Programming Challenges and Competitions

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9 February 2016
Course Plan

- Review Main Programming Concepts
- Practice on Example Problems
- Study Other Relevant Material
- Generate textbook?
Example Competitions

- ACM ICPC
- IEEE Xtreme
- Google Code Jam
- Google Distributed Code Jam
- Yandex Algorithm
Competitive Programming Reference Books

- Arefin, The Art of Programming Contest, Gyankosh Prokashoni (2006) Also available as an online resource
Algorithm Reference Books

- Sedgewick, Algorithms, Addison-Wesley, Various editions and programming languages
Online Judges

- Aizu online judge http://judge.u-aizu.ac.jp/
- Codechef https://www.codechef.com/
- Codeforces http://codeforces.com/
- PEG online judge http://wcipeg.com/main
- Sphere online judge http://www.spoj.com/
- UVA online judge https://uva.onlinejudge.org/index.php
Other Competition Websites

- Croatian Open in Informatics
  http://www.hsin.hr/coci/
- Hacker Rank https://www.hackerrank.com/
- Top coder https://www.topcoder.com/
- USA Computing Olympiad
Course topics

• Class 0: Course plan
• Class 1: data types, data structures Introduction to Algorithm Design, Algorithm Analysis
• Class 2: strings, sorting Data Structures, Sorting and Searching
• Class 3: arithmetic and algebra, combinatorics Graph Traversal, Weighted Graph Algorithms
• Class 4: number theory, backtracking Combinatorial search and heuristic methods, Dynamic programming
• Class 5: graph traversal, graph algorithms Intractable problems and approximation algorithms, How to design algorithms
Course topics

- Class 6: dynamic programming, grids A catalog of algorithmic problems, data structures
- Class 7: geometry, computational geometry Numerical problems, combinatorial problems
- Class 8: mathematics Graph problems: Polynomial time, Graph problems: Hard problems
- Class 9: TBD Computational Geometry, Set and String Problems
- Class 10: TBD
- Class 11: TBD
- Class 11: TBD
What is missing?

- Code maintainability, reliability, software engineering topics
- Other application areas
- Web development
- Scientific computing
- Parallel computing
- Data analysis
- Mobile development
- Distributed computing
- Programming languages
- Computer science ethics
Basic Course Aim

- Read two chapters per week of Skiena and Revilla Skiena
- Solve half of the example problems
- Discuss a programming technique related to the chapters – check recent journal literature
- Generate a problem each second week
Advanced Course Aim

• Write an introductory text for high school students (preferably with Estonian translation, though other translations also welcome)
• Generate interesting problems – perhaps a code force or SPOJ round
• Review previous ACM ICPC finals problems (IEEE Xtreme, Google Code Jam, Yandex Cup and KPI Open problems also ok if aiming for these)
• Review recent literature to find better algorithm implementations
Possible Search Interfaces

- Google Scholar https://scholar.google.com/
- Web of Science http://wokinfo.com/
- Scopus http://www.scopus.com/home.uri
- DPLB http://dblp.uni-trier.de/
Possible Relevant Journals

- ACM Transactions on Algorithms
  http://talg.acm.org/
- Communications of the ACM http://cacm.acm.org/
- Informatics in Olympiads
  http://www.mii.lt/olympiads_in_informatics/
- Algorithmica
  http://link.springer.com/journal/453
- For each topic, search for a recent overview paper that extends the method
Other areas to work on

• Typing speed
• Learn an editor very well
• Teamwork
• Programming language review/re-learn - C, C++, Java, Pascal, Fortran
• Deadline24 https://www.deadline24.pl/