SCIENCE-1 Project

Survival Probality of Blind Rat

YOUTUBE LINK: https://youtu.be/5Iw_vimtYN0

COMPUTATIONAL:

For lattice grid:

```
import random
from matplotlib import pyplot as plt


# size of the grid
N = 8
# No of iterations
EXPERIMENTS = 1000

# No of steps
TIME =1000

time_array = [i for i in range(0, TIME)]

def valid(row, col):
        if(row < 0 or row >= N or col < 0 or col >= N):
                return False
        return True

def solve(mouseStartRow, mouseStartCol, catStartRow, catStartY):

        frq = [0] * TIME
        probability = [0] * TIME
        diff = [[1, 0], [-1, 0], [0, 1], [0, -1]]

        for i in range(0, EXPERIMENTS):

                mouseRow = mouseStartRow
                mouseCol = mouseStartCol
                catRow = catStartRow
                catCol = catStartY

                for j in range(1, TIME):

                        mouse_movement = []
                        cat_movement = []

                        mouse_movement = random.choice(diff)
```

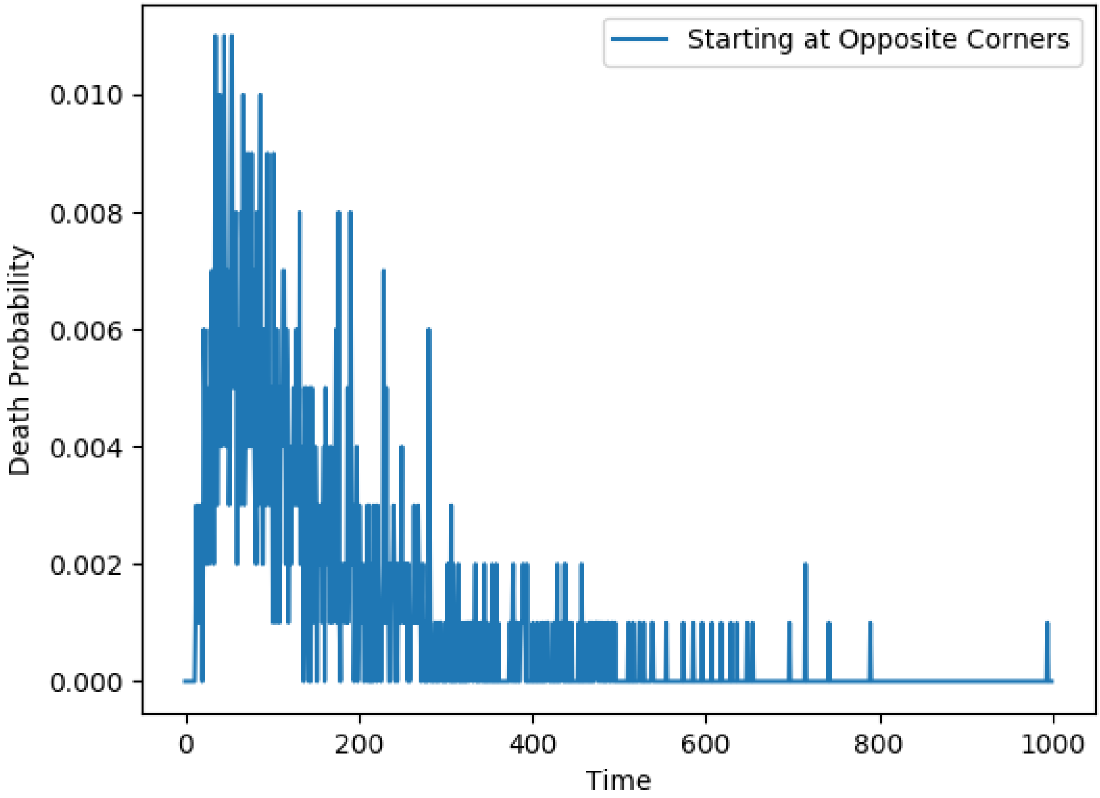
```
            cat_movement = random.choice(diff)

            if(valid(mouseRow + mouse_movement[0], mouseCol +
mouse_movement[1])):
                mouseRow = mouseRow + mouse_movement[0]
                mouseCol = mouseCol + mouse_movement[1]

            if(valid(catRow + cat_movement[0], catCol + cat_movement[1])):
                catRow = catRow + cat_movement[0]
                catCol = catCol + cat_movement[1]

            if(mouseRow == catRow and mouseCol == catCol):
                frq[j] = frq[j] + 1
                break

    return [(frq[i] / EXPERIMENTS) for i in range(0, TIME)]

MID = N // 2
Opposite = solve(0, 0, N - 1, N - 1)
Center = solve(MID, MID, MID, MID)

plt.plot(time_array, Opposite, label = "Starting at Opposite Corners")
plt.plot(time_array, Center, label = "Starting at Center")
plt.legend()
plt.ylabel("Death Probability")
plt.xlabel("Time")
plt.show()
plt.savefig("Center_Grid.png")
plt.close()
```

For Sphre:

```
#include<stdio.h>
#include<stdlib.h>
#include<time.h>
#include<math.h>
#define PI 3.1415926
#define dbl double
dbl fn[100005];
dbl save[100005];
int main(){
    dbl rad;
    int i,j;
    dbl count = 0.00,x,y,z;
    dbl rats[3];
    dbl cats[3],fl=0;
rep:
    fprintf(stderr,"R??");
    scanf("%lf",&rad);
    dbl range = rad/10;
    srand(time(0));
    for(i=0;i<10000;i++){
        rats[0] = -rad;
        rats[1] = rats[2] = cats[1] = 0;
        cats[0] = rad;
        cats[2] = 1;
        fprintf(stderr,"%d\n",i);
        for(j=1;j<=10000;j++){
            int flag=0;
            do{
                dbl theta = (dbl)rand()/(dbl)RAND_MAX;
                theta*=PI;
                dbl phi = (dbl)rand()/(dbl)RAND_MAX;
                phi*=2*PI;
                x = cos(theta);
                y = sin(theta) * cos(phi);
                z = sin(theta) * sin(phi);
                if(sqrt(pow(rats[0]+x,2) + pow(rats[1]+y,2) + pow(rats[2]+z,2)) <=
rad){
                    flag=1;
                    rats[0]+=x;
                    rats[1]+=y;
                    rats[2]+=z;
                }
            }
            while(flag==0);
            flag=0;
            do{
                dbl theta = (dbl)rand()/(dbl)RAND_MAX;
                theta*=PI;
                dbl phi = (dbl)rand()/(dbl)RAND_MAX;
                phi*=2*PI;
                x = cos(theta);
                y = sin(theta) * cos(phi);
                z = sin(theta) * sin(phi);
                if(sqrt(pow(cats[0]+x,2) + pow(cats[1]+y,2) + pow(cats[2]+z,2)) <=
rad){
                    flag=1;
                    cats[0]+=x;
                    cats[1]+=y;
                    cats[2]+=z;
                }
            }
            while(flag==0);
            if(sqrt(pow(cats[0]-rats[0],2) + pow(cats[1]-rats[1],2) +pow(cats[3]-
rats[3],2)) < range) break;
            else if(fl==0) fn[j]+=1.0;
            else save[j]+=1.0;
        }
    }
    if(fl==0){
        fl=1;
```

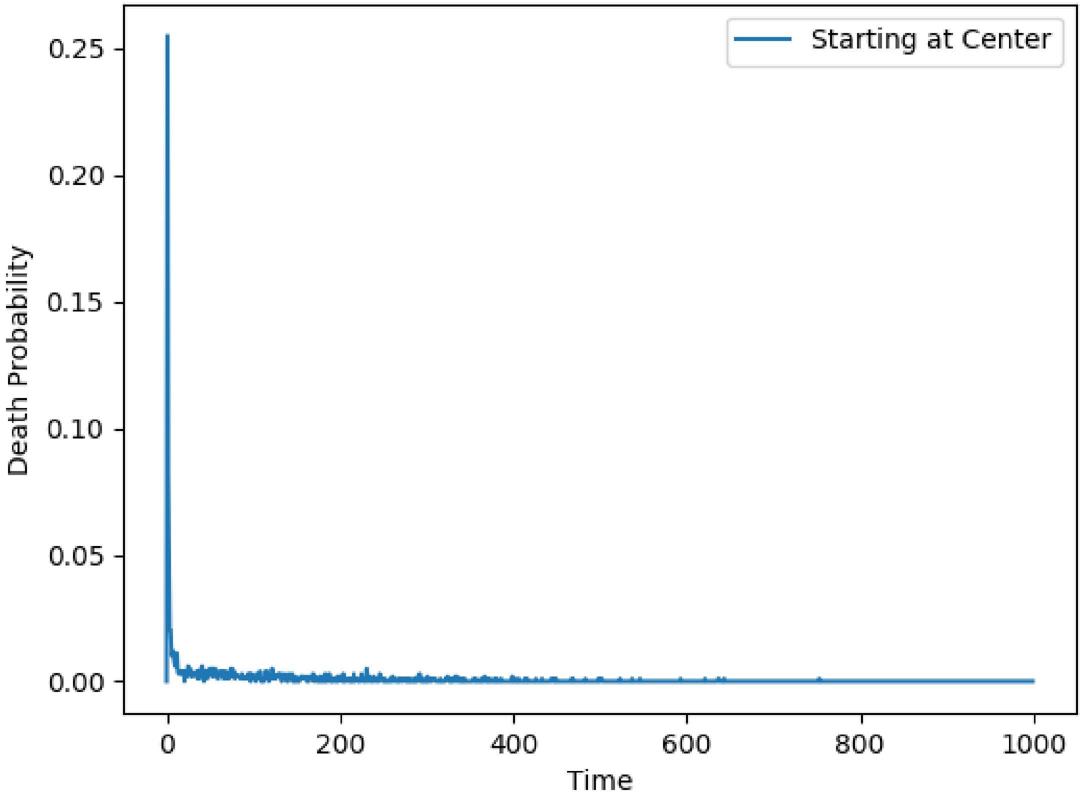
```
                goto rep;
        }
        for(i=1;i<=10000;i++){
                printf("%d %lf %lf\n",i,(dbl)(fn[i]/10000.00),(dbl)(save[i]/10000.00));
        }
        return 0;
}
```

Probablity of Meet when CAT and RAT start at opposite ends



Probablity of Meet when CAT and RAT start at opposite ends

Probablity of Meet when CAT and RAT start at from center


Starting at Center
Death Probability
Time