

Efficient Algorithms and Programming

Week2

The references to the textbook in parenthesis refer to the second edition of the book.

Reading before Monday September 3rd

You should have read Chapter 2 (chap. 3) and chapter 23 (chap. 22) before Monday September 3rd.

Exercises for Monday September 3rd

1. Problem 2-2 in Chapter 2 (3-2 in chap. 3). Only the columns O , Ω , and Θ need to be filled out.
2. Rank the following functions by order of growth; that is, find an arrangement g_1, g_2, \dots, g_{14} of the functions satisfying $g_1 = \Omega(g_2)$, $g_2 = \Omega(g_3)$, \dots , $g_{14} = \Omega(g_{13})$. Partition your list into equivalence classes such that $f(n)$ and $g(n)$ are in the same class if and only if $f(n) = \Theta(g(n))$.

$$\begin{array}{cccccccc} n^2 & n! & 2^{n+1} & 2^{2n} & \lg n & \ln \ln n & 2^n & \\ n & n \lg n & 42 & 2^{\lg n} & n \cdot 2^n & n^3 & e^n & \end{array}$$

3. Exercises 23.2-3, 23.3-1, 23.4-3, 23.4-5, 23.5-4 (22.2-3, 22.3-1, 22.4-3, 22.4-5, 22.5-4).

Programming assignment for Friday September 7th

This assignment is due Friday September 7th. It will be corrected and returned Monday September 10th.

1. Write a program (in C, C++, Java, ML,...) that reads a weighted directed graph from a file into an adjacency-list data structure and then prints the graph out in the following format: for each vertex u in the graph, the program should generate a single line:

$$u : (v_1, w_1), (v_2, w_2), \dots$$

where $v_i \in Adj[u]$ and $w_i = w(u, v_i)$.

The graphs are stored in files with the following format: The first line is a header:

n m

The first number n is the number of vertices, the second m is the number of edges. The header line is followed by a sequence of lines:

```
i j w
```

Each line represents an edge from vertex i to vertex j with weight w , where $0 \leq i, j < n$.

For example, a graph with $n = 10$ vertices and $m = 50$ edges could start like:

```
10 50
0 0 3.0
1 3 5.0
3 4 6.0
0 7 5.0
...
```

For this graph, the program should produce an output looking like

```
0: (7, 5.0), (0, 3.0), ...
1: (3, 5.0), ...
```

Sample graphs can be found on the Web at <http://www.it-c.dk/courses/EAP/Graphs/>. Hand in a print-out of your program and a print-out of the output it generates for the graphs `de10` and `sp10`.

Reading for next week

You should read Chapter 25 (chap. 24) for Monday September 10th.