Game of Life

Lawrence To

November 2015

1 What is Game of Life

In 1970, the game of life is created by a genius mathematician, John Conway. Game of life is a kind of system that help expert and specialist to predict the change of population in the future in python. In another word, it is a set of rules that mimics the chaotic yet patterned growth of a colony of biological organisms. The "game" take place on a 2 dimensional platform which include the "death" and "born" of the cells. Furthermore, the cells are not just randomly born and die. Believe it or not, they are in fact always follow a certain pattern. That is, the system will accurately predict the future and the result will always be different each time specialist runs it. Due to this reason, the specialist and expert can prevent some incident that may happen in the future. For instance, food shortage, water shortage, even human extinction can be prevented.

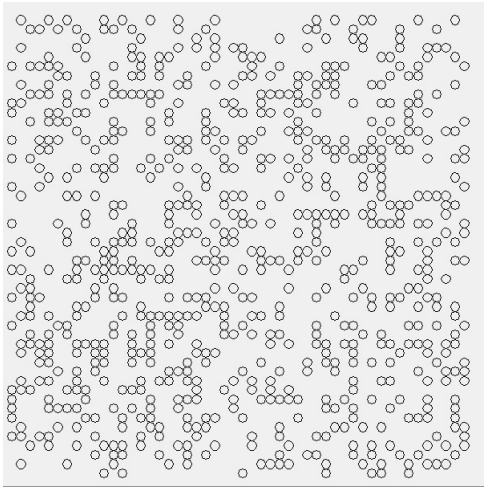

Figure 1: Picture of Game of life generated by the code I made in class(N=50)

2 Rules of Game of Life

Some people think it is pretty hard to predict the future and find the correct pattern because of the outer affect that may influence the result. This idea is correct; however, the fact is the genius who created the game of life simplified the patterns and ignored all the outer affect. The reason is that he said the outer affects are not the major influence of the output. However, it is the object itself. Consequently, believe it or not the rules(patterns) of Game of Life is actually pretty easy and simple:

(1)Overpopulation: if a living cell is surrounded by more than three living cells, it dies.

(2)Stasis: if a living cell is surrounded by two or three living cells, it survives.

(3)Underpopulation: if a living cell is surrounded by fewer than two living cells, it dies.

(4)Reproduction: if a dead cell is surrounded by exactly three cells, it becomes a live cell.

3 Glider

Glider is a special thing in Conway's game of life. Glider is a kind of code that contains 5 coordinates in a certain pattern and it will run across the 2 dimensional platform. Furthermore, specialist and expert can control the direction of where the Glider run by changing the coordinates in a special pattern:

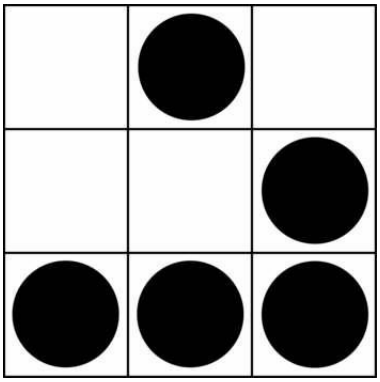

Figure 2: Picture of Glider

Example1: Bottom right to top left in a role

```
def glider(a,x,y):
    a[0+x][0+y]=1
    a[0+x][1+y]=1
    a[2+x][1+y]=1
    a[0+x][2+y]=1
    a[1+x][2+y]=1

for i in range(10):
    glider(grid,5*i,5*i)
```

Example2: Top left to bottom right in a role

```
def glider3(a,x,y):
    a[0+x][1+y]=1
    a[1+x][0+y]=1
    a[2+x][0+y]=1
    a[2+x][1+y]=1
    a[2+x][2+y]=1

for i in range(10):
    glider3(grid,5*i,5*i)
```

References

Glider: https://en.wikipedia.org/wiki/Glider_(*Conway*

The game of life in python: https://jakevdp.github.io/blog/2013/08/07/conways-game-of-life/

TEX: http://tex.stackexchange.com/questions/26712/how-to-make-outline-frame-in-beamer