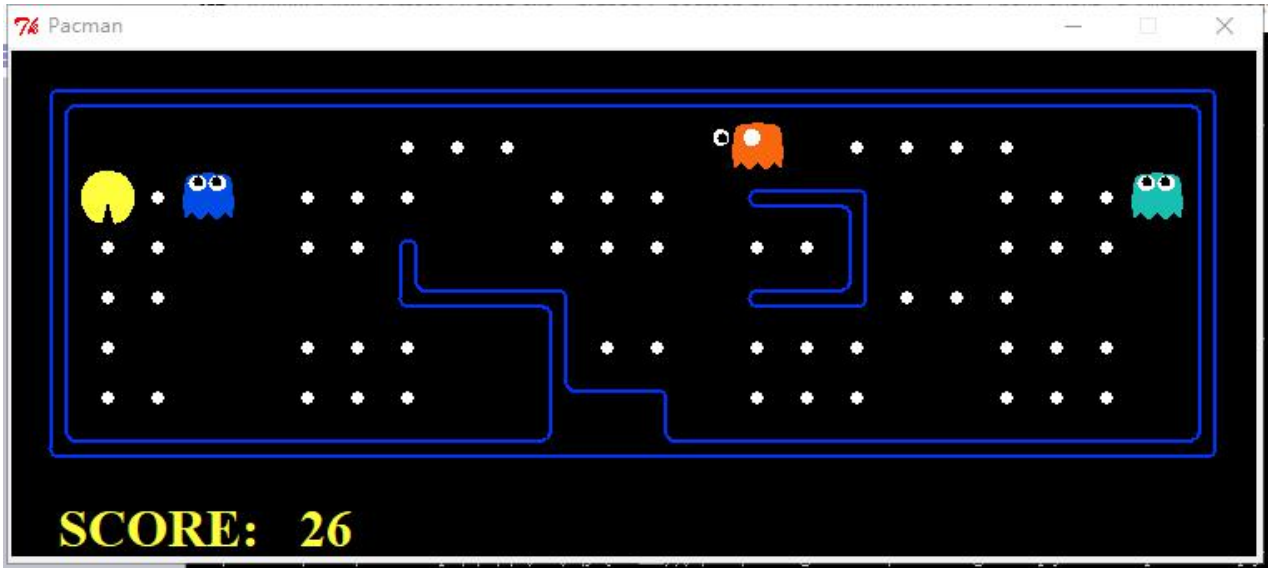
1. NewLayout：

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%.. P   ...G       ....    %
%..   ...   ... %%%   ... %
%..   ..%   ...  ..%  ... %
%..     %%%%    %%%... G %
%.G   ...   %..  ...   ... %
%..   ...   %%% ...   ... %
%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

```
C:\Users\123\Desktop\本科学习\大三上期\AI\Assignment\multiagent>python2 pacman.py -p ExpectimaxAgent -l newLayout -g Min
imaxGhost -a depth=1
Pacman died! Score: -429
Average Score: -429.0
Scores:        -429.0
Win Rate:      0/1 (0.00)
Record:        Loss
```



2.

	Adversarial Ghost	Random Ghost
Minimax Pcman	Won 0/5 Avg.Score:-141	Won 1/5 Avg.Score:-50.6
Expectimax Pcman	Won 0/5 Avg.Score:-141	Won 1/5 Avg.Score:128.2

```
C:\Users\123\Desktop\本科学习\大三上期\AI\Assignment\multiagent>python2 pacman.py -p ExpectimaxAgent -l small1Classic
MinimaxGhost -a depth=1 -q -n 5
Pacman died! Score: -141
Pacman died! Score: -141
Pacman died! Score: -141
Pacman died! Score: -141
Pacman died! Score: -141
Average Score: -141.0
Scores:        -141.0, -141.0, -141.0, -141.0, -141.0
Win Rate:      0/5 (0.00)
Record:        Loss, Loss, Loss, Loss, Loss
```

```
C:\Users\123\Desktop\本科学习\大三上期\AI\Assignment\multiagent>python2 pacman.py -p MinimaxAgent -l smallClassic -g Ran
domGhost -a depth=1 -q -n 5
Pacman died! Score: 10
Pacman died! Score: -165
Pacman died! Score: -322
Pacman emerges victorious! Score: 603
Pacman died! Score: -379
Average Score: -50.6
Scores:        10.0, -165.0, -322.0, 603.0, -379.0
Win Rate:      1/5 (0.20)
Record:        Loss, Loss, Loss, Win, Loss
```

```
C:\Users\123\Desktop\本科学习\大三上期\AI\Assignment\multiagent>python2 pacman.py -p ExpectimaxAgent -l smallClassic -g
RandomGhost -a depth=1 -q -n 5
Pacman died! Score: 482
Pacman died! Score: -247
Pacman emerges victorious! Score: 827
Pacman died! Score: -320
Pacman died! Score: -101
Average Score: 128.2
Scores:        482.0, -247.0, 827.0, -320.0, -101.0
Win Rate:      1/5 (0.20)
Record:        Loss, Loss, Win, Loss, Loss

C:\Users\123\Desktop\本科学习\大三上期\AI\Assignment\multiagent>
```

3. Pacman behaviors more smaller when implementing the ExpectimaxAgent than the RandomGhost. It got higher average scores, but have the same win rate. So the Pacman agent implementing the correct assumption of the ghosts behaviour in ExpectimaxAgent. Minimax is a decision rule used in artificial intelligence, decision theory, game theory, statistics and philosophy for minimizing the possible loss for a worst case (or maximum loss) scenario. The Expectimax is a variation of the minimax algorithm, for use in artificial intelligence systems that play two-player zero-sum games, such as backgammon, in which the outcome depends on a combination of the player's skill and chance elements such as dice rolls.

4. Because they has the same goal to make the Pacman has the lowest score, then they have the same enemy to gather them and cooperate with each other. Also, the enemies of the enemy have conflicts with the enemy, they are the enemy. The enemies of the enemy have conflicts with the enemy in the interests, and you also have conflicts with the enemy. In order to maximize the interests of the two, you can become friends. A friend is a person who has a common interest with the enemy. In order to protect his own interests, he protects the interests of your enemy and therefore opposes you to protect his own interests.