

```
import random
```

```
class QLearning:
```

```
    def __init__(self):
```

```
        self.gamma=0.9
```

```
        self.epsilon=0.9
```

```
        self.learningRate = 0.1
```

```
        self.gridWorld=[[0.0, 0.0, 0.0, 0.0] for row in range(0,15)] for column in range(0,15)]
```

```
        self.maxEpisodes=1000
```

```
    def SelectEpsilonGreedyNeighbor(self, row, column):
```

```
        maxQ=-99999.99;
```

```
        maxQMove=[]
```

```
        possibleMoves=[]
```

```
        if row>0:
```

```
            possibleMoves.append(0)
```

```
            if maxQ<self.gridWorld[row][column][0]:
```

```
                maxQ=self.gridWorld[row][column][0]
```

```
                maxQMove=[0]
```

```
            elif maxQ==self.gridWorld[row][column][0]:
```

```
                maxQMove.append(0)
```

```
        if row<14:
```

```
            possibleMoves.append(1)
```

```
            if maxQ<self.gridWorld[row][column][1]:
```

```
                maxQ=self.gridWorld[row][column][1]
```

```
                maxQMove=[1]
```

```
            elif maxQ==self.gridWorld[row][column][1]:
```

```
                maxQMove.append(1)
```

```
        if column>0:
```

```
            possibleMoves.append(3)
```

```
            if maxQ<self.gridWorld[row][column][3]:
```

```
                maxQ=self.gridWorld[row][column][3]
```

```
                maxQMove=[3]
```

```
            elif maxQ==self.gridWorld[row][column][3]:
```

```
                maxQMove.append(3)
```

```
        if column<14:
```

```
            possibleMoves.append(2)
```

```
            if maxQ<self.gridWorld[row][column][2]:
```

```
                maxQ=self.gridWorld[row][column][2]
```

```
                maxQMove=[2]
```

```

        elif maxQ==self.gridWorld[row][column][2]:
            maxQMove.append(2)

    explorationProbability=random.randint(1,10)
    if explorationProbability/10.0 > self.epsilon:
        for move in maxQMove:
            possibleMoves.remove(move)

    if possibleMoves==[]:
        return [random.choice(maxQMove),maxQ]

    randomMove=random.choice(possibleMoves)

    if randomMove==0:
        QVal=self.gridWorld[row][column][0]
    elif randomMove==1:
        QVal=self.gridWorld[row][column][1]
    elif randomMove==2:
        QVal=self.gridWorld[row][column][2]
    else:
        QVal=self.gridWorld[row][column][3]
    return [randomMove,QVal]

return [random.choice(maxQMove),maxQ]

```

```

def EpsilonGreedyLearn(self):
    episode=1
    while episode<=self.maxEpisodes:
        row=1
        column=1
        steps=0
        while True:
            nextState = self.SelectEpsilonGreedyNeighbor(row,column)

            steps+=1

            if nextState[0]==0:
                newRow= row-1
                newColumn=column
            elif nextState[0]==1:
                newRow=row+1
                newColumn=column
            elif nextState[0]==2:
                newColumn=column+1
                newRow=row
            else:

```

```

newColumn=column-1
newRow=row

if newRow<0:
    self.gridWorld[row][column][nextState[0]] = self.gridWorld[row][column][nextState[0]] + self.learningRate * -2
elif newRow>14:
    self.gridWorld[row][column][nextState[0]] = self.gridWorld[row][column][nextState[0]] + self.learningRate * -2
elif newColumn<0:
    self.gridWorld[row][column][nextState[0]] = self.gridWorld[row][column][nextState[0]] + self.learningRate * -2
elif newColumn>14:
    self.gridWorld[row][column][nextState[0]] = self.gridWorld[row][column][nextState[0]] + self.learningRate * -2
else:
    if newRow == 14 and newColumn==14:
        self.gridWorld[row][column][nextState[0]] = self.gridWorld[row][column][nextState[0]] + self.learningRate *
(10 - self.gridWorld[row][column][nextState[0]])
        break

    futureMove=self.SelectEpsilonGreedyNeighbor(newRow,newColumn)

    self.gridWorld[row][column][nextState[0]] = self.gridWorld[row][column][nextState[0]] + self.learningRate * (-1 +
(self.gamma*futureMove[1]) - self.gridWorld[row][column][nextState[0]])
    row=newRow
    column=newColumn
print steps
episode+=1

learner=QLearning()
learner.EpsilonGreedyLearn()
print learner.gridWorld

```