National University of Computer and Emerging Sciences

A* vs non-A* search

Assignment 01

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1. Documentation

Implementation Details:

A* Algorithm:

It considers both the actual cost to reach a certain point and the estimated cost to reach the goal.
Utilizes a heuristic function to guide the snake towards the target while avoiding obstacles.

Greedy Best First Search (GBFS):

Using the GBFS algorithm, it prioritizes nodes based solely on the heuristic estimate to the goal.
Guides the snake towards the goal without considering the entire path, potentially undermine optimality for speed.

BFS Algorithm:

- Explores nodes level by level, expanding outward from the starting point.
- Does not consider the actual cost, only the shortest path in terms of number of steps.

Results:

A* Algorithm:

Achieved the shortest path length in most scenarios.
Demonstrated efficient navigation through complex maze-like environments with walls and turns.
Outperformed other algorithms in terms of both path length and state search efficiency.

Greedy Best First Search (GBFS):

Generally faster than A* algorithm in terms of computation.
Often failed to find the shortest path due to its greedy nature, resulting in suboptimal paths.
Occasionally led the snake into dead ends or loops, especially in complex maze structures.

BFS Algorithm:

BFS successfully finds the shortest path in simple and moderately complex maze scenarios.
Demonstrates slower performance compared to A* and GBFS algorithms, especially in larger mazes.
Faces challenges in navigating through intricate maze structures with multiple branching paths and dead ends.
Generally provides reliable results but may encounter difficulties or inefficiencies in highly convoluted mazes.