

DATA STRUCTURES AND ALGORITHMS

Extra reading 8

Lect. PhD. Oneț-Marian Zsuzsanna

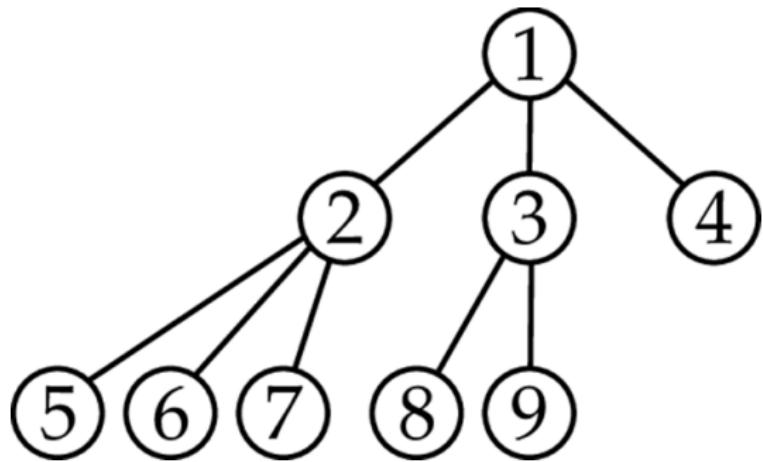
Babeș - Bolyai University
Computer Science and Mathematics Faculty

2024 - 2025

- This extra reading contains a problem statement taken from <https://open.kattis.com/problems/chewbacca>, an archive with a lot of programming problems. Obviously, this problem is somehow related to what we have recently discussed at the lectures.
- The solution and explanation for the problem will be given in the next extra reading.

Problem statement I

- You are given a tree of out-degree K with N nodes or, in other words, each node can have at most K children. The tree is constructed so it is of the “lowest energy”: the nodes are placed in a new depth of the tree only when all the places (from left to right) in the previous depth have been filled. This is also the order of enumerating the nodes, starting with 1. Figure 1 depicts an example of a tree of order 3 with 9 nodes.



- Given two nodes, x and y ($x \neq y$, both valid numbers in the tree) determine the minimum number of steps to get from node x to y . For the above example:
 - $\text{minDist}(5, 9) = 4$
 - $\text{minDist}(5, 3) = 3$
 - $\text{minDist}(5, 7) = 2$
 - $\text{minDist}(7, 2) = 1$
- Hint:** Try to solve the problem for $K = 2$. Can you generalize for any K based on that solution?