**AI PROJECT REPORT**

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**-Project Report: Snake Game with-**

**-Pathfinding Algorithms-**

* Introduction

The Snake Game with Pathfinding Algorithms is a Python-based game that combines classic snake gameplay with pathfinding algorithms to make the game more challenging and interesting. The game features a snake that needs to navigate through obstacles and collect food items. Four different pathfinding algorithms, namely A\* search, Depth-First Search (DFS), Breadth-First Search (BFS), and Greedy Best-First Search (GBFS), are implemented to control the snake's movement. The objective of this project is to provide an engaging and educational gaming experience that allows players to observe how different pathfinding algorithms perform in guiding the snake to its target.

* Project Components

1. **Game Environment**

- Grid Layout: The game takes place on a grid layout with a customizable size, providing a clear visual representation of the game area.

- Obstacles: The game includes obstacles that the snake must navigate around. These obstacles are positioned in a predetermined pattern to create challenging gameplay.

- Food Items: The snake must eat four different food items to win the game. The food items are placed randomly on the grid.

- Boundary: The grid layout has boundaries to prevent the snake from leaving the game area.

**2. Pathfinding Algorithms**

=>Four pathfinding algorithms are implemented for controlling the snake's movement:

- A\* Search: A\* is an informed search algorithm that uses a combination of the cost to reach a node and a heuristic that estimates the cost to reach the goal. It guides the snake towards the food item using the Manhattan distance as a heuristic.

- Depth-First Search (DFS): DFS is an uninformed search algorithm that explores the deepest branch of the search tree first. It is used for controlling the snake's movement towards the second food item.

- Breadth-First Search (BFS): BFS is another uninformed search algorithm that explores all neighbor nodes before moving on to their children. It is used for controlling the snake's movement towards the third food item.

- Greedy Best-First Search (GBFS): GBFS is an informed search algorithm that only considers the heuristic to estimate the cost to reach the goal. It guides the snake towards the fourth food item using the Manhattan distance as a heuristic.

**3. Game Logic**

- Snake Movement: The snake's movement is determined by the selected pathfinding algorithm. It moves one step at a time and tries to reach the target food item.

- Collision Detection: The game checks for collisions, including collisions with obstacles, boundary, and itself. If a collision occurs, the game ends.

- Food Collection: When the snake reaches a food item, the item is collected, and a new food item is generated in a random position. The player must collect all four food items to win the game.

**4. User Interface**

- Game Information Display: The game displays information about the currently selected pathfinding algorithm, Manhattan distance to the target food, and the total path length as the snake moves.

- Game Over Message: When the game ends, a "Game Over" message is displayed, indicating whether the player has won or lost.

* Implementation

The project is implemented in Python using the Pygame library for creating the game environment and graphics. The main components of the project include a grid layout, pathfinding algorithms, game logic, and user interface elements.

* Usage

To play the game, you need to run the Python script in a compatible environment. The game will start, and the snake will begin to move automatically based on the selected pathfinding algorithm. The player's goal is to collect all four food items to win the game.

You can change the starting algorithm and observe the snake's behavior as it progresses through the game. The game keeps track of various statistics, including the Manhattan distance and total path length, which are displayed in the user interface.

* Conclusion

The Snake Game with Pathfinding Algorithms is an engaging project that combines classic gameplay with educational elements. Players can observe and compare the performance of different pathfinding algorithms in guiding the snake to its target. The project provides an opportunity to learn about pathfinding algorithms while enjoying a fun gaming experience.

This report outlines the key components of the project and how to use it. It demonstrates the integration of pathfinding algorithms into a classic game, making it an ideal choice for educational purposes and entertainment.