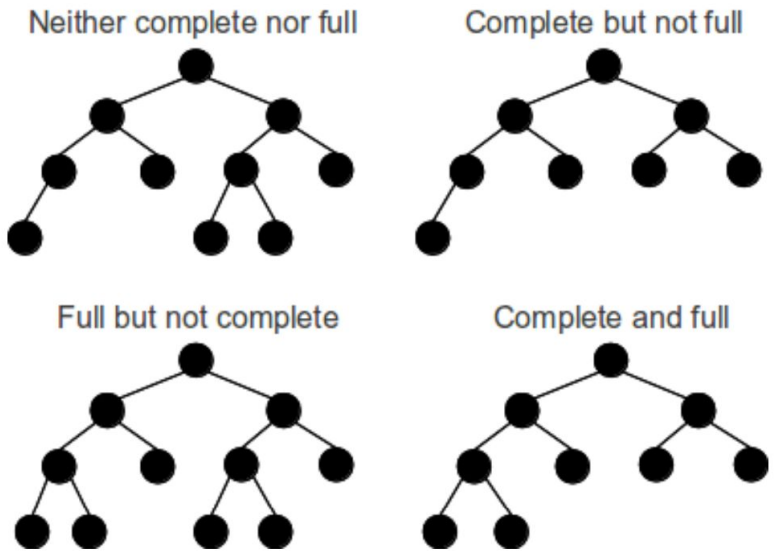
Lab 04: Tree Traversal

Data Structure 2023

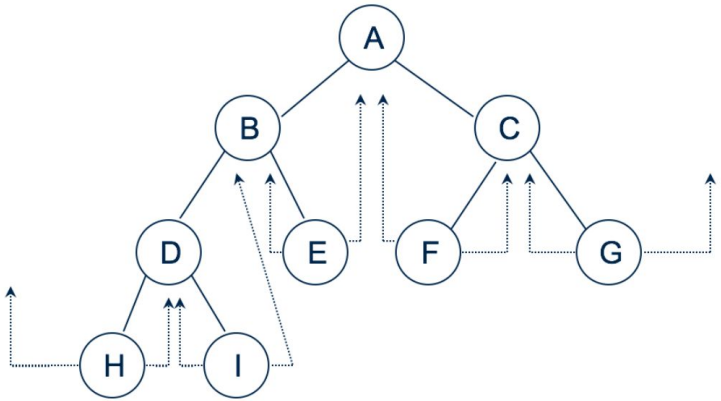
Binary Tree

- **Full binary tree** is a binary tree in which every node has 0 or 2 children
- **Complete binary tree** is a binary tree in which every level, except the last, is completely filled and the last level has all its nodes to the left side



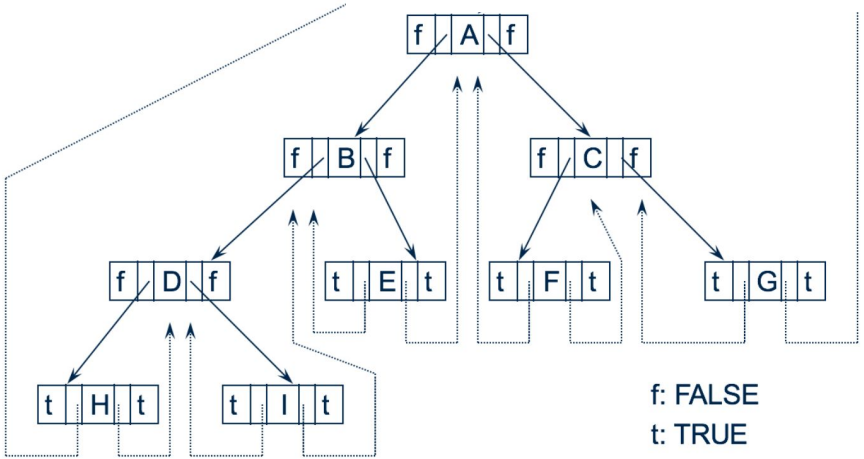
Threaded Binary Tree

- There are n+1 null links out of 2n total links
- Replace the null links by pointers, called threads to other nodes in the tree
  - if ptr -> leftChild is null, replace the null with a pointer to the node that would be visited before ptr in an in-order traversal
  - if ptr -> rightChild is null, replace the null with a pointer to the node that would be visited after ptr in an in-order traversal



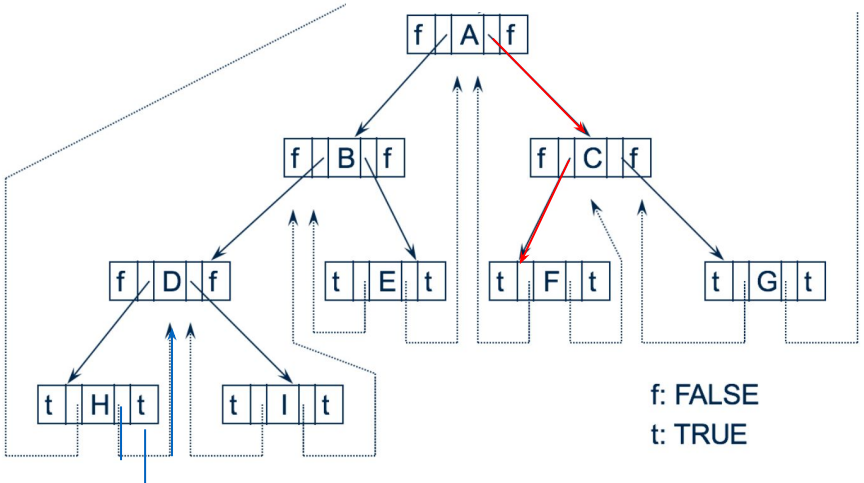
Threaded Binary Tree

- if ptr -> leftThread is True, ptr -> leftChild contains a thread
- if ptr -> leftThread is False, ptr -> leftChild contains a pointer to the left child



Threaded Binary Tree

- **Find the in-order successor of ptr without using stack**
  - **if ptr -> rightThread = TRUE, ptr = ptr-> rightChild**
  - **otherwise follow a path of leftChild links from the rightChild of ptr until we reach a node with leftThread = TRUE**



Threaded Binary Tree ADT

- **CreateTree** **create a root** of new threaded binary tree.

- **Insert** insert a new node in tree. If dynamic allocation is failed, just print error message.
  Do not use recursive functions of stack.
- **printInorder** print the tree by inorder traversal. **Do not use recursive functions of stack.**

- **DeleteTree** free all memory of the threaded binary tree.

Threaded Binary Tree ADT

Structure

```
struct ThreadedTree {
    int left_thread; // flag if ptr is thread
    ThreadedPtr left_child;
    ElementType data;
    ThreadedPtr right_child;
    int right_thread; // flag if ptr is thread
}ThreadedTree;
```

Function

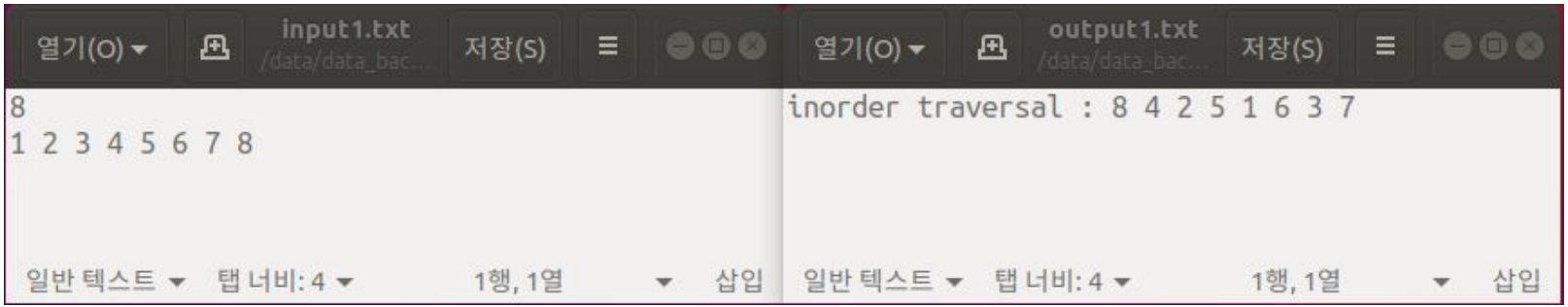
```
ThreadedPtr CreateTree();

int Insert(ThreadedPtr root, int root_idx,
        ElementType data, int idx);

void printInorder(ThreadedPtr root);

void DeleteTree(ThreadedPtr root);
```

Input & Output Example



Assignment

- Due
  - **~ 2023.04.05(Wed) 23:59**
  - Last Commit 기준

- 자세한 내용은 과제 명세 PDF 파일 참고