, especially in large graphs, as it stores all potential paths.**
- **It can be slower in some cases, as it explores many paths.**

3. **Greedy Best-First Search:**

- **Pros:**
- **Greedy Best-First Search is efficient and often finds a solution quickly.**

- **Cons:**
- **It may not find the optimal solution, but it may reach to dead end.**

4. **A-Star Algorithm:**

- **Pros:**
- **It combines the benefits of BFS and Greedy Best-First Search by using heuristics and considering the actual cost.It guarantees the shortest path in both unweighted and weighted graphs when using consistent heuristics.**

- **Cons:**
- **A* can be slower than BFS and DFS due to the extra computation needed for heuristics. The effectiveness of A* heavily depends on the quality of the heuristics used.**

Conclusion:

1. **DFS is the least efficient in terms of path length.**
2. **BFS guarantees the shortest path in unweighted graphs but can be memory-intensive.**
3. **Greedy Best-First Search provides shorter paths in some cases but in my case it doesn't reach a dead end.**
4. **A-Star has given the shortest and best possible path available.**

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Thank You