

資料結構

Data Structure

Lab 11

姓名： 曾致嘉

學號： 113AB0014

Lab11-Q1

Q1: Sort the products according to the rules mentioned above and output the order of the products from the most prominent position to the least prominent position.

Q2: Discuss the time complexity of the sorting method you used.

```
#include<iostream>
```

```
#include<iostream>
```

```
#include<vector>
```

```
#include<fstream>
```

```
#include<cstring>
```

```
#include<sstream>
```

```
using namespace std;
```

```
class Product{
```

```
public:
```

```
    char name[100]; // 商品名稱
```

```
    int popularity; // 人氣
```

```
    int deadline;    // 期效
```

```
};
```

```
void Loadfile(const char* filename, vector<Product>* inp){
```

```
    ifstream ifs(filename);
```

```
    if (!ifs.is_open()){
```

```
        cout<<"Failed to open file.\n";
```

```
        return ;
```

```
    }
```

```
    string line; //一行一行讀
```

```
    getline(ifs, line); // 不需要第一行的數字
```

```
    while (getline(ifs, line)){
```

```
        istream iss(line);
```

```
        string part; // 將資料一空格分段處理
```

```
        Product p;
```

```
        p.name[0]='\0'; // 初始化字串
```

```
        while(iss >> part){ // 讀入各組文字
```

```
            if(isdigit(part[0])){
```

```

        p.deadline = stoi(part);// 遇到數字代表後面只會有效期與熱門度
        iss >> p.popularity;
        break;
    }else{
        if(strlen(p.name)>0) strcat(p.name, " ");// 文字間的空格
        strcat(p.name, part.c_str());
    }
}

inp->push_back(p);
}
ifs.close();
}

vector<Product> Sort(vector<Product> inp){
    for (int i=0; i < inp.size();i++){
        for (int j=0;j<inp.size()-1-i;j++){ // 氣泡排序法
            if (inp[j].deadline > inp[j+1].deadline)swap(inp[j], inp[j+1]);
            // 依照效期大小降序排列
            else if (inp[j].deadline == inp[j+1].deadline){
                if(inp[j].popularity<inp[j+1].popularity)swap(inp[j], inp[j+1]);
                // 效期相同，依照熱門度升序排列
            }
        }
    }
}

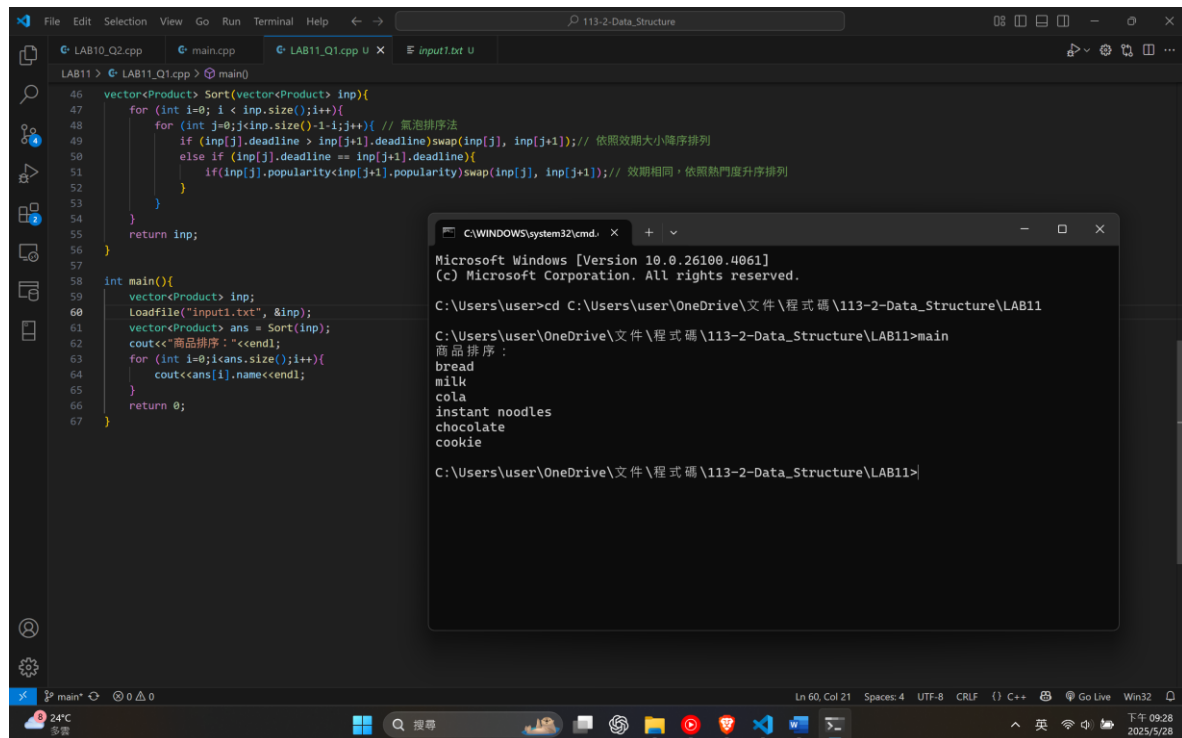
return inp;
}

int main(){
    vector<Product> inp;
    Loadfile("input2.txt", &inp);
    vector<Product> ans = Sort(inp);
    cout<<"商品排序："<<endl;
    for (int i=0;i<ans.size();i++){
        cout<<ans[i].name<<endl;
    }
    return 0;
}

```

Discussion Section

Picture 1:



```
LAB11 > C:\Users\user> cd C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11
46 vector<Product> Sort(vector<Product> inp){
47     for (int i=0; i < inp.size();i++){
48         for (int j=0;j<inp.size()-1-i;j++){ // 氣泡排序法
49             if (inp[j].deadline > inp[j+1].deadline)swap(inp[j], inp[j+1]); // 依照效期大小降序排列
50             else if (inp[j].deadline == inp[j+1].deadline){
51                 if(inp[j].popularity<inp[j+1].popularity)swap(inp[j], inp[j+1]); // 效期相同，依照熱門度升序排列
52             }
53         }
54     }
55     return inp;
56 }
57
58 int main(){
59     vector<Product> inp;
60     Loadfile("input1.txt", &inp);
61     vector<Product> ans = Sort(inp);
62     cout<<"商品排序："<<endl;
63     for (int i=0;i<ans.size();i++){
64         cout<<ans[i].name<<endl;
65     }
66     return 0;
67 }
```

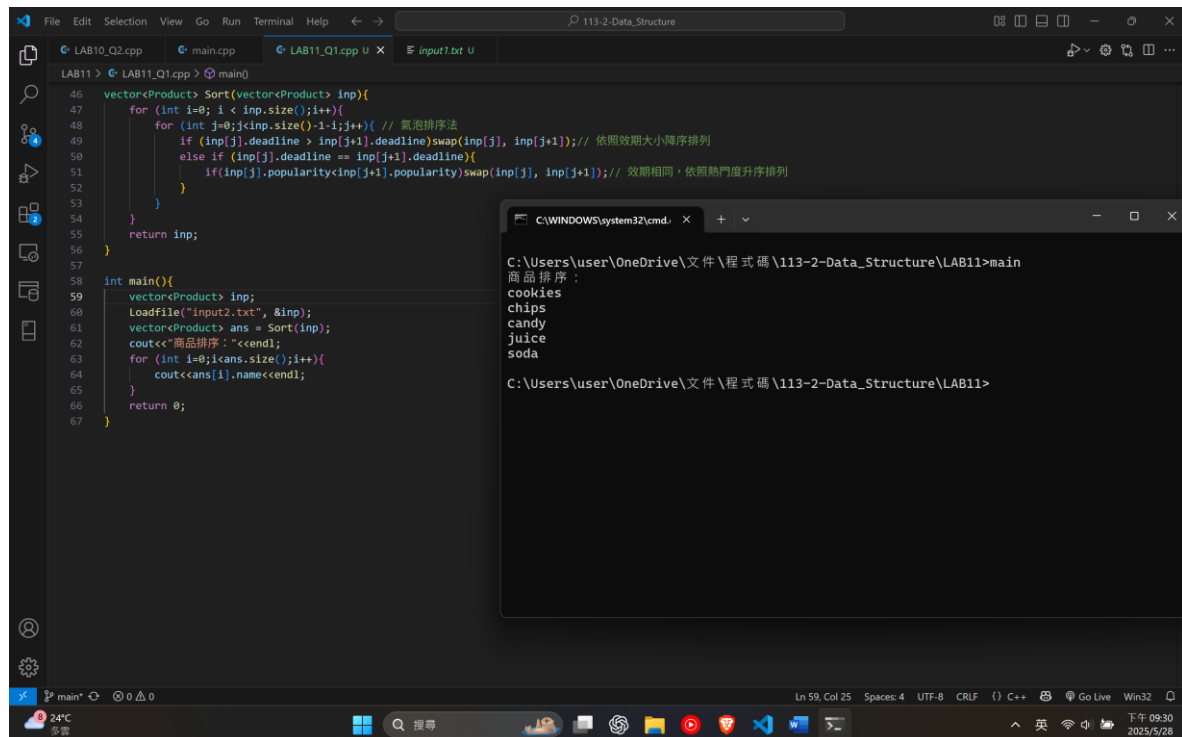
```
C:\WINDOWS\system32\cmd. x + v
Microsoft Windows [Version 10.0.26100.4061]
(c) Microsoft Corporation. All rights reserved.

C:\Users\user>cd C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11

C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>main
商品排序：
bread
milk
cola
instant noodles
chocolate
cookie

C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>
```

Picture 2:

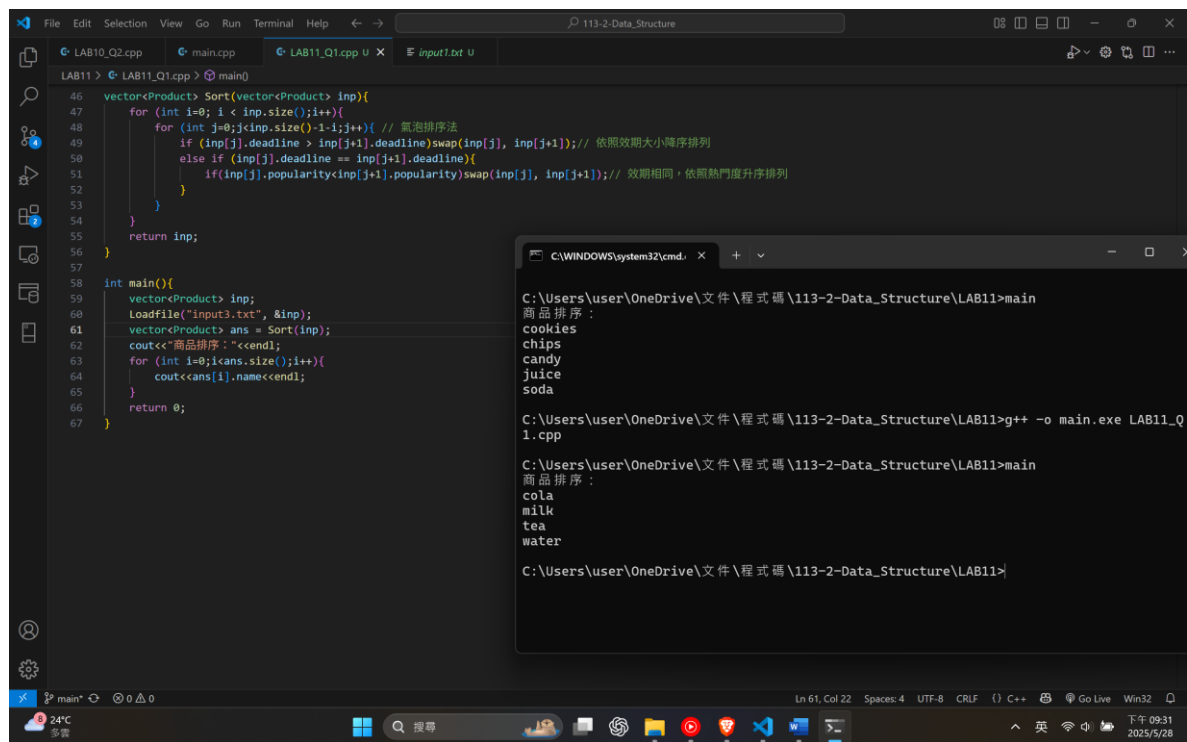


```
LAB11 > C:\Users\user> cd C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11
46 vector<Product> Sort(vector<Product> inp){
47     for (int i=0; i < inp.size();i++){
48         for (int j=0;j<inp.size()-1-i;j++){ // 氣泡排序法
49             if (inp[j].deadline > inp[j+1].deadline)swap(inp[j], inp[j+1]); // 依照效期大小降序排列
50             else if (inp[j].deadline == inp[j+1].deadline){
51                 if(inp[j].popularity<inp[j+1].popularity)swap(inp[j], inp[j+1]); // 效期相同，依照熱門度升序排列
52             }
53         }
54     }
55     return inp;
56 }
57
58 int main(){
59     vector<Product> inp;
60     Loadfile("input2.txt", &inp);
61     vector<Product> ans = Sort(inp);
62     cout<<"商品排序："<<endl;
63     for (int i=0;i<ans.size();i++){
64         cout<<ans[i].name<<endl;
65     }
66     return 0;
67 }
```

```
C:\WINDOWS\system32\cmd. x + v
C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>main
商品排序：
cookies
chips
candy
juice
soda

C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>
```

Picture 3 :



The screenshot shows a C++ IDE with a file named 'LAB11_Q1.cpp'. The code implements a bubble sort algorithm for a vector of products. The comments in the code describe the sorting logic: first by deadline, then by popularity if deadlines are equal. The main function reads from 'input.txt' and prints the sorted list of products.

```
46 vector<Product> Sort(vector<Product> inp){
47     for (int i=0; i < inp.size(); i++){
48         for (int j=0; j<inp.size()-1-i; j++){ // 氣泡排序法
49             if (inp[j].deadline > inp[j+1].deadline)swap(inp[j], inp[j+1]); // 依照效期大小降序排列
50             else if (inp[j].deadline == inp[j+1].deadline){
51                 if(inp[j].popularity<inp[j+1].popularity)swap(inp[j], inp[j+1]); // 效期相同，依照熱門度升序排列
52             }
53         }
54     }
55     return inp;
56 }
57
58 int main(){
59     vector<Product> inp;
60     Loadfile("input3.txt", &inp);
61     vector<Product> ans = Sort(inp);
62     cout<<"商品排序："<<endl;
63     for (int i=0; i<ans.size(); i++){
64         cout<<ans[i].name<<endl;
65     }
66     return 0;
67 }
```

The terminal output shows the execution of the program, displaying the sorted list of products: cookies, chips, candy, juice, and soda.

```
C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>main
商品排序：
cookies
chips
candy
juice
soda

C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>g++ -o main.exe LAB11_Q1.cpp

C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>main
商品排序：
cola
milk
tea
water

C:\Users\user\OneDrive\文件\程式碼\113-2-Data_Structure\LAB11>
```

time complexity :

bubble sort: $T(n \times (n-1)) \rightarrow O(n^2)$