METU Dept. of Computer Engineering - CENG315
Fall 2013-2014 – Homework 4
(Deadline: 26th January 2014, Sunday)

January 7, 2014

1 Problem Definition

In this assignment, you are given the map of a water canal system of a countryside area. In this region, there is one source of water which should be used to supply water to two cities. The canal system is made of some junctions which are used to direct the water flow and arcs which carry the flow between the water source and the cities through junctions. Each arc in the canal system has a definite capacity. Each of the two cities desires as much water as they can get. However, to prevent disputes, you should make sure that the cities will be supplied by equal amount of water.

Design and implement and algorithm to find the amount of water which should be carried through each arc given their capacities, such that the two cities are supplied with maximum amount of water without creating a dispute.

2 Input and Output Specifications

From a file named "hw4.inp", you are going to read the number of junctions (N) and the number of arcs (M). After that there will be a triplet at each line for each arc:

i j c : specifies the arc connecting junction i with junction j with capacity c.

Indices 0, 1 and 2 correspond to the source, the first city and the second city, respectively. Junctions will have indices 3 to $N + 2$. Paremeters N, M are nonnegative integers and capacities are positive real numbers (use double data type):

N M
i_1 j_1 $capacity_1$
i_2 j_2 $capacity_2$
$\vdots$
i_M j_M $capacity_M$

To a file named "hw4.out", just write the arcs and their flow amounts in the same order with input:

i_1 j_1 $flow_1$
i_2 j_2 $flow_2$
$\vdots$
i_N j_N $flow_N$

3 Example

Content of an example "hw4.inp":

1 5
0 1 2
0 2 1
0 3 5
3 1 10
3 2 8

Content of the corresponding "hw4.out":

0 1 2
0 2 1
0 3 5
3 1 2
3 2 3

4 Other Instructions

- Water can be carried in both directions through arcs.
- The canal system will be connected.
- The cities themselves can also function as junctions.
- In the output, pairwise ordering of indices for each junction, the cities and the source are not important.
- In the case of more than one solution, output any one of them.
- The parameters N and M cannot be greater than INT_MAX.
- Submit a single file called "hw4.cpp" through the COW system.
- You are not allowed to use the algorithms library or any external library for graph algorithms.
- Since black box evaluation method is going to be used, be careful about input/output specifications. You should use space as a delimiter and do not print any unnecessary characters, white spaces etc.
- You homeworks will be tested on inek machines.
- All the work should be done individually. Your homeworks will be checked for cheating.