

## 1. Introduction of the problem and your solution

The homework 6 is a daily problem that we need to simulate population of cities

We need to assume there are several neighbor cities arranged in a two dimensional array. And our homework is to simulate 16 cities in a 4X4 array. Also we have to simulate the variation of populations from one year to another in this homework. The solution I used include a lot of function calls and for loop because we need to calculate data by formulation too many times.

## 2. Implementation details ,Additional features of your program (data structure, flows and algorithms)

Because we were required to use the specific function to calculate the variation of populations and read file. In order to print the array on the screen, I use for loop contain the function so that they can do it sixteen times. The following is the part of my code:

```
cout<<"if we only consider the birthrate and deathrate,the population  
will be:"<<endl;  
    for(i = 0 ; i < 4 ; i++)  
        {Population(i);}  
    cout<<"if we add the economic rate to consider,the population  
will be:"<<endl;  
    for(i=0;i<4;i++)  
        {EconomicFlow(i);}  
    cout<<"if we add the living cost rate to consider,the population  
will be:"<<endl;  
    for(i=0;i<4;i++)  
        {CostFlow(i);}
```

As I show the above, the important skill is to clear where the for loop can be use. The formulation are just copy them to the corresponding functions from the Internet. However, when we compare the economic growth rate and living cost rate, we can't consider the neighbor cities top, down, left or right at the same time because it will calculate again between two city. The solution of this problem is that we compare the rate to the right cities and down cities, by this solution the calculation will not repeat.

### 3. Discussions and conclusions.

This homework have another problem is that we need to analyze if the population of these cities will stabilize (means no change for next year). So we should assume to run a long time to observe the variation. At the first time I don't how to write this part , so I discussed with some classmates. They hint me that we just need a for loop with some if-else to judge the statement correct or not. The following is the solution code of this problem:

```
for(a=0;a<100;a++)
{
    Simulate();
    for(i=0;i<4;i++){
        for(j=0;j<4;j++){
            if(population1[i][j]==population[i][j])
            {
                examine=false;
                break;
            }
        }
        if(!examine)
            break;
    }
    for(int i=0;i<4;i++)
    {
        for(int j=0;j<4;j++)
        {
            if(population1[i][j]<0)
                population1[i][j]=0;
        }
    }
    if(!examine&&a!=99)
    {
        for(int i=0;i<4;i++){
            for(j=0;j<4;j++)
            {
                population[i][j]=population1[i][j];
```

```
        }  
    }  
}  
else  
    break;  
}
```

The first for loop is to let the calculations run 100 times to calculate the population after 100 years and call Simulate function to do this. The second for loop is to check if the population stabilize during the 100 times. If it match the condition, then it will jump out the loop and check if which city's population is below the zero. If it does, then it will be set zero(means this city is deserted), and if it will not stabilize ,it will stop at the one hundred times. These skills and concepts are what I learn from this homework.