

例 5.2 注水。考虑如下凸优化问题

$$\begin{array}{ll}\text{minimize} & -\sum_{i=1}^n \log(\alpha_i + x_i) \\ \text{subject to} & x \succeq 0, \quad \mathbf{1}^T x = 1,\end{array}$$

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```

1  #include<iostream>
2  #include<cmath>
3  #include<cstdlib>
4  #include<ctime>
5  using namespace std;
6  #define dimension 10 //问题的维数
7  #define Precision 1.0e-6 //精度
8
9  void print_alpha(double *a) { { ... } }
10 //打印数组
11 void print_x(double *a) { { ... } }
12 //打印数组
13 double caculate_target(double *alpha, double *x) { { ... } }
14 //返回所求目标值
15 double fill_water(double *alpha, double total_water, double precision) { { ... } }
16 //根据随机出的alpha数组值, 计算注水量
17 void random(double *a) { { ... } }
18 //生成具有随机数的数组, 值的范围为(0, 1)
19 int main()
20 {
21     double alpha[dimension] = {0};
22     double total_water = 1;
23     random(alpha);
24     print_alpha(alpha);
25     double minimize = fill_water(alpha, total_water, Precision);
26     cout << "minimize = " << minimize << endl;
27 }

```

```

alpha[0] = 0.3946958831
alpha[1] = 0.0971709342
alpha[2] = 0.5320596942
alpha[3] = 0.7307657094
alpha[4] = 0.7337870418
alpha[5] = 0.006805628
alpha[6] = 0.8518936735
alpha[7] = 0.6024048585
alpha[8] = 0.1584826197
alpha[9] = 0.1078829310

x[0] = 0.0000000000
x[1] = 0.2383831239
x[2] = 0.0000000000
x[3] = 0.0000000000
x[4] = 0.0000000000
x[5] = 0.2653734953
x[6] = 0.0000000000
x[7] = 0.0000000000
x[8] = 0.2075714384
x[9] = 0.2581711271

1 water_volume = 0.366054058
3 minimize = 6.870854240

```