BLG 372E - Analysis of Algorithms, Spring 2011

Handed Out : 04.04.2011 Monday
Due : 18.04.2011 - Monday- 23:00

Assignment 2 – Lightening a City

Economic crisis affected many countries. AOACountry is one of these countries. The government wants to make some savings. In the cities of AOACountry, street lights are turned on all night. The cost of a turned on street light is 1 AOALiras. The government decides to turn off some lights but they still want to establish a safe, peaceful environment. Therefore, the government wants to supply at least one lighted road from a crossroad to another crossroad even if the road is not the shortest path between the crossroads. Roads consist of one or more streets. Crossroads connect the streets to each other. Streets are dual carriageway; cars both go and come back from a street.

You are going to be given a city plan of some cities in AOACountry which holds crossroads and number of lights on the streets. By supplying the restriction of the government maximum how many AOALiras can be saved for a day?

City plan documentation format:

A city consists of **m** crossroads and **n** streets. You are going to be given an input file called "cityplan.txt". The first line of the input file holds the numbers of **m** and **n** respectively. The following lines hold $\mathbf{m_i}$. and $\mathbf{m_j}$. crossroads and the number of the lights on the street between these crossroads (i != j).

As an output, **print** the lighted streets by representing them with crossroads that they connect. Give the total savings in AOALiras, and calculate and print the percentage of gain. In the last line, give the running time of the algorithm in milliseconds. You can run the algorithm for 1000 times in order to obtain a statistically significant value.

Input file format:

7	11	
0	1	7
0	3	5
1	2	8
1	3	9
1	4	7
2	4	5
3	4	15
3	5	6
4	5	8
4	6	9
5	6	10

Output format:

0 1
0 3
1 4
2 4
3 5
4 6

Total savings: 50 AOALiras

Total gain: (39 / 89) 43.82 %

Running time: 5 ms

Implementation notes:

You are allowed to use one of the algorithms that you have learned in the Analysis of Algorithms class. All your code must be written in C++ and compile and run on linux/unix using g++. You have to use standard libraries. Keep the input file name as written (cityplan.txt), and read it from your code. When you write your code, try to follow an object-oriented methodology with well-chosen variable, method, and class names and comments where necessary. Your code must compile without any errors; otherwise, you may get a grade of zero on the assignment.

Your compilation code will be g++ city.cpp –o city

Running command will be ./city

In Reports:

In your reports, explain the algorithm you have used in your code **in detail**. Analyze and write the time complexity of your algorithm. Give the data structures you have built and explain them. Explain the critical points of your algorithm and code. If you have to change the compilation and running command write it to your report exactly. Please be sure that your code can be compiled and run with these commands in Linux g++. Give inputs and outputs in your report.

Policy: You may discuss the problem addressed by the project at an abstract level with your classmates, but you should not share or copy code from your classmates or from the Internet. You should submit your own, individual project. Plagiarism and any other forms of cheating will have serious consequences, including failing the course.

Submission Instructions: Please submit your assignment through Ninova. Please zip and upload all your files using filename HW2_ studentID.zip. In the zipped file, you must include your completed report and all your program and header files.

You can create a discussion topic and discuss the assignment with your classmates and assistant through Ninova.