

CS205 C/ C++ Programming - Lab Assignment 3

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Part 1 - Analysis

First, read the csv file line by line to initialize different city structures one by one, those cities are stored in an array. By using the technics of string dealing, we can splite out different parts of a line to store them in the different parts of city structure.

Then prompt user to input the city names, after trimming the space in both ends of input, if the name matches the only city in the list, then choosing step is finished; if no any match, then prompt user to input again; if exist more than one matches, list all the matched cities and prompt user to choose the right city he or she want. After some complex wrong-case dealing, we can get the right city in the city array we constructed before and the cities could be used to calculate the distance.

After two cities are selected correctly, using fomulas in assignment 1 can calculate the distance easily. Output the outcome and repeat the user-input part above.

At any input case, if "bye" is input, the programme will exit.

All the input will be capitalized as well as when comparing the name, so the input is case-insensitive.

Part 2 - Code

```
1  //compiled by gcc 6.3.0 (MinGW.org GCC-6.3.0-1)
2  #include <iostream>
3  #include <fstream>
4  #include <string>
5  #include <string.h>
6  #include <sstream>
7  #include <math.h>
8
9  #define MAX_NAME_LENGTH 35
10 #define ARRAY_SIZE 1000
11
12 #define PI 3.1415926
13 #define R 6371
14 using namespace std;
15
16 struct city{
17     bool notNull=false;
18     string name;
19     string province;
20     string country;
```

```

21     double latitude;
22     double longitude;
23 };
24
25 void splite(string s, string strs[]);
26 string truncate(string oldstr);
27 void splite(string s, string strs[]);
28 string up(string o);//capitalizing
29 string& trim(string &s);//remove the space in both ends
30 city chooseCity(city cities[], int n, string nd);//interaction with users to choose
    the right city
31 double getDist(city city1,city city2);//computing
32 city setCity(string strs[5]);//initializing the city objects
33
34
35 template <class Type>
36 Type stringToNum(const string& str){
37     istringstream iss(str);
38     Type num;
39     iss >> num;
40     return num;
41 }
42
43 string truncate(string oldstr){
44     if(oldstr.length()<=MAX_NAME_LENGTH)
45         return oldstr;
46     cout << "WARNING: The string " << oldstr << " exceeds the max length of " <<
MAX_NAME_LENGTH << ", it was truncated." << endl;
47     return oldstr.substr(0,MAX_NAME_LENGTH);
48 }
49
50 void splite(string s, string strs[]){
51     string delimiter = ",";
52     int pos = 0;
53     int i=0;
54     while (i<4) {
55         pos=s.find(delimiter);
56         string token = s.substr(0, pos);
57         strs[i]=token;
58         s.erase(0, pos + 1);
59         i++;
60     }
61     strs[4]=s;
62 }
63
64 string up(string o){//capitalizing
65     char* arr=(char*) o.data();
66     for(int i=0;i<o.length();i++){
67         if(arr[i]>=97&&arr[i]<=122)
68             arr[i]-=32;
69     }
70     string n=arr;
71     return n;

```

```

72 }
73
74 string& trim(string &s) { //remove the space in both ends
75     if (s.empty())
76         return s;
77     while(s.find_first_not_of(" ") != 0 || s.find_first_not_of("\t") != 0){
78         s.erase(0,s.find_first_not_of(" "));
79         s.erase(0,s.find_first_not_of("\t"));
80     }
81     while(s.find_last_not_of("
") != s.length()-1 || s.find_last_not_of("\t") != s.length()-1){
82         s.erase(s.find_last_not_of(" ") + 1);
83         s.erase(s.find_last_not_of("\t") + 1);
84     }
85     return s;
86 }
87
88 double getDist(city city1, city city2) { //computing
89     double phi1 = (PI/180) * (90 - city1.latitude);
90     double phi2 = (PI/180) * (90 - city2.latitude);
91     double theta1 = (PI/180) * city1.longitude;
92     double theta2 = (PI/180) * city2.longitude;
93     double c = sin(phi1)*sin(phi2)*cos(theta1-theta2) + cos(phi1)*cos(phi2);
94     double d = R*acos(c);
95     return d;
96 }
97
98 city setCity(string strs[5]) { //initializing the city objects
99     city ctemp;
100     ctemp.notNull=true;
101     ctemp.name=truncate(strs[0]);
102     ctemp.province=truncate(strs[1]);
103     ctemp.country=truncate(strs[2]);
104     ctemp.latitude=stringToNum<double>(strs[3]);
105     ctemp.longitude=stringToNum<double>(strs[4]);
106     return ctemp;
107 }
108
109 city chooseCity(city cities[], int n, string nd) { //interaction with users to choose
the right city
110     while(1){
111         char c2[256];
112         cout << "\nInput the name of the "<< nd << " city: \n";
113         cin.getline(c2,256);
114         while(c2[0]=='\0')
115             cin.getline(c2,256);
116         string c1=c2;
117         c1=up(c1);
118         c1=trim(c1);
119         if(c1==up("bye"))
120             exit(0);
121         if(c1.length()==0){
122             continue;

```

```

123     }
124     if(c1.length()<3){
125         cout << "\nIllegal input, please input the name of the "<<nd<<" city
again: \n";
126         continue;
127     }
128     int count=0;
129     city temp1;
130     for(int i=0;i<n;i++){
131         if(up(cities[i].name).find(c1)!=string::npos){
132             count++;
133             temp1=cities[i];
134         }
135     }
136     if(count==0){
137         cout << "\nIllegal input, please input the name of the "<<nd<<" city
again: \n";
138         continue;
139     }
140     if(count==1){
141         return temp1;
142     }
143     city temp_cities[count];
144     int tempi=0;
145     for(int i=0;i<n;i++){
146         if(up(cities[i].name).find(c1)!=string::npos){
147             temp_cities[tempi++]=cities[i];
148         }
149     }
150     cout << "\nPlease choose the city you want: \n";
151     for(int i=0;i<count;i++){
152         cout << i+1 << ". " << temp_cities[i].name << ", "
<<temp_cities[i].province << ", " <<temp_cities[i].country << ", "
<<temp_cities[i].latitude << ", " <<temp_cities[i].longitude <<endl;
153     }
154     char* choose;
155     cin.getline(choose,256);
156     while(choose[0]=='\0')
157         cin.getline(choose,256);
158     string choose_s=choose;
159     choose_s=up(choose_s);
160     choose_s=trim(choose_s);
161     if(choose_s==up("bye"))
162         exit(0);
163     int choose_n=stringToNum<int>(choose_s);
164     while(choose_n<=0||choose_n>count){
165         cout<<"\nIllegal input, please input again: \n";
166         cin>>choose;
167         choose_n=stringToNum<int>(choose);
168     }
169     return temp_cities[choose_n-1];
170 }
171 }

```

```

172
173
174 int main(){
175     city cities[ARRAY_SIZE];
176     ifstream datas;
177     datas.open("world_cities.csv", ios::in);
178     if(datas.fail()){
179         cout<<"WARNING: File is missing, please check it.\n";
180         return -1;
181     }
182     int n;
183     for(n=0;n<ARRAY_SIZE&&!datas.eof();n++){
184         string temp;
185         getline(datas,temp);
186         char* char_array=(char*) temp.data();
187         string strs[5];
188         splite(temp,strs);
189         cities[n]=setCity(strs);
190     }
191     if(!datas.eof())
192         cout << "WARNING: The number of lines exceeds the max number of " <<
ARRAY_SIZE << ", the exceeds are not loaded." << endl;
193     datas.close();
194     while(1){
195         city city1,city2;
196         city1=chooseCity(cities,n,"first");
197         city2=chooseCity(cities,n,"second");
198         int d=(int) getDist(city1,city2);
199
200         cout<<"=====\n";
201         cout<<"The distance between "<<city1.name<<" and "<<city2.name<<" is "<<d<<"
km."<<endl;
202
203         cout<<"=====\n";
204     }
205     return 0;
206 }

```

Part 3 - Result & Verification

As shown, works well!

1_1:

```
命令提示符
C:\Users\mi\Documents\Undergraduate\C\hw3>make
g++ hw.cpp -o hw

C:\Users\mi\Documents\Undergraduate\C\hw3>hw
WARNING: the string Federal District (Brazil) Distrito Federal exceeds the max length of 25, it was truncated.
WARNING: the string Federal District (Brazil) Distrito Federal exceeds the max length of 25, it was truncated.
WARNING: the string Australian Capital Territory exceeds the max length of 25, it was truncated.
WARNING: the string United States Virgin Islands exceeds the max length of 25, it was truncated.
WARNING: the string Islamabad Capital Territory exceeds the max length of 25, it was truncated.
WARNING: the string Saint Vincent and the Grenadines exceeds the max length of 25, it was truncated.
WARNING: the string Democratic Republic of the Congo exceeds the max length of 25, it was truncated.
WARNING: the string Federal Territory (Malaysia) Federal Territory exceeds the max length of 25, it was truncated.
WARNING: the string Las Palmas de Gran Canaria exceeds the max length of 25, it was truncated.
WARNING: the string Democratic Republic of the Congo exceeds the max length of 25, it was truncated.
WARNING: the string Federated States of Micronesia exceeds the max length of 25, it was truncated.
WARNING: the string Andaman and Nicobar Islands exceeds the max length of 25, it was truncated.
WARNING: the string British Antarctic Territory exceeds the max length of 25, it was truncated.
WARNING: the number of lines exceeds the max number of 800, the exceeds are not loaded.

C:\Users\mi\Documents\Undergraduate\C\hw3>_
```

1_2:

```
命令提示符
C:\Users\mi\Documents\Undergraduate\C\hw3>make
g++ hw.cpp -o hw

C:\Users\mi\Documents\Undergraduate\C\hw3>hw
WARNING: the string Federal District (Brazil) Distrito Federal exceeds the max length of 35, it was truncated.
WARNING: the string Federal District (Brazil) Distrito Federal exceeds the max length of 35, it was truncated.
WARNING: the string Federal Territory (Malaysia) Federal Territory exceeds the max length of 35, it was truncated.

C:\Users\mi\Documents\Undergraduate\C\hw3>
```

1_3:

```
命令提示符
C:\Users\mi\Documents\Undergraduate\C\hw3>hw
WARNING: File is missing, please check it.

C:\Users\mi\Documents\Undergraduate\C\hw3>
```

2:

```
C:\Users\mi\Documents\Undergraduate\C\hw3>hw
WARNING: The string Federal District (Brazil) Distrito Federal exceeds the m
ax length of 35, it was truncated.
WARNING: The string Federal Territory (Malaysia) Federal Territory exceeds t
he max length of 35, it was truncated.

Input the name of the first city:
shen

Please choose the city you want:
1. Shenyang, Liaoning, China, 41.817, 123.417
2. Shenzhen, Guangdong, China, 22.55, 114.1
nonum

Illegal input, please input again:
2

Input the name of the second city:
new york
=====
The distance between Shenzhen and New York City is 12936 km.
=====

Input the name of the first city:
nowhere

Illegal input, please input the name of the first city again:

Input the name of the first city:
hong kong

Input the name of the second city:
hong k
=====
The distance between Hong Kong and Hong Kong is 0 km.
=====

Input the name of the first city:
hong

Please choose the city you want:
1. Chongjin, , North Korea, 41.8, 129.783
2. Chongqing, , China, 29.567, 106.567
3. Hai Phong, , Vietnam, 20.85, 106.683
4. Hong Kong, Hong Kong, China, 22.283, 114.167
5. Taizhong, Taiwan, China, 24.15, 120.667
bye

C:\Users\mi\Documents\Undergraduate\C\hw3>_
```

Part 4 - Difficulties & Solutions

1. I tried to printf to print a string, but the output is in a mess, I thought it is because the string is not correct, but later I found that it is because printf cannot be used to print string, cout is needed. Also, later I found that if cout and printf are used in one program, the output may be in a mess. At last, I use cout to output anywhere, the output is normal now.
2. To split one line to separate parts by comma is difficult, I tried two ways to do it, one is to split two character arrays to separate, but failed with confusing problems, for certain lines with brackets the reading will stop, I don't know the reasons. Later I use substr and find function of string class to do the same task and succeeded.