CS2040C Semester 2 2021/2022

Data Structures and Algorithms

Tutorial 11 - MST and Finale

For Week 13

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1 Introduction and Objective

This tutorial/lab slot on Week 13 is set to wrap up the class (the last examinable topic is about MST) and as another open slot for past paper discussions.

We will also do a quick class photo taking session (for e-classes, please turn on your webcams).

2 Discussion

2.1 MST

In this segment, we spend some time discussing MST problem and its associated algorithms: Prim's, Kruskal's, and Boruvka's. Here are some possible discussion pointers:

1. What are the differences between (Single-Source) Shortest Paths and Minimum Spanning Tree? Follow up: What are the similarities between the two (that sometime caused the mix-up)?
2. Discuss two important properties of a generic MST algorithm:
   (a) Cycle property: A max-edge in any cycle in the graph can never be part of any MST.
   (b) Cut property: No matter how you cut the vertices of your graph, the minimum-weight edge that goes across the cut must be part of the MST.
3. Revise on how Prim's/Kruskal's/Boruvka's apply the ideas of those generic MST algorithm.

2.2 Past Paper Discussions, Open Ended

Here is the list of final paper questions that Steven found 'interesting' and 'suitable' for CS2040C final paper on Tuesday, 26 Apr 2022, 1-3pm SGT. However, since they have been asked in the past,

obviously none of them can ever appear in the real final paper this semester. Perhaps TA can just throw a vote and discuss the most voted question first, and then repeat this process until either time (maximum 1 hour, as we need the 2nd hour for one last hands-on exercise on MST) runs out (more likely) or all proposed problems below have been discussed (less likely).

1. `https://www.comp.nus.edu.sg/~stevenha/cs2040c/tests/CS2010-2015-16-S1-WQ2-medium.pdf`, Question C.1, Graph Traversal 
2. `https://www.comp.nus.edu.sg/~stevenha/cs2040c/tests/CS1020E-2016-17-S1-final.pdf`, Question B.1, Printing Integers 
3. `https://www.comp.nus.edu.sg/~stevenha/cs2040c/tests/CS2040C-2018-19-S2-final.pdf`, Question B.2, Interesting Variants 
4. `https://www.comp.nus.edu.sg/~stevenha/cs2040c/tests/CS2040C-2017-18-S1-final.pdf`, Question C.1, Isomorphic BSTs 
5. `https://www.comp.nus.edu.sg/~stevenha/cs2040c/tests/CS2040C-2018-19-S1-final.pdf`, Question C.3, From Matching to Connectivity 
6. `https://www.comp.nus.edu.sg/~stevenha/cs2040c/tests/CS2010-2011-12-S1-final.pdf`, Question 4, Vehicle Monitoring System 

Hands-on 11

TA will run the second half of this session with just one to do list:

- Hands-on: One task about MST.

Problem Set 6

We will end the tutorial with **high-level** last-minute discussion of PS6.

Class Photo

Let's take a class photo with your tutor as momento (and post the photos in Discord).

All the best for your final assessment of this module and of your other modules (PS: If you have not cleared PS6 (legally), you have to do so by Thursday morning of 14 April 2022, 07.59am).