

Trees

Metodický koncept k efektivní podpoře klíčových odborných kompetencí s využitím cizího jazyka ATCZ62 - CLIL jako výuková strategie na vysoké škole

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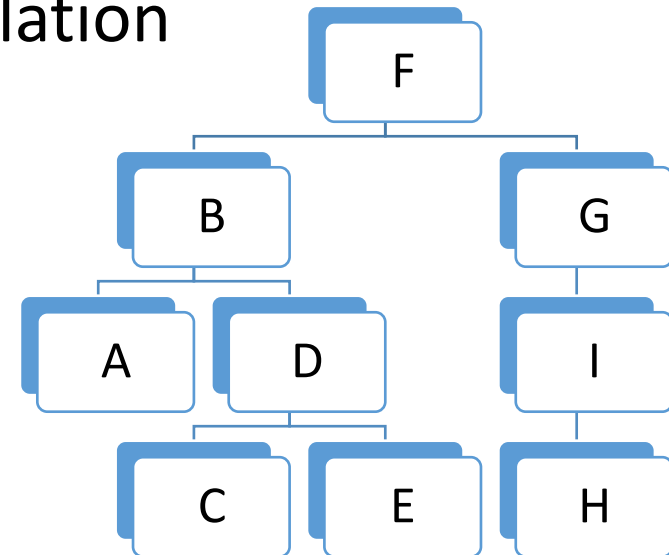
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Tree

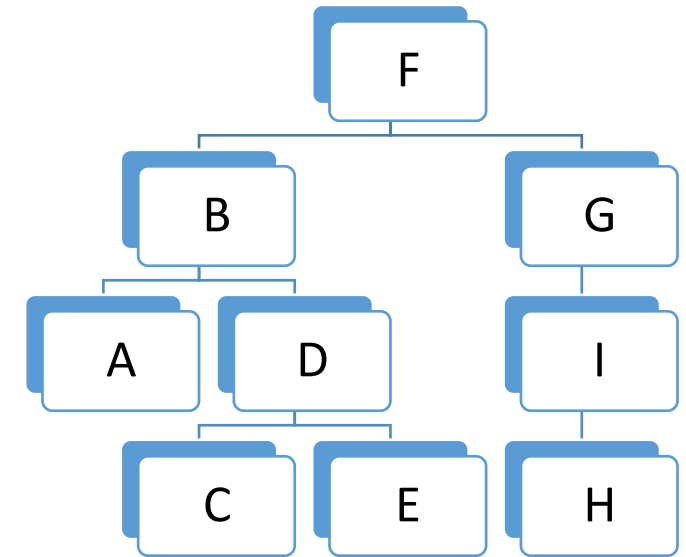
- In computer science, a tree is an abstract model of a hierarchical structure
- A tree consists of nodes with a parent-child relation
- Applications:
 - Organization charts
 - File systems
 - Programming environments



Tree Terminology

- Root: node without parent (A)
- Internal node: node with at least one child (A, B, C, F)
- External node (a.k.a. leaf): node without children (E, I, J, K, G, H, D)
- Ancestors of a node: parent, grandparent, grand-grandparent, etc.
- Depth of a node: number of ancestors
- Height of a tree: maximum depth of any node (3)
- Descendant of a node: child, grandchild, grand-grandchild, etc

- Subtree: tree consisting of a node and its descendants



Tree – ADT

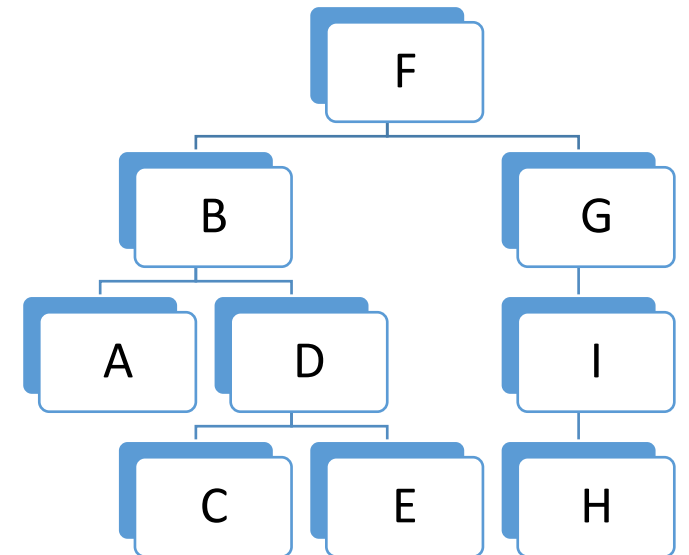
- Generic methods:
 - integer size()
 - boolean isEmpty()
 - objectIterator elements()
 - positionIterator positions()
- Accessor methods:
 - position root()
 - position parent(p)
 - positionIterator children(p)
- Query methods:
 - boolean isInternal(p)
 - boolean isExternal(p)
 - boolean isRoot(p)
- Update methods:
 - swapElements(p, q)
 - object replaceElement(p, o)
- Additional update methods may be defined by data structures implementing the Tree ADT

Trees - traversal

- Pre-order Traversal
 - Check if the current node is empty / null.
 - Display the data part of the root (or current node).
 - Traverse the left subtree by recursively calling the pre-order function.
 - Traverse the right subtree by recursively calling the pre-order function.
- In-order průchod
 - Check if the current node is empty / null.
 - Traverse the left subtree by recursively calling the in-order function.
 - Display the data part of the root (or current node).
 - Traverse the right subtree by recursively calling the in-order function.

Tree Traversal

- Post-order průchod
 - Check if the current node is empty / null.
 - Traverse the left subtree by recursively calling the post-order function.
 - Traverse the right subtree by recursively calling the post-order function.
 - Display the data part of the root (or current node).
- Pre-order: F, B, A, D, C, E, G, I, H
- In-order: A, B, C, D, E, F, G, H, I
- Post-order: A, C, E, D, B, H, I, G, F



Binary tree

- A binary tree is a tree with the following properties:
 - Each internal node has two children
 - The children of a node are an ordered pair
- Applications:
 - arithmetic expressions
 - decision processes
 - searching

Binary Tree – ADT

- The BinaryTree ADT extends the Tree ADT, i.e., it inherits all the methods of the Tree ADT
- Additional methods:
 - position leftChild(p)
 - position rightChild(p)
 - position sibling(p)
- Update methods may be defined by data structures implementing the BinaryTree ADT