1 Introduction and Objective

This is the last tutorial for the second part of CS2010 (Graph Algorithms). After this, we will switch to the last part of CS2010 (Dynamic Programming/DP).

We will continue discussing the SSSP problem, especially the graph modeling aspects. We will revisit Dijkstra’s algorithm, both the Original and the Modified implementation variants.

The VisuAlgo page that is used in this tutorial is still [http://visualgo.net/sssp.html](http://visualgo.net/sssp.html)
2 Tutorial 08 Questions

Standard Stuffs

Q1. In Lecture 09, you are presented with one more SSSP algorithm: Dijkstra’s algorithm, but in two implementation variants: the Original one (as defined by Dijkstra himself) and the Modified one (as commonly used in Competitive Programming world). First, the tutor will (re-)demonstrate the executions of both variants of Dijkstra’s algorithm on a small directed weighted graph using http://visualgo.net/sssp.html from a certain source vertex \( s \). The tutor will re-explain what the Original Dijkstra’s can do and cannot do, followed with similar discussion with the Modified Dijkstra’s. The tutor may invite some students to do this live demonstration using different source vertex \( s \) and/or using different graph. Finally, the tutor will discuss which variant that you should use and why?

Graph Modeling Exercises, Again

Q2. A salesman frequently needs to drive from one city to another to promote his products. Since time is of the essence, he wants to use the shortest route to get from one city to another. However in every city he passes he will have to pay a toll fee. The toll fee is the same for every city and it is a positive unit. Therefore, given two different routes of the same distance (positive unit) to get from city \( A \) to city \( B \), he will prefer the one which passes through fewer cities. An example is shown below:

![Figure 1: An Illustration](image)

To get from \( A \) to \( E \), route \( A,B,E \) is preferred over route \( A,C,D,E \) even though both have the same cost 25, since \( A,B,E \) goes through fewer cities.

Propose the best algorithm using what you have learnt so far (and a bit more), so that the salesman will choose a route from any source city \( A \) to any destination city \( B \) such that it has the shortest distance and also passes through the fewest cities. What is the running time for your algorithm?

Problem Set 5

Now the tutor will discuss Problem Set 5, Subtask A+B+C... The focus for today is to discuss what is/are so special about Subtask A+B. The tutor will only describe Subtask C vaguely and just say that it has very similar flavor to both of the graph modeling problems that we discussed in this tut08.

Online Quiz 2 Preparation

If there is still some time left, the tutor will discuss random question(s) from http://visualgo.net/training.html?diff=Hard&n=20&tl=40&module=graphds,graphtraversal,mst,sssp to prepare you all for the upcoming Online Quiz 2.