PROJECT 2

Course: CSE 537

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Multi-Agent Pacman

Question 1 (15 points): Reflex Agent

Commands:
Win Scenario
python pacman.py -p ReflexAgent -l testClassic

No. of nodes expanded 103
Pacman emerges victorious! Score: 560
Average Score: 560.0
Scores: 560.0
Win Rate: 1/1 (1.00)

Win Scenario
python pacman.py --frameTime 0 -p ReflexAgent -k 1

No. of nodes expanded 737
Pacman emerges victorious! Score: 1296
Average Score: 1296.0
Scores: 1296.0
Win Rate: 1/1 (1.00)
Record: Win

Loss Scenario
python pacman.py --frameTime 0 -p ReflexAgent -k 2

No. of nodes expanded 392
Pacman died! Score: -225
Average Score: -225.0
Scores: -225.0
Win Rate: 0/1 (0.00)

Record: Loss

Question 2 (25 points): Minimax

Commands:

Win Scenario
python pacman.py -p MinimaxAgent -l minimaxClassic -a depth=4

No. of nodes expanded 2970
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p MinimaxAgent -l trappedClassic -a depth=1

No. of nodes expanded 75
Pacman emerges victorious! Score: 531
Average Score: 531.0
Scores: 531.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p MinimaxAgent -l trappedClassic -a depth=2

No. of nodes expanded 121
Pacman emerges victorious! Score: 532
Average Score: 532.0
Scores: 532.0
Win Rate: 1/1 (1.00)
Record: Win

Loss Scenario
python pacman.py -p MinimaxAgent -l trappedClassic -a depth=3

No. of nodes expanded 58
Pacman died! Score: -501
Average Score: -501.0

Scores: -501.0
Win Rate: 0/1 (0.00)
Record: Loss

Here , Pacman rushes to the closest ghost as its death is unavoidable in this case, so to avoid cost of penalty, it dies .

Question 3 (25 points): Alpha-Beta Pruning

On minimaxClassic:

Depth 1:
Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=1 -l minimaxClassic
No. of nodes expanded 141
Pacman died! Score: -499
Average Score: -499.0
Scores: -499.0
Win Rate: 0/1 (0.00)
Record: Loss

Win Scenario
python pacman.py -p AlphaBetaAgent -a depth=1 -l minimaxClassic
No. of nodes expanded 42
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=1 -l minimaxClassic
No. of nodes expanded 35
Pacman died! Score: -493
Average Score: -493.0
Scores: -493.0
Win Rate: 0/1 (0.00)
Record: Loss

Depth 2:
Loss Scenario

python pacman.py -p AlphaBetaAgent -a depth=2 -l minimaxClassic
No. of nodes expanded 162
Pacman died! Score: -492
Average Score: -492.0
Scores: -492.0
Win Rate: 0/1 (0.00)
Record: Loss

Win Scenario
python pacman.py -p AlphaBetaAgent -a depth=2 -l minimaxClassic
No. of nodes expanded 496
Pacman emerges victorious! Score: 513
Average Score: 513.0
Scores: 513.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p AlphaBetaAgent -a depth=2 -l minimaxClassic
No. of nodes expanded 502
Pacman emerges victorious! Score: 511
Average Score: 511.0
Scores: 511.0
Win Rate: 1/1 (1.00)
Record: Win

Depth 3:
Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=3 -l minimaxClassic
No. of nodes expanded 494
Pacman died! Score: -492
Average Score: -492.0
Scores: -492.0
Win Rate: 0/1 (0.00)
Record: Loss

Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=3 -l minimaxClassic
No. of nodes expanded 1092
Pacman died! Score: -495
Average Score: -495.0
Scores: -495.0
Win Rate: 0/1 (0.00)

Record: Loss

WIn Scenario
python pacman.py -p AlphaBetaAgent -a depth=3 -l minimaxClassic
No. of nodes expanded 1734
Pacman emerges victorious! Score: 513
Average Score: 513.0
Scores: 513.0
Win Rate: 1/1 (1.00)
Record: Win

Depth 4:
Win Scenario
python pacman.py -p AlphaBetaAgent -a depth=4 -l minimaxClassic
No. of nodes expanded 2354
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p AlphaBetaAgent -a depth=4 -l minimaxClassic
No. of nodes expanded 2213
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=4 -l minimaxClassic
No. of nodes expanded 1382
Pacman died! Score: -492
Average Score: -492.0
Scores: -492.0
Win Rate: 0/1 (0.00)
Record: Loss

On smallClassic

Depth 1:
Win Scenario

python pacman.py -p AlphaBetaAgent -a depth=1 -l smallClassic
No. of nodes expanded 8390
Pacman emerges victorious! Score: 463
Average Score: 463.0
Scores: 463.0
Win Rate: 1/1 (1.00)
Record: Win

Depth 2:
Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=2 -l smallClassic
No. of nodes expanded 12151
Pacman died! Score: -311
Average Score: -311.0
Scores: -311.0
Win Rate: 0/1 (0.00)
Record: Loss

Depth 3:
Loss Scenario
python pacman.py -p AlphaBetaAgent -a depth=3 -l smallClassic
No. of nodes expanded 5871
Pacman died! Score: -329
Average Score: -329.0
Scores: -329.0
Win Rate: 0/1 (0.00)
Record: Loss

Depth 4:
Win Scenario
python pacman.py -p AlphaBetaAgent -a depth=4 -l smallClassic
No. of nodes expanded 172394
Pacman emerges victorious! Score: 1290
Average Score: 1290.0
Scores: 1290.0
Win Rate: 1/1 (1.00)
Record: Win

Question 4 (25 points): Expectimax

Running Trapped Classic using AlphaBeta Agent and Expectimax we see that AlphaBeta Agent always looses and Expectimax agent wins half the time.

python pacman.py -p AlphaBetaAgent -l trappedClassic -a depth=3 -q -n 10
Pacman died! Score: -501
Average Score: -501.0
Scores: -501.0, -501.0, -501.0, -501.0, -501.0, -501.0, -501.0, -501.0, -501.0, -501.0
Win Rate: 0/10 (0.00)
Record: Loss, Loss, Loss, Loss, Loss, Loss, Loss, Loss, Loss, Loss

python pacman.py -p ExpectimaxAgent -l trappedClassic -a depth=3 -q -n 10
Pacman emerges victorious! Score: 532
Average Score: -88.4
Scores: 532.0, -502.0, -502.0, -502.0, -502.0, -502.0, 532.0, 532.0, -502.0, 532.0
Win Rate: 4/10 (0.40)
Record: Win, Loss, Loss, Loss, Loss, Loss, Win, Win, Loss, Win

On minimaxClassic:

Depth 1:
Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=1
No. of nodes expanded: 154
Pacman emerges victorious! Score: 510
Average Score: 510.0
Scores: 510.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=1
No. of nodes expanded: 56
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Loss Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=1
No. of nodes expanded: 131
Pacman died! Score: -498
Average Score: -498.0
Scores: -498.0
Win Rate: 0/1 (0.00)

Record: Loss

Depth 2:
Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=2
No. of nodes expanded: 216
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Loss Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=2
No. of nodes expanded: 192
Pacman died! Score: -493
Average Score: -493.0
Scores: -493.0
Win Rate: 0/1 (0.00)
Record: Loss

Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=2
No. of nodes expanded: 802
Pacman emerges victorious! Score: 509
Average Score: 509.0
Scores: 509.0
Win Rate: 1/1 (1.00)
Record: Win

Depth 3:
Loss Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=3
No. of nodes expanded: 1366
Pacman died! Score: -497
Average Score: -497.0
Scores: -497.0
Win Rate: 0/1 (0.00)
Record: Loss

Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=3
No. of nodes expanded: 1531

Pacman emerges victorious! Score: 513
Average Score: 513.0
Scores: 513.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=3
No. of nodes expanded: 2073
Pacman emerges victorious! Score: 512
Average Score: 512.0
Scores: 512.0
Win Rate: 1/1 (1.00)
Record: Win

Depth 4:
Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=4
No. of nodes expanded: 2170
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win

Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=4
No. of nodes expanded: 1738
Pacman died! Score: -493
Average Score: -493.0
Scores: -493.0
Win Rate: 0/1 (0.00)
Record: Loss

Win Scenario
python pacman.py -p ExpectimaxAgent -l minimaxClassic -a depth=4
No. of nodes expanded: 1832
Pacman emerges victorious! Score: 516
Average Score: 516.0
Scores: 516.0
Win Rate: 1/1 (1.00)
Record: Win