COMP 3711 Design and Analysis of Algorithms
Spring 2015
Programming Assignment 4

In this programming assignment, you will implement Prim's and Dijkstra's algorithm, and run them on the same graph.

You can find 4 data files at the following URLs:
http://course.cse.ust.hk/comp3711/homework/G1.txt
http://course.cse.ust.hk/comp3711/homework/G2.txt
http://course.cse.ust.hk/comp3711/homework/G3.txt
http://course.cse.ust.hk/comp3711/homework/G4.txt

Each file describes an undirected graph. The first line of the file has two integers "n, m", which are the number of vertices and the number of edges, respectively. Then each following line corresponds to an edge of the graph in the form of "u, v, w", meaning that the edge connects vertex u and v, with weight w. We will label all vertices as integers $1, 2, 3, \ldots, n$.

Your first step is to build the adjacency list representation of the graph from the file as described above. Note that each undirected edge should be stored twice in the adjacency list representation.

Then you should implement the two algorithms. Recall that there is only one small, but crucial difference between the two algorithms. After you have run the two algorithms on each graph, you should compute the total weight of the MST, as well as the distance of the shortest path from vertex 1 to vertex n.

As discussed in class, the Decrease-Key operation of the heap requires the location of the key in the heap (implemented as an array). Thus, you will need to remember the location of each vertex in the heap (say, in another array), and keep them updated as the keys in the heap move around.

What to submit:

1. A printout of your code for the two algorithms.

2. For each graph, report the weight of the MST and the distance of the shortest path from vertx 1 to vertex n.