SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

C/C++ Programming Language assignment 1

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1 ANALYSIS

The problem is to calculate the distance between two places by their latitude and longitude. As we all know that the radius of earth is 6371 km, assume earth is a perfect sphere, we could use latitude and longitude to calculate the angle. Firstly, convert latitude to positive radian:

$$\phi\text{=(90-latitude)}\times \pi \div 180$$

Where latitude is angle.
And let longitude be in radian too.

$$\theta\text{=longitude}\times \pi \div 180$$

Using the following formula could compute the shortest distance between the two places.

$$c\text{=}\sin(\phi_1)\times \sin(\phi_2)\times \cos(\theta_1\text{-}\theta_2)\text{+}\cos(\phi_1)\times \cos(\phi_2)$$

$$d\text{=R}\times \arccos(c)$$

Where R is the radius of earth that is R = 6371 km.

2 CODE

Listing 1: Assignment 1.

```
1  //
2  // Created by Lenovo on 2019/9/12.
3  //
4  #include <iostream>
5  #define _USE_MATH_DEFINES
6  #include <math.h>
7  using namespace std;
8  int main(){
9      double latitude1;
10     double longitude1;
11     double latitude2;
12     double longitude2;
13     string city1;
```

```
    string city2;
    cout<<"Please write the name of the first city and its latitude and longitude"<<endl;
    cin>>city1>>latitude1>>longitude1;
    cout<<"Please write the name of the second city and its latitude and longitude"<<endl
    cin>> city2>>latitude2>>longitude2;
    double phi1 = (90 - latitude1)*M_PI/180;
    double theta1=longitude1*M_PI/180;
    double phi2 = (90 - latitude2)*M_PI/180;
    double theta2=longitude2*M_PI/180;
    double c=sin(phi1)*sin(phi2)*cos(theta1-theta2)+cos(phi1)*cos(phi2);
    double d =6371*acos(c);
    cout <<"The first city:" << city1<<endl;
    cout <<"The second city:" << city2<<endl;
    cout <<"The distance between " << city1<<" and "<<city2<<" is "<<d<<"km."<<endl;

    return 0;
}
```

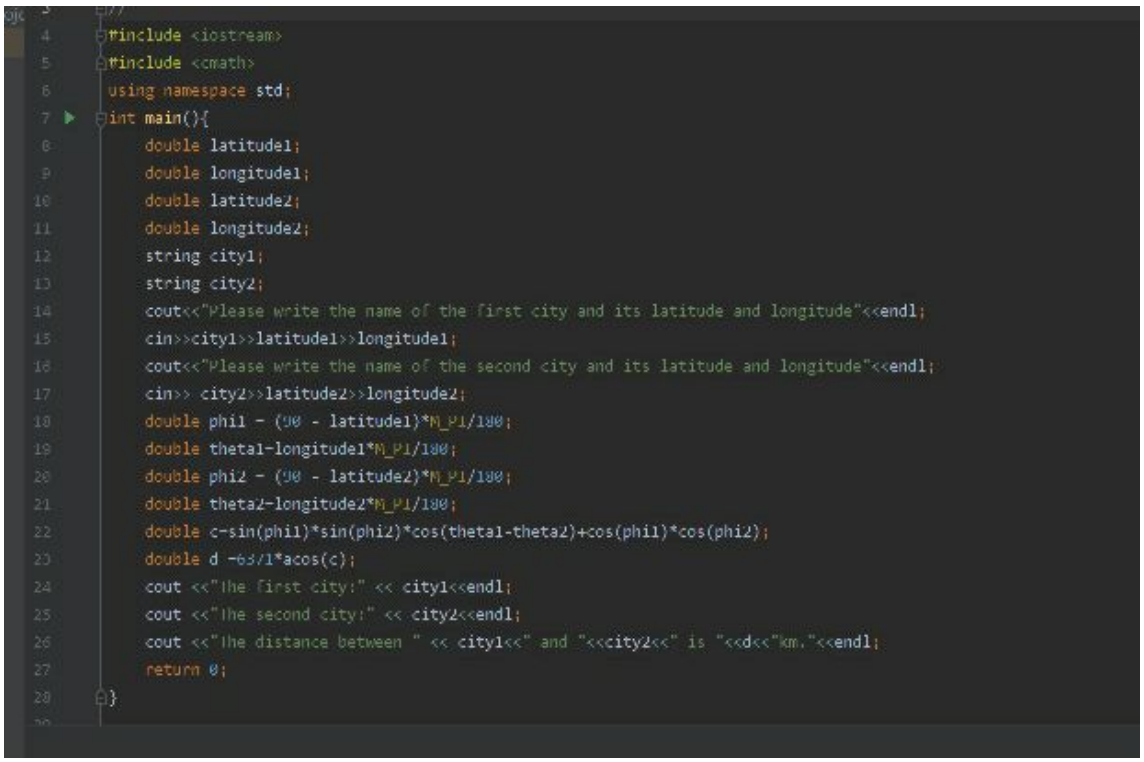

Figure 2.1: code.

3 RESULT & VERIFICATION

Test case #1:

Listing 2: Test1.

```
Please write the name of the first city and its latitude and longitude
Shenzhen
22.55
114.1
Please write the name of the second city and its latitude and longitude
Beijing
39.9139
116.3917
The first city:Shenzhen
The second city:Beijing
The distance between Shenzhen and Beijing is 1942.84km.
```

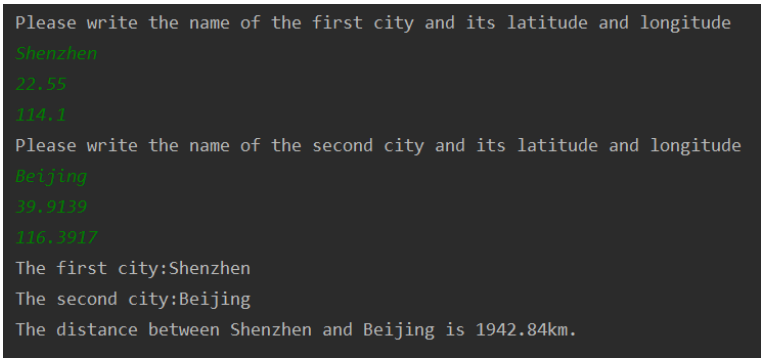

Figure 3.1: test1.

Test case #2:

Listing 3: Test2.

```
Please write the name of the first city and its latitude and longitude
Beijing
39.9139
116.3917
Please write the name of the second city and its latitude and longitude
London
51.5072
-0.1275
The first city:Beijing
The second city:London
The distance between Beijing and London is 8139.4km.
```

```
Please write the name of the first city and its latitude and longitude
Beijing
39.9139
116.3917
Please write the name of the second city and its latitude and longitude
London
51.5072
-0.1275
The first city:Beijing
The second city:London
The distance between Beijing and London is 8139.4km.
```

Figure 3.2: test2.

4 Difficulties & Solutions

To understand what the formula and model means.