Game Of Life

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this is the paper about what is game of life, and how it works.

Figure 1: This is a type of game of life.

What is Game Of Life?

The Game of Life, also known simply as Life, is a cellular automaton devised by the British mathematician John Horton Conway in 1970.[1]

The "game" is a zero-player game, meaning that its evolution is determined by its initial state, requiring no further input. One interacts with the Game of Life by creating an initial configuration and observing how it evolves or, for advanced players, by creating patterns with particular properties.

The library

```
import random
from graphics import *


def empty(N):
  a=[]
  for i in range(N):
    b=[]
    for j in range(N):
      b=b+[0]
      a=a+[b]
  return a


def fill(a,p):
  N=len(a)
  for i in range(N):
    for j in range(N):
```

first, we import random, then import the graphics library so we can use the graph window later.

this function creates an NxN array filled with zeros

this function fills the array a with a portion p of live cells.

```
    if random.uniform(0,1)<p:
    a[i][j]=1
```

define update so the graph can be updated, or the graph will just be a image and will not change.

neigh=neighbor, here is how we adopt game of life's rule to this python code.

here we generate 2d praphics and start to draw circles in the graph window.

Circle was already defined in the graphics library.

```
def update(A,B):
  N=len(A)
  for i in range(N):
    for j in range(N):
    neigh=A[(i-1)%N][(j-1)%N]+A[(i-1)%N][j]+A[(i-1)%N]
    [(j+1)%N]+A[i][(j-1)%N]+A[i][(j+1)%N]+A[(i+1)%N]
    [(j-1)%N]+A[(i+1)%N][j]+A[(i+1)%N][(j+1)%N]
    if A[i][j]==0:
      if neigh==3:
        B[i][j]=1
      else:
        B[i][j]=0
      else:
        if neigh==2 or neigh==3:
          B[i][j]=1
        else:
          B[i][j]=0


def gen2Dgraphic(N):
a=[]
for i in range(N):
  b=[]
  for j in range(N):
    b=b+[Circle(Point(i,j),.49)]
    a=a+[b]
  return a

def push(B,A):
  N=len(A)
  for i in range(N):
    for j in range(N):
      A[i][j]=B[i][j]
```

```
def drawArray(A,a,window):
  N=len(A)
  for i in range(N):
    for j in range(N):
      if A[i][j]==1:
        a[i][j].undraw()
        a[i][j].draw(window)
        if A[i][j]==0:
          a[i][j].undraw()

def slider(a):
  a[1][0]=1
  a[0][1]=1
  a[0][2]=1
  a[1][2]=1
  a[2][2]=1

N=50
win = GraphWin("Title",600,600)
win.setCoords(-1,-1,N+1,N+1)
grid=empty(N)
grid2=empty(N)
circles=gen2Dgraphic(N)
fill(grid,0.1)

while True:
  drawArray(grid,circles,win)
  update(grid,grid2)
  push(grid2,grid)
```

A is the array of 0,1 values representing the state of the game

a is an array of Circle objects

window is the GraphWin in which we will draw the circles

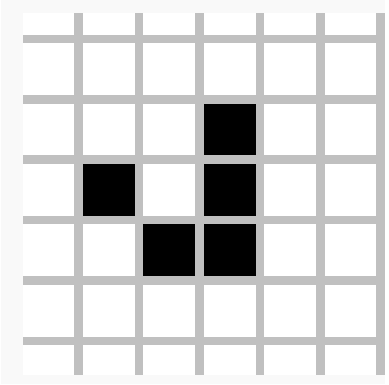

Figure 2: This is slider.

```
this is what it will look like>>>
```