1 Introduction and Objective

This is the last official tutorial session for CS2040C in this semester (notice the change of timing due to ACM ICPC Jakarta 2017). We will discuss SSSP on Tree and on DAG, the surprisingly simple Floyd Warshall’s algorithm for the All-Pairs Shortest Paths problem, and interesting 2nd best shortest path problem (on small graph).

We will still use https://visualgo.net/en/sssp in this tutorial.
2 Tutorial 11 Questions

Standard Stuffs

Q1). We will start this tutorial by reviewing two other possible special cases for the SSSP problem:

1. [https://visualgo.net/en/sssp?slide=9](https://visualgo.net/en/sssp?slide=9) on Tree (we can use BFS again, or even DFS :O, as there is no cycle to take care of)

2. [https://visualgo.net/en/sssp?slide=10](https://visualgo.net/en/sssp?slide=10) on DAG (we can use topological sort first (either modified DFS or modified BFS) and process/relax outgoing edges of vertices according to the topological order)

Floyd Warshall’s Algorithm for the APSP problem

Q2. Study the following code for Floyd Warshall’s algorithm:

```java
for (int k = 0; k < V; k++)
    for (int i = 0; i < V; i++)
        for (int j = 0; j < V; j++)
            AM[i][j] = min(AM[i][j], AM[i][k]+AM[k][j]);
```

Self study this algorithm, analyze its time complexity, and mention its potential usage!

Q3. Describe an algorithm to find the 2nd shortest path (if it exist) from a source vertex $s$ to another destination vertex $t$. What is the time complexity of your algorithm? Hint: Use Floyd Warshall’s.

Open Ended Discussion

Now you are allowed to ask anything to your tutor about CS2040C, including any questions from past CS2010 final papers.

Class Photo

Let’s take a class photo with your tutor as momento (and post the photos in our Facebook Group).

All the best for your final assessment of this module and of your other modules.