Chapter 0
Introduction

Algorithm Theory
WS 2013/14

Fabian Kuhn

About myself…

Fabian Kuhn

- PhD: ETH Zurich (2002)
- Afterwards: Microsoft Research, ETH, MIT, U. Lugano (CH)

- In Freiburg since April 2012
  Chair of Algorithms and Complexity

- Background/Research:

  Theory, algorithms (esp. distributed algorithms)

About the Course

Design and analysis techniques for algorithms

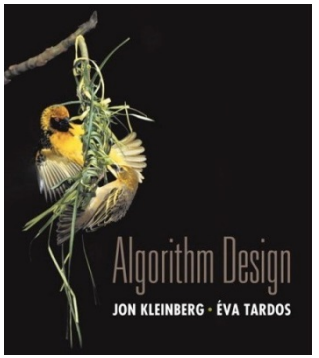
- Selection of (possible) topics:
  - Divide and conquer
  - Greedy
  - Dynamic programming
  - More on heaps, hash tables, …
  - Amortized analysis
  - Graph algorithms
  - Randomization
  - Approximation algorithms
  - Competitive analysis
  - Parallel algorithms

Requirements

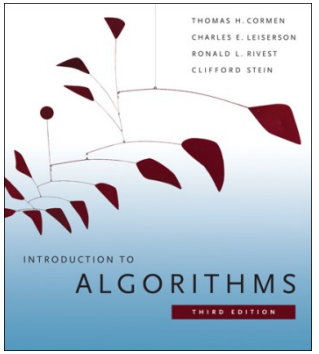
- I assume that you have basic algorithms and data structures knowledge as well as some mathematical maturity
  - E.g., from the Bachelor course Informatik 2
- In particular, you should be (at least partly) familiar with
  - Math. induction, basic combinatorics & (discrete) probability theory, …
  - Big-O notation and Landau notation more generally
  - Searching and Sorting (binary search, mergesort, quicksort)
  - Binary search trees, balanced binary search trees
  - Priority queues (heaps)
  - Hash tables
  - Basic graph-theoretic definitions
  - Representations of graphs
  - Basic graph algorithms: traversal (depth-first, breadth-first), minimum spanning trees, shortest paths

Literature

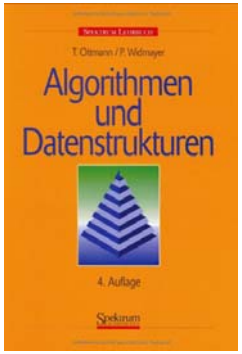
- J. Kleinberg, E. Tardos
  Algorithm Design
  Addison Wesley, 2005



- T. Cormen, C. Leiserson, R. Rivest, C. Stein
  Introduction to Algorithms, Third Edition,
  MIT Press, 2009



- T. Ottmann, P. Widmayer
  Algorithmen und Datenstrukturen
  4th Edition, Spektrum Akademischer Verlag,
  Heidelberg, 2002



- Original literature

Lecture

Lecture (101-00-026)

- Tuesday 16:15 – 18:00 (should we skip the break?)
- Thursday 10:15 – 12:00
- Roughly once every 2 weeks, there will be exercise tutorials

Language

- Lectures will be in English

General Remarks

- Theory lecture (there will be math)

Recordings

- Lectures will be recorded
- **No guarantee that there's always a recording!**

Web Page

http://ac.informatik.uni-freiburg.de

→ Teaching → WS 2013/14 → Algorithm Theory

- We will publish all important information there!
- Check the web page regularly!
- First recordings will be published as soon as the Electure page of the course is set up

Exercises

- There will be (theoretical) exercises to practice the material
  - We will provide **sample solutions**
- 7-8 problem sets: (roughly) one every two weeks
- Hand-in **electronically** by email
  - We will grade solutions that are handed in in time
- It is OK to work in groups on the exercises
  - Please only hand in the same solution once!
- It is **not necessary** to hand in exercises in order to be admitted to the exam
- **Important** to do the exercises!
  - You're highly encouraged to hand them in and have them corrected

Exercise Tutorials

Tentatively (details follows)

- Roughly bi-weekly, normal lecture hours
  - First problem set will go out on Thursday
  - I will be away in the 4^{th} week (Nov 12/14):
    We'll have only lectures in weeks 1-3 and exercise tutorials on both Tue and Thu in the 4^{th} week
- Details regarding times, ex. groups, etc. follow next Thursday
  - Probably 3 groups, at least one in English
  - Also check the web page!
- What is better? Tuesday or Thursday?

Exam

Final Exam

- Final exam will take place after the semester (probably end of February)
  - Exact date to be announced
- **No conditions for admission to the exam!**
  - Sufficient to sign up for the exam!

Midterm Exam

- Will take place in December
- Same style as final exam
  - Exact date and rules will be announced
- Counts 30% towards final grade if it is better than the final exam
  - If the final exam is better, the grade of the final exam is your final grade