Artificial Intelligence

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Snake AI Game

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Introduction

This project presents an intelligent version of the classic Snake game using Artificial Intelligence techniques. The main focus is comparing BFS and A* search algorithms to determine which one is more efficient in finding the shortest path to food.

Project Goal

The goal is to transform the traditional Snake game into an educational platform that demonstrates how AI pathfinding algorithms work in real time.

Algorithms Used

- BFS (Breadth-First Search): Guarantees the shortest path but expands many nodes, which increases computational cost.
- A* Algorithm: Uses a heuristic (Manhattan distance) to guide the search, resulting in fewer expanded nodes while still finding the shortest path.

Implementation

- The game is developed using Python and Pygame.
- The snake's body is treated as obstacles.
- Movement cost is uniform in all directions (up, down, left, right).
- A dual-board system is used to compare BFS and A* simultaneously.

Results

- Both algorithms successfully find the shortest path.
- A* is more efficient, expanding significantly fewer nodes than BFS.
- This proves that heuristic-guided search reduces computational load.

Conclusion

The project confirms that A* provides a better balance between path quality and efficiency compared to BFS. Future improvements may include implementing longest-path strategies to avoid deadlock situations when the snake grows longer.