软件工程第二次上机作业

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问题描述：

In a box bounded by [-1, 1], given m balloons(they cannot overlap) with variable radio r and position mu. And some tiny blocks are in the box at given position {d};balloons cannot overlap with these blocks. find the optimal value of r and mu which maximizes

sum r^2

算法思想：

这个问题与实验意义非常相似，不同之处只是多了几个点。我们可以把这些点看成半径为0的气球，然后把他们加入到气球队列。然后按照实验一的思路即可,所以只需要把实验一的代码稍加修改就可以。

代码：

#include <stdlib.h>

#include <stdio.h>

#include <math.h>

//气球结构体

typedef struct ball{

double x; //圆心x坐标

double y; //圆心y坐标

double r; //圆半径

}Ball;

//用链表来储存已经放置的气球

typedef struct ballList{

struct ballList \* next;

Ball ball;

}BallList;

void insert(Ball ball);

double distance(Ball b1, Ball b2);

int judge(Ball b);

void putBall();

void putPoint(double x, double y);

BallList \*head = NULL;

double step = 0.01; //改变气球位置的最小单位

int num = 0; //放置气球的个数

double sumr = 0; //用来记录r^2之和

int main(){

int n, pointNum, i;

printf("请输入气球总数量: ");

scanf\_s("%d", &n);

printf("请输入点的数量: ");

scanf\_s("%d", &pointNum);

for (i = 0; i < pointNum; i++){

printf("请输入第%d个点的坐标(空格隔开)：", i + 1);

double x, y;

scanf\_s("%lf %lf", &x, &y);

putPoint(x, y);

}

printf("\n球编号\t x坐标\t y坐标\t 半径\t r^2之和\n");

for (i = 0; i < n; i++){

putBall();

}

printf("\nr^2之和最大为:\t %lf\n", sumr);

system("pause");

return 0;

}

//将气球插入气球队列

void insert(Ball ball){

BallList \* newBall = (BallList \*)malloc(sizeof(BallList));

newBall->ball = ball;

newBall->next = head;

head = newBall;

}

//将设置的点作为半径为0的点插入气球队列

void putPoint(double x, double y){

Ball ball = { x, y, 0 };

insert(ball);

}

//改变气球的初始位置，求的满足条件的气球

void putBall() {

Ball ball = { -1 + step, -1 + step, 0 };

Ball maxBall = ball;

int i, j;

for (i = 0; ball.x < 1; ++i) {

ball.x += step;

ball.y = -1 + step;

for (j = 0; ball.y < 1; ++j) {

ball.y += step;

ball.r = 0;

double rstep = 0.1;

while (rstep > 0.00001) {

if (ball.r > maxBall.r) {

maxBall = ball;

}

ball.r += rstep;

if (!judge(ball)) {//此气球不合适，减小半径与步长重新尝试

ball.r -= rstep;

rstep /= 10;

}

}

}

}

if (judge(maxBall)) {

insert(maxBall);

num++;

sumr += maxBall.r \* maxBall.r;

printf("%d\t %.3lf\t %.3lf\t %.3lf\t %lf \n", num, maxBall.x, maxBall.y, maxBall.r, sumr);

}

}

//判断气球之间的距离

double distance(Ball b1, Ball b2){

double x1 = b1.x;

double y1 = b1.y;

double x2 = b2.x;

double y2 = b2.y;

return pow((x1 - x2) \* (x1 - x2) + (y1 - y2) \* (y1 - y2), 0.5);

}

//判断新加入的气球是否符合规则

int judge(Ball b){

//将气球限制在[-1，1]内

if ((fabs(b.x) + b.r) > 1 || (fabs(b.y) + b.r) > 1){

return 0;

}

//依次比较气球b与已有气球是否相交

BallList \*tmp = head;

while (tmp){

Ball ball = tmp->ball;

if (distance(b, ball) < b.r + ball.r){

return 0;

}

tmp = tmp->next;

}

return 1;

}

运行结果：

请输入气球总数量: 4

请输入点的数量: 2

请输入第1个点的坐标(空格隔开)：0.3 0.5

请输入第2个点的坐标(空格隔开)：0.7 0.6

球编号 x坐标 y坐标 半径 r^2之和

1 -0.180 -0.180 0.820 0.672400

2 0.450 0.730 0.270 0.745246

3 -0.740 0.740 0.257 0.811295

4 0.740 -0.740 0.257 0.877344

r^2之和最大为: 0.877344