INF102 Algorithms and Data Structures

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INF102

- Lecturer: Marc Bezem, teaching assistants: NN
- Homepage: INF102 (hyperlinks in red)
- Textbook: Algorithms, 4th edition, R. Sedgewick and K. Wayne, Pearson, 2011
- Prerequisites: INF100 + 101 ($\approx$ Ch. 1.1 + 1.2)
- Syllabus (pensum): Ch. 1.3–1.5, Ch. 2, Ch. 3, Ch. 4
- Exam: two or three compulsory exercises and a written exam
- Old exams: 2004–2013, 2014
- Contents of these slides here

Didactical stuff

- Good textbook from USA: many pages, exercises etc.
- Average speed must be ca 50 pages p/w
- Lectures focus on the essentials
- Prepare yourself by reading in advance
- Workshops about selected exercises
- Test yourself by trying some exercises in advance
- If you can do the exercises (incl. compulsory), you are fine

Generic Bags, Queues and Stacks

- Generic programming in Java, example: PolyPair
- Bag, Queue and Stack are generic, iterable collections
- Queue and Stack: Ch. 9 in textbook INF100/1
- APIs include: `boolean isEmpty()` and `int size()`
- All three support adding an element
- Queue and Stack support removing an element (if any)
- FIFO Queue, LIFO Stack
- Dijkstra's Two-Stack Expression Evaluation Movie

Implementations

- ResizingArray_Stack.java
- Resizing takes time and space proportional to size
- LinkedList_Stack.java
- Pointers take space and dereferencing takes time
- Programming with pointers: make a picture
- LinkedList_Queue.java

Computation time and memory space

- Two central questions:
  - How long will my program take?
  - Will there be enough memory?
- Example: TheeSum
- Inner loop is important

Methods of Analysis

- Empirical:
  - Run the program with randomized inputs and measure time and space
  - Run the program repeatedly, doubling the input size
  - Measuring time: StopWatch
  - Plot, log-plot, log-log-plot
- Theoretical:
  - Define a cost model by abstraction (e.g., array accesses, comparisons, operations)
  - Try to count/estimate/average this cost as function of the input (size)
  - Use $O(f(n))$ and $f(n) \sim g(n)$

ToC and topics of general interest

- Table of Contents on next slide (all items clickable)
- Practical stuff: slide 2