National University of Computer & Emerging Sciences
Karachi Campus

Snake Game Using AI Searching Algorithms

Project Proposal
Artificial Intelligence [AI]
Section: CS-6E

Group Members:
21K-4503 Muhammad Tahir
21K-3279 Insha Javed
21K-4606 Sabika Shameel

Project Proposal

1. Introduction

This project proposes an AI-powered Snake game developed using Python. The system that We will develop aims to transform the classic Snake game into an intelligent game by incorporating various AI search algorithms. These algorithms include BFS, DFS, A-Star, and Genetic Algorithm, all of which will be used to determine the most efficient path for the snake to consume fruit and grow.

2. Existing System

Currently, Snake games typically employ simplistic algorithms for snake movement, often lacking sophisticated decision-making capabilities. While some implementations may incorporate basic pathfinding techniques, they often do not utilize advanced AI algorithms to optimize gameplay. Also, the existing systems only use a single AI algorithm, and they often lack an interface that allows players to compare the performance of different AI algorithms in real-time.

3. Problem Statement

The main problem with existing systems is their limited use of AI algorithms. Furthermore, they fail to provide a comprehensive comparison of these algorithms' performances, which could provide valuable insights into their respective strengths and weaknesses. In addition, there is a need to develop a snake game that can interactively display the decision-making process of the AI algorithms during gameplay.

4. Proposed Solution

a. Develop the Snake game using Pygame library in Python.
b. Implement modules for BFS, DFS, A*, and a Genetic Algorithm to control the snake's movement.
c. Each algorithm will have a distinct approach:
    - BFS will explore all possible paths systematically, ensuring no fruit is missed.
    - DFS will prioritize depth, potentially finding fruit faster but risking dead ends.
    - A* will balance exploration and goal-directed movement using a heuristic function (e.g., distance to fruit).
    - The Genetic Algorithm will evolve a population of "snakes" with different movement strategies, selecting the most successful ones for reproduction.
d. Users can choose the search algorithm to control the snake and observe its performance.

5. Salient Features

- Integration of multiple AI search algorithms, including BFS, DFS, A-Star, and Genetic Algorithm.
- An interactive game interface that illustrates the decision-making process of the AI algorithms.
- A performance comparison feature that allows players to analyze and compare the effectiveness of each AI algorithm.

6. Tools & Technologies

- Programming Language: Python
- Framework: Pygame
- Additional Libraries: Numpy (for array manipulation), Pickle (for data serialization)
- Operating System: Compatible with Linux, Windows, and macOS.