***Problem 1 : The Gift Packer***

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#include<stdio.h>

#include<stdlib.h>

#include<math.h>

typedef struct{ //Point struct

int x,y;

}Point;

Point p[100];

float ComputeAngle(Point A,Point B){

float Dx,Dy;

float Angle;

Dx = B.x - A.x;

Dy = B.y - A.y;

if((Dx>=0) && (Dy==0))

Angle = 0;

else{

Angle = Dy/((Dx)+(Dy));

if((Dx<0) &&(Dy>=0))

Angle = 2-Angle;

else if((Dx<=0) && (Dy<0))Angle = 2 + Angle;

else if((Dx>0) &&(Dy<0))Angle = 4-Angle;

}

return (Angle\*90.0);

}

void main(){

int N=0,i,min\_x,min\_y,same=0,j,pos;

int w\_X=0,w\_Y=0,c=0;

int temp1;

float big\_X,big\_Y,small\_X,small\_Y;

float area,wast\_Area,result;

float ang[100],temp=0;

int num\_Ang[100];

while(1){ //N is number of points

printf("Input number of points : ");

scanf("%d",&N);//Receive

fflush(stdin);

while(N<=3 || N >100){ //Exception points

printf("\nWrrong! -- Input number of points : ");

scanf("%d",&N);

fflush(stdin);

}

for(i=0; i<N;i++){ //Receive the point value

scanf("%d %d",&p[i].x,&p[i].y);

while(p[i].x < 0 || p[i].y > 100){

printf("Wrong!!\n");

scanf("%d %d",&p[i].x,&p[i].y);

}

}

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

for(j = i+1; j<N-1; j++){ //Exception of three consecutive points are co-linear

if(p[i].x ==p[j].x && p[i].y ==p[j].y)

same++;

}

}

if(same >=3){ //Exception

printf("No three consecutive points are co-linear!\n");

same = 0;

continue;

}

min\_x = p[0].x;

min\_y = p[0].y;

pos = 0;

for(i=1; i<N-1; i++){ //Find origin points

if(p[i].x <=0 && p[i].y<=100 && p[i].y<min\_y){

min\_y = p[i].y;

min\_x = p[i].x;

pos = i;

}

}

num\_Ang[0] = pos;

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

if(pos == i)

continue;

ang[c] = ComputeAngle(p[pos],p[i]);

num\_Ang[c] = i;

c++;

printf("%f ",ang[i-1]);

}

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

for(j=0; j<N-1; j++){

if(ang[j] > ang[j+1]){

temp = ang[j];

ang[j] = ang[j+1];

ang[j+1] = temp;

temp1 = num\_Ang[j];

num\_Ang[j] = num\_Ang[j+1];

num\_Ang[j+1] = temp1;

}

}

}

printf("\n");

//Find paking Box area

big\_X = p[0].x;

big\_Y= p[0].y;

small\_X = p[0].x;

small\_Y = p[0].y;

for(i=1; i<N; i++){

if(big\_X < p[i].x)

big\_X = p[i].x;

if(big\_Y < p[i].y)

big\_Y = p[i].y;

if(small\_X > p[i].x)

small\_X = p[i].x;

if(small\_Y > p[i].y)

small\_Y = p[i].y;

}

area = (big\_X-small\_X)\*(big\_Y-small\_Y);

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

if(i==N-1){

w\_X = w\_X + (p[i].x\*p[0].y);

w\_Y = w\_Y + (p[i].y\*p[0].x);

}

else{

w\_X = w\_X + (p[i].x\*p[i+1].y);

w\_Y = w\_Y + (p[i].y\*p[i+1].x);

}

}

wast\_Area = (float)(w\_X - w\_Y)/2;

result = (1-wast\_Area/area)\*100;

printf("Result : %.2f Percent\n\n",result);

}

}

