ADVANCED ALGORITHMS 2021-2022

Assignment 1 - Minimum Spanning Trees

Aperto: lunedì, 14 marzo 2022, 10:26
Data limite: lunedì, 25 aprile 2022, 23:59

Algorithms

In the first assigment you will compare three algorithms for the Minimum Spanning Tree pro

1. **Prim's Algorithm** implemented with a Heap
2. **Naive Kruskal's Algorithm** with O(mn) complexity
3. **Efficient Kruskal's Algorithm** based on **Union-Find**

Dataset

The dataset contains 68 example graphs, ranging in size from 10 to 100,000 vertices, generat
TestCaseGenerator. Each file describes an undirected graph with integer weights using the fo

```
[number_of_nodes] [number_of_edges]
[one_node_edge_1] [other_node_edge_1] [weight_edge_1]
[one_node_edge_2] [other_node_edge_2] [weight_edge_2]
[one_node_edge_3] [other_node_edge_3] [weight_edge_3]
...
```

For example, a row "2 3 -8874" indicates that there is an edge connecting vertex 2 to vertex 3
be assumed to be positive nor distinct.

Question 1

Run the three algorithms you have implemented (Prim, Kruskal naive and Kruskal efficient) o
execution times of the three algorithms and create a graph showing the increase of executio
graph increases. Compare the measured times with the asymptotic complexity of the algorit
weight of the minimum spanning tree obtained by your code.

Question 2

Comment on the results you have obtained: how do the algorithms behave with respect to th
that is always better than the others? Which of the three algorithms you have implemented i

What to deliver

- A brief report on your project. The report must contain:
  - an introductory section with a description of the algorithms and implementation choice
  - explanatory graphs of the results with the answers to the two questions;
  - any originality you introduced in the implementation;
  - a concluding section with your comments and your conclusions on results.
- The source code of the implementation in a single archive file (.zip, .tar.gz, etc.).

How to submit the assigment

- You can do the assigment either on your own or in a group of up to three people.
- Create the group before submitting the assigment using the "Assigments: Groups self-sele
- You have to create a group even if you do the assigment on your own.
- The first assigment must be delivered by **Monday 25 April, 11:55 pm**. Late submissions ge

Final remarks

- You can implement the algorithms with any programming language you like. Basic data str
dictionaries or maps, provided by the standard libraries of the language, can be used with
libraries that directly provide data structures and algorithms to represent and manipulate
similar.
- Comment the essential parts of the code so that the reader can grasp the ideas that led yo
help to clarify whether a bug is a conceptual error or just a small mistake.

mst_dataset.zip 22 marzo 2021, 16:13

◄ Forum: group creation

Vai a...