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Project 2: The Multi-Agent Pac-Man

Question 1: Reflex Agent

Results: Average Score: 1240.0

Scores: 1233.0, 1252.0, 1247.0, 1247.0, 1201.0, 1250.0, 1260.0, 1226.0, 1252.0, 1232.0

Win Rate: 10/10 (1.00)

Record: Win, Win, Win, Win, Win, Win, Win, Win, Win, Win

Running time: 4 seconds

Analysis: Reflex agent uses state evaluation function to choose an action at each choice by examining its alternative.

Question 2: Minimax

Results: Pacman died! Score: 84

Average Score: 84.0

Scores: 84.0

Win Rate: 0/1 (0.00)

Record: Loss

*** Finished running MinimaxAgent on smallClassic after 2 seconds.

*** Won 0 out of 1 games. Average score: 84.000000 ***

*** PASS: test_cases\q2\8-pacman-game.test

Running time: 3 seconds

Nodes Expanded: 11658

Analysis: Minimax uses game theory and decision making to find the optimal move for a player. It is widely used in two player turn based game. In Minimax, two players are called as Minimizer and Maximizer. Minimizer tries to minimize the score and maximizer tries to maximize the score. Every state has some value associated with it. If Minimizer has upper hand then value tends to be negative and if maximizer has upper hand then value tends to be positive.

Question 3: Alpha-Beta Pruning

Results: Pacman died! Score: 84

Average Score: 84.0

Scores: 84.0

Win Rate: 0/1 (0.00)

Record: Loss

*** Finished running AlphaBetaAgent on smallClassic after 1 seconds.

*** Won 0 out of 1 games. Average score: 84.000000 ***

*** PASS: test_cases\q3\8-pacman-game.test

Running time: 2 seconds

Nodes Expanded: 9714

Analysis: It is an optimized version of Minimax algorithm where time taken and states explored reduce drastically when compared to Minimax. It cuts off branches in the tree because a better solution exists.

Alpha is best value for Maximizer and Beta is best value for Minimizer.

Nodes expanded for alpha beta pruning is less compared to minimax. Alpha beta is better.

Question 4: Expectimax

Results: Pacman died! Score: 84

Average Score: 84.0

Scores: 84.0

Win Rate: 0/1 (0.00)

Record: Loss

*** Finished running ExpectimaxAgent on smallClassic after 2 seconds.

*** Won 0 out of 1 games. Average score: 84.000000 ***

*** PASS: test_cases\q4\7-pacman-game.test

Running time: 2 seconds

Analysis: It is a specialized version of Minimax algorithm where outcome is dependent on state and the chance of an event. In this chance nodes are interleaved with max nodes.