Kickoff meeting

Dynamic Algorithms

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March 29th, 2022

The topic: Dynamic Algorithms

Topic: Dynamic Algorithms

Example: Dynamic *graph* algorithm

- Data struct structure supports edge insertions + deletions
- Answer queries of some kind (e.g., connectivity, shortest path)
- *fully dynamized* if *updates* take time $O(T(|E|)/|E|)$, where T static run time
- *Query* time should be fast, e.g. polylogarithmic for connectivity

Organization of the Seminar

Outline

- **Kickoff / Questions** (today)
- **Topic Assignment / Questions** (this week)
  - Everyone gets a topic to present (1-2 persons per topic)
  - With poll and short meeting
- **Preparation phase** (at least four weeks)
- **Weekly Presentations** (starting in May)
  - One joined or two single talks
  - 30-40 minutes talk + 10-20 minutes discussion
- **Essay Deadline** (1st of September)
  - Summarize the main ideas, at most 8 pages, LaTeX
  - Hand in via email as pdf

Outline of a Seminar Meeting

If you are not presenting:

- Follow the talk closely
- Write down questions that you have about it
- Participate in the following discussion
- You may be randomly requested to ask a question to the speaker
- Give feedback to your peers

Outline of a Seminar Meeting

If you are presenting:

- Present a selection of topics of the paper
- Focus on the main ideas, but don't be too shallow
- Stay within the time limits
- Your presentation should be understandable to the audience, especially all of *your peers*!
- Answer questions during the discussion round

Moderating a session

If you held the previous talk

- Introduce the speaker and topic
- Moderate the discussion
- You should have a question to start the discussion

Possible Structure of a Presentation

- Briefly introduce the topic
- Motivation: Why is it interesting? What are typical applications?
- Give necessary background knowledge. What techniques are used?
- Present the topic
- Conclude with a summary with open problems
- Encourage discussion

Advice for topic presentation

Before you begin:

- Understand your topic, look at the sources
- Outline your talk. Select the topics of your focus
- Find good examples, create pictures!
- Find possible questions and open topics for discussion

Advice for topic presentation

When preparing the slides and presenting:

- Provide context. Make appropriate references to previous talks
- *Go slowly.* Do not expect everybody to understand everything immediately
- Keep the slides clean. Usually one figure is better than a wall of text
- Use simple examples to illustrate ideas. Sometimes a good example is better than presenting a proof
- Use Beamer with LaTeX
- These presenation slides are a bad role model

Ressources on presentation

- Many available, e.g.,
  `http://ianparberry.com/pubs/speaker.pdf`
- Learning by doing!
- Learn from strengths and weaknesses of others
- Practise, practise, practise!

Essay

- Feel free to use the same structure as for the presentation
- LaTeX is mandatory (tutorial: `https://www.latex-tutorial.com/tutorials/`)
- 8 pages
- Template will be available on our website
- Give appropriate references

But:

- Do not simply retell the paper!

Problems?

- We only grade your presentation and essay
- Come to us if you have problems
- You can deregister within the first three weeks without a failing grades

Remarks about team presentations

- Some talks are for 2 person
- Divide the topic appropriately
- Bad idea: One person deals only with the easy part
- Joint essay: up to 16 pages (or up to 2x 8 pages)

Discussion Group?

Telegram, WhatsApp, ...

The Topics

About the topics

- We give you a starting point for research
- You have to find good sources
- Select your own main points you want to cover
- May be older/newer results

Topics

Starting point: Survey by Hanauer et al. **??**

1. Connectivity on undirected graphs:
2. Connectivity etc. on directed graphs
3. Minimum weight spanning tree
4. Cycle Detection + Topological Ordering

Topics

5. Matching (2 persons)
6. k-core
7. Motif counting (2 persons)
8. Diameter

Topics

9. Shortest Path (2 persons)

10. Min flow / max cut (2 persons)

11. Libraries for dyn. graphs More practically oriented. Should contain a demonstration

Topics

13. Reoptimzation of Steiner trees Paper [2]

14. On the Approximability of TSP on Local Modifications of Optimally Solved Instances Paper [1]

15. Fully Dynamic Algorithms for Knapsack Problems with Polylogarithmic Update Time Paper [3]

16. FULLY DYNAMIC ALGORITHMS FOR BIN PACKING: BEING (MOSTLY) MYOPIC HELPS Paper [4]

Find Date for Regular Meeting

Possible dates

- Monday 14:30
- Tuesday 10:30, 12:30, 14:30
- Thursday 10:30, 12:30

References

[1] Hans-Joachim Böckenhauer, Luca Forlizzi, Juraj Hromkovic, Joachim Kneis, Joachim Kupke, Guido Proietti, and Peter Widmayer. On the approximability of TSP on local modifications of optimally solved instances. *Algorithmic Oper. Res.*, 2(2):83–93, 2007.

[2] Hans-Joachim Böckenhauer, Juraj Hromkovic, Richard Královic, Tobias Mömke, and Peter Rossmanith. Reoptimization of steiner trees: Changing the terminal set. *Theor. Comput. Sci.*, 410(36):3428–3435, 2009.

[3] Franziska Eberle, Nicole Megow, Lukas Nölke, Bertrand Simon, and Andreas Wiese. Fully dynamic algorithms for knapsack problems with polylogarithmic update time. In Mikolaj Bojanczyk and Chandra Chekuri, editors, *41st IARCS Annual Conference on Foundations of Software Technology and Theoretical Computer Science, FSTTCS 2021, December 15-17, 2021, Virtual Conference*, volume 213 of *LIPIcs*, pages 18:1–18:17. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2021.

[4] Zoran Ivkovic and Errol L. Lloyd. Fully dynamic algorithms for bin packing: Being (mostly) myopic helps. *SIAM J. Comput.*, 28(2):574–611, 1998.