

Algorithmique et Programmation

Examen sur machine: solution

G1: keriven(at)certis.enpc.fr G2: thorstensen(at)certis.enpc.fr
G3: aganj(at)certis.enpc.fr G4: etyngier(at)certis.enpc.fr
G5: segonne(at)certis.enpc.fr G6: chariot(at)certis.enpc.fr

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```
1 // Voyageur de commerce
2
3 #include <win>
4 #include <iostream>
5 #include <ctime>
6 #include <cmath>
7 using namespace Win;
8 using namespace std;
9
10 const int n=20;
11 const int tmax=10000000;
12 const int w=512,h=512;
13 const double Tinit=10;
14
15 void genere(Pixel c[n])
16 {
17     for (int i=0;i<n;i++) {
18         c[i].x=10+rand()%(w-20);
19         c[i].y=10+rand()%(h-20);
20     }
21 }
22
23 void dessine(Pixel c[n])
24 {
25     for (int i=0;i<n;i++)
26         DrawLine(c[i],c[(i+1)%n],Green);
27     for (int i=0;i<n;i++)
28         FillCircle(c[i],2,Red);
29 }
30
31 double longueur(Pixel c[n])
32 {
33     double l=0;
34     for (int i=0;i<n;i++)
35         l+=sqrt(pow(c[i].x-c[(i+1)%n].x,2)+pow(c[i].y-c[(i+1)%n].y,2));
36     return l;
37 }
38
39 void copie(Pixel c[n],Pixel d[n]) {
40     for (int i=0;i<n;i++)
41         d[i]=c[i];
42 }
43
44 void mute(Pixel c[n],Pixel d[n]) {
45     copie(c,d);
46     int i1=rand()%n;
```

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48     do {
49         i2=rand()%n;
50     } while (i2==i1);
51     Pixel tmp=d[i1];
52     d[i1]=d[i2];
53     d[i2]=tmp;
54 }
55
56 void mute2(Pixel c[n],Pixel d[n]) {
57     copie(c,d);
58     int i1=rand()%n;
59     int i2;
60     do {
61         i2=rand()%n;
62     } while (abs(i2-i1)<2);
63     int imin=min(i1,i2);
64     int imax=max(i1,i2);
65     for (int i=0;i<=(imax-imin)/2;i++) {
66         Pixel tmp=d[i+imin];
67         d[i+imin]=d[imax-i];
68         d[imax-i]=tmp;
69     }
70 }
71
72 int main()
73 {
74     srand(unsigned(time(0)));
75     OpenWindow(w,h);
76     Pixel C[n];
77     genere(C);
78     dessine(C);
79     double lc=longueur(C);
80     cout << lc << endl;
81     for (int t=1;t<=tmax;t++) {
82         Pixel D[n];
83         //mute(C,D);
84         mute2(C,D);
85         double ld=longueur(D);
86         double T=Tinit/sqrt(double(t));
87         if (ld<lc || (ld-lc>1e-5 && (double(rand())/RAND_MAX)<exp(-(ld-lc)/T))) {
88             copie(D,C);
89             lc=ld;
90             Clear();
91             dessine(C);
92             cout << lc << endl;
93         }
94     }
95     Terminate();
96     return 0;
97 }

```