Spider Game

Hashemite University

Artificial Intelligence project

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This project is a game in Python using pygame library where a spider navigates a grid to chase an ant, and we reach the goal when the spider eats the ant, so the spider wins or when the ant makes a step off the board so the ant wins. The spider is controlled by different Graph theory algorithms, algorithms are BFS, DFS, A*, and 2 different Heuristic function and a third one which takes the average of the first 2 Heuristics.

- State-space

The spider is chasing the ant by the shortest path, so the state space is the path from one location to another, where the states are traveling between neighboring locations of the spider and the ant after, the spider can move to 8 locations, it move in L letter, the start state is the spider's location when the game begins, and the goal state is the ant's location when the game ends.
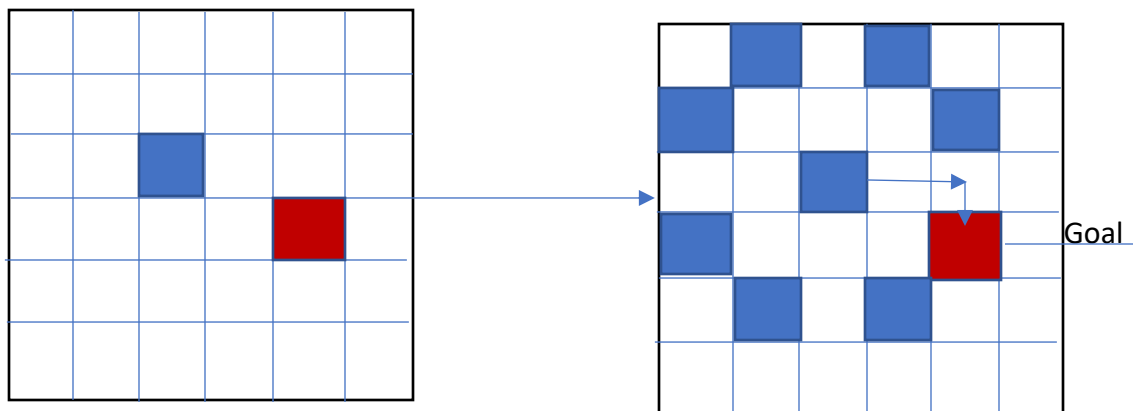
- Heuristic-Functions

- the first heuristic function first returns the distance when the ant around the spider in at most 2 cells in the x-axis and 2 cells in the y-axis manually by returning an exact distance, when the ant is further away from that the function calculates straight line distance from the spider to the ant using $d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ equation, the function has proven that it is efficient in calculating the shortest path between the spider and the ant.

- the second heuristic function first calculates the distance when the ant around the spider in at most 2 cells in the x-axis and 2 cells in the y-axis manually by returning an exact distance, when the ant is further away the function check the difference between the x-axis and y-axis of the spider and ant, if they are both even numbers in the first case or if they are both odd numbers in the second case, it will return 2 plus the maximum between the difference of the x-axis or y-axis, else if they are both even numbers in the first case or if they are both odd numbers in the second case, it will return 3 plus the maximum between the difference of the x-axis or y-axis ,the function has proven that it is efficient in calculating the shortest path between the spider and the ant.

The 2 heuristic functions have proven that they are efficient in calculating the shortest path between the spider and the ant, but the first function is better in general.