

2 .

	Adversarial Ghost (MinimaxGhost)	Random Ghost (RandomGhost)
Minimax Pacman (MinimaxAgent)	Won(pacman) 2/5 (0.4) Avg. Score: -120.2	Won(pacman) 3/5 (0.6) Avg. Score: 93.6
Expectimax Pacman (ExpectimaxAgent)	Won(pacman) 0/5 (0) Avg. Score: -560.4	Won(pacman) 1/5 (0.2) Avg. Score: -313.2

结果截图

```
C:\Users\GONG GUOYU\Desktop\multiagent(1)\multiagent>python2 pacman.py -p MinimaxAgent -l specialNew -g MinimaxGhost -q --numGames=5
Pacman died! Score: -515
Pacman emerges victorious! Score: 497
Pacman died! Score: -519
Pacman emerges victorious! Score: 497
Pacman died! Score: -561
Average Score: -120.2
Scores: -515.0, 497.0, -519.0, 497.0, -561.0
Win Rate: 2/5 (0.40)
Record: Loss, Win, Loss, Win, Loss
```

```
C:\Users\GONG GUOYU\Desktop\multiagent(1)\multiagent>python2 pacman.py -p MinimaxAgent -l specialNew -g RandomGhost -q --numGames=5
Pacman died! Score: -506
Pacman died! Score: -506
Pacman emerges victorious! Score: 490
Pacman emerges victorious! Score: 492
Pacman emerges victorious! Score: 498
Average Score: 93.6
Scores: -506.0, -506.0, 490.0, 492.0, 498.0
Win Rate: 3/5 (0.60)
Record: Loss, Loss, Win, Win, Win
```

```
C:\Users\GONG GUOYU\Desktop\multiagent(1)\multiagent>python2 pacman.py -p ExpectimaxAgent -l specialNew -g MinimaxGhost -q --numGames=5
Pacman died! Score: -520
Pacman died! Score: -546
Pacman died! Score: -642
Pacman died! Score: -548
Pacman died! Score: -546
Average Score: -560.4
Scores: -520.0, -546.0, -642.0, -548.0, -546.0
Win Rate: 0/5 (0.00)
Record: Loss, Loss, Loss, Loss, Loss
```

```
C:\Users\GONG GUOYU\Desktop\multiagent(1)\multiagent>python2 pacman.py -p ExpectimaxAgent -l specialNew -g RandomGhost -q --numGames=5
Pacman died! Score: -517
Pacman died! Score: -515
Pacman emerges victorious! Score: 498
Pacman died! Score: -517
Pacman died! Score: -515
Average Score: -313.2
Scores: -517.0, -515.0, 498.0, -517.0, -515.0
Win Rate: 1/5 (0.20)
Record: Loss, Loss, Win, Loss, Loss
```

3.

According to the won rate in 2, if the pacman is minimax pacman, it will perform better than Expectimax pacman when it encountering both minmax ghost and random ghost. In addition, minmax pacman will perform better when encountering random ghost compared with encountering minmax ghost; expectimax pacman will also perform better when encountering random ghost.

4.

This is because the minmax algorithm that implements ghost has order in the max level. Actually, the movement of each agent seems to be in sequence. For example, after the first ghost made a movement, the second ghost is likely to have already known the movement of the first ghost, so they seem to work together.