

CS2010 Semester 1 2012/2013
Data Structures and Algorithms II

E-Tutorial 06 - Shortest Paths 1

For Week 08 e-Tutorial (08 October - 12 October 2012)

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1 Introduction and Objective

Week08 of this semester is SoC turn to execute the NUS e-Learning week. It is an NUS policy post-SARS that NUS teaching staffs should be prepared conduct classes online in cases of major outbreak/disaster prevents students from physically coming to NUS.

For lecture, Steven is too tired from his Italy trip to produce a new (better) video, so he will just ask student's to view last year's version (only minor modifications compared to this year's slides).

<http://ivle.nus.edu.sg/bank/media/modvideo.aspx?KEY=7e528a4f-32bd-47a5-8619-d66ea438f0b7&ChannelID=22adcec0-b0d2-4ee1-a102-9611a4d61c45>

For tutorial, it is a bit harder to make this into an e-tutorial, as tutorial rely on heavy interaction between TAs and students. So, read and attempt the questions in this tutorial first. During our designated tutorial time, we (the tutors) will standby in front of our computer to discuss the questions over this IVLE chat room.

<https://ivle.nus.edu.sg/chatroom/chatroom.aspx?ChatID=99b30f19-d622-42af-96a0-313eec71e863>

In case you still have any doubts after this e-tutorial... Don't worry. I have planned the course such that the SSSP problem is covered with two lectures and two tutorials... We can clarify doubts during Week09 (or other sessions). Moreover, I have also asked Lab TA to re-discuss question 3 and 4 during their lab demo on Week08. Somehow lab sessions are excluded from e-learning :).

Note: As usual, use <http://www.comp.nus.edu.sg/~stevenha/visualization/sssp.html> to *verify* the answers of some questions in this tutorial. However during written tests, you have to be able to do this by yourself.

2 Tutorial 06 Questions

Shortest Path application

Q1. What are the costs of the shortest path between A and H, A and F, and A and E? Show how you will use Bellman Ford's algorithm taught in Lecture 07 to solve this question. You can assume that the edges are sorted according to increasing vertex pair labels (e.g. (A,B) before (A,C)).

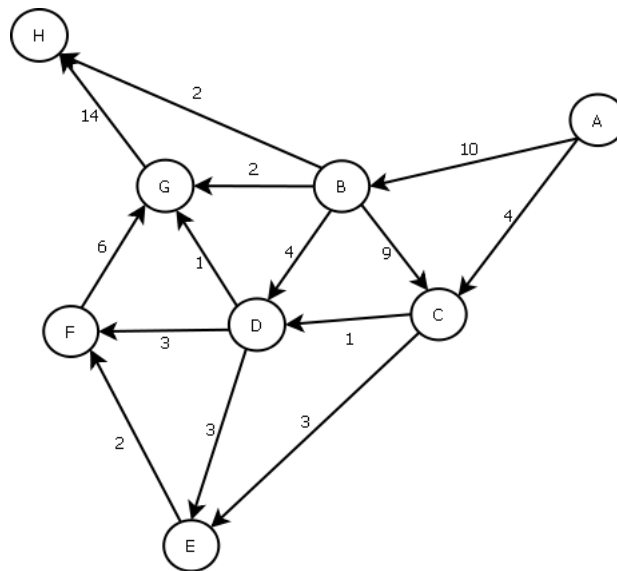


Figure 1:

Q2. Using the graph shown in Figure 1, how many times Bellman Ford's passes through all edges before you cannot see any more edge relaxations? Can this phenomenon be used to slightly improve Bellman Ford's algorithm?

Graph Modeling Exercises

Q3. Find the graph, identify the underlying shortest paths problem, and choose the best algorithm that you have learned so far to solve the problem.

UVa 12160 - Unlock the Lock

<http://uva.onlinejudge.org/external/121/12160.html>

Q4. Find the graph, identify the underlying shortest paths problem, and choose the best algorithm that you have learned so far to solve the problem.

UVa 929 - Number Maze

<http://uva.onlinejudge.org/external/9/929.html>