Tree

quarta-feira, 16 de outubro de 2024 13:49

Each node of a tree is an object that contains key attribute and pointers to other nodes

↳ Can vary depending on the type of the tree

- Binary tree

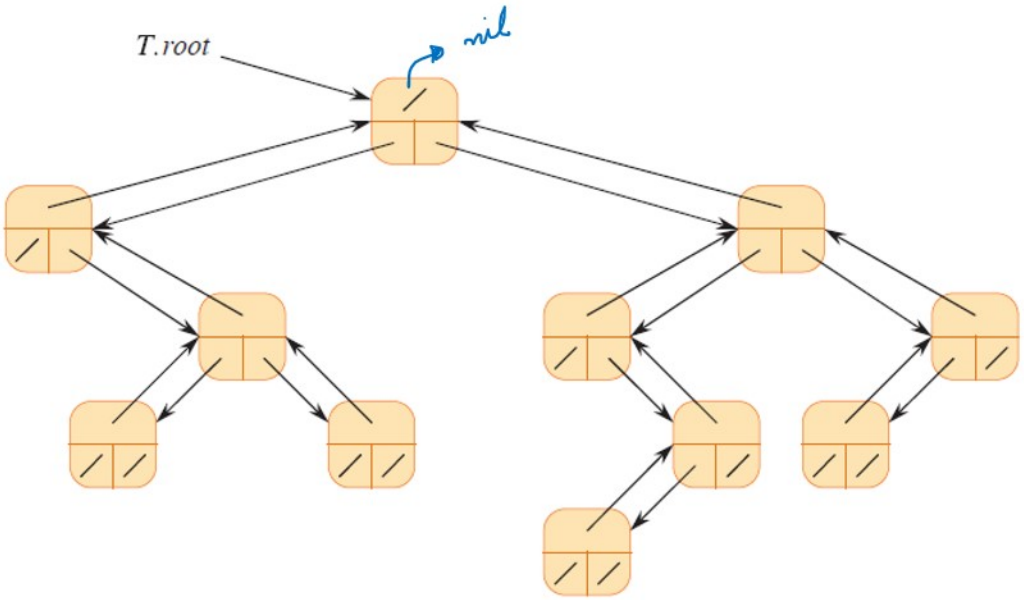


Figure 10.6 The representation of a binary tree T. Each node x has the attributes $x.p$ (top), $x.left$ (lower left), and $x.right$ (lower right). The *key* attributes are not shown.

Store pointers to the parent & childs on each node

Binary trees

Figure 10.6 shows how to use the attributes p, $left$, and $right$ to store pointers to the parent, left child, and right child of each node in a binary tree T. If $x.p = \text{NIL}$, then x is the root. If node x has no left child, then $x.left = \text{NIL}$, and similarly for the right child. The root of the entire tree T is pointed to by the attribute $T.root$. If $T.root = \text{NIL}$, then the tree is empty.

- Rooted trees with unbounded branching

↳ Can use the example above to grow the number of childrens

Uses $O(n)$ space for a n-node rooted tree

↳ left-child, right-sibling representation

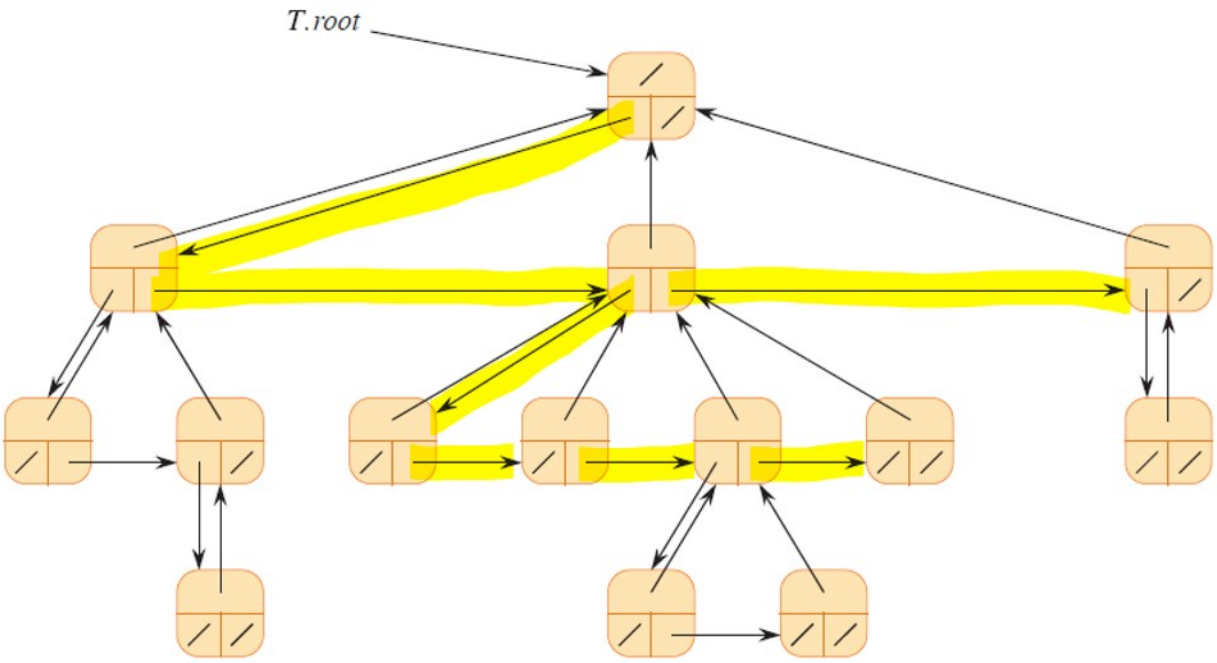


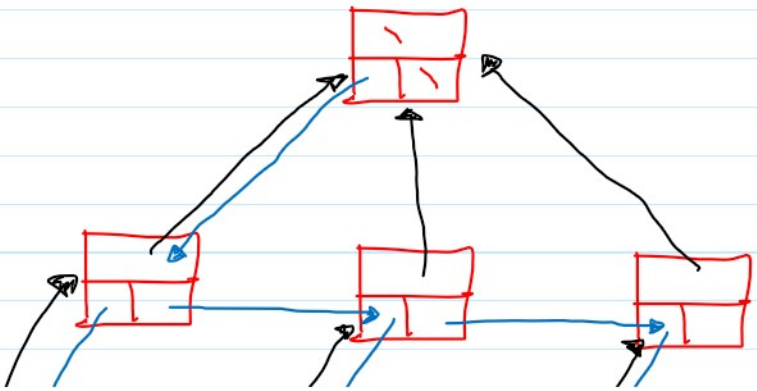
Figure 10.7 The left-child, right-sibling representation of a tree T. Each node x has attributes $x.p$ (top), $x.left\text{-}child$ (lower left), and $x.right\text{-}sibling$ (lower right). The *key* attributes are not shown.

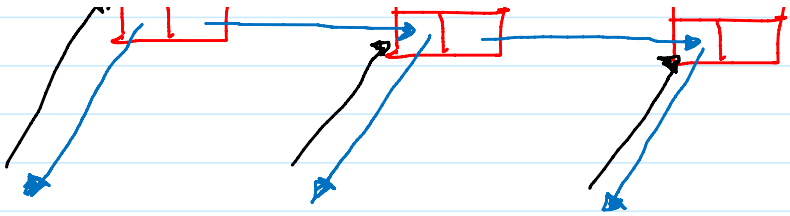
↳ Each node has a parent pointer, pointing to the root

↳ Each node x has only 2 pointers (instead of pointers to each children)

- x.left-child → left child
- x.right-sibling → Points to the first sons (left one)

↳ But all the parents points to it's fathers

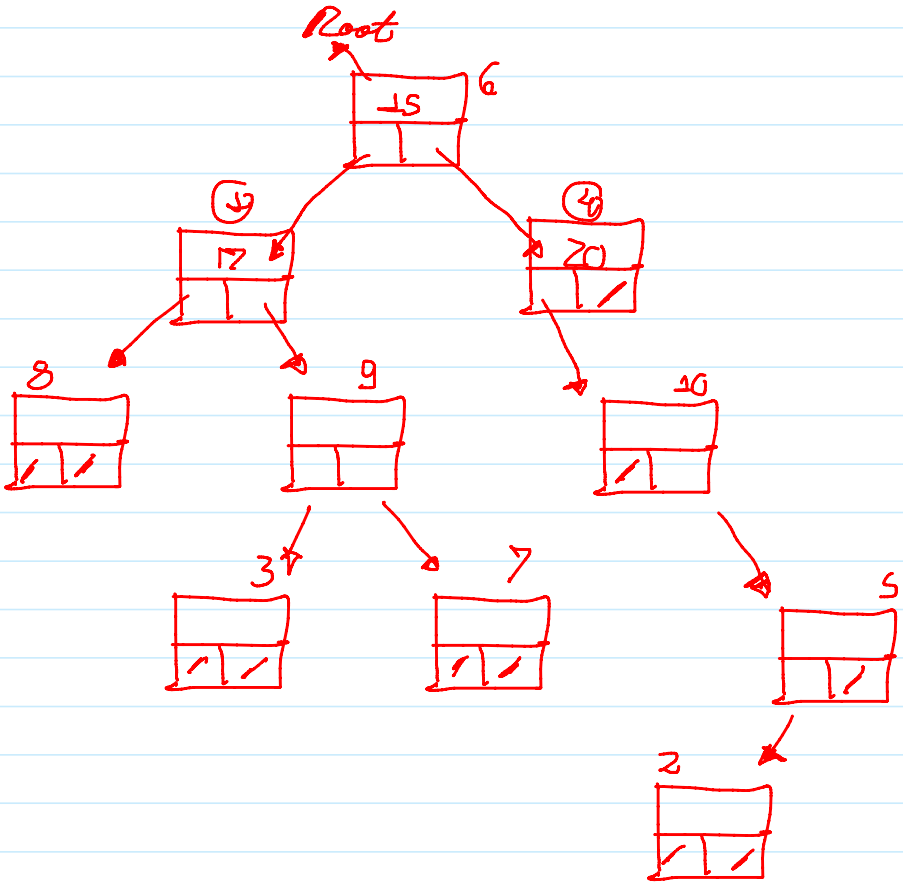




10.3-1

Draw the binary tree rooted at index 6 that is represented by the following attributes:

index	*key*	*left*	*right*
~~1~~	17	8	9
~~2~~	14	NIL	NIL
~~3~~	12	NIL	NIL
~~4~~	20	10	NIL
~~5~~	33	2	NIL
~~6~~	15	1	4
~~7~~	28	NIL	NIL
~~8~~	22	NIL	NIL
~~9~~	13	3	7
~~10~~	25	NIL	5



→ Represent a node in a Btree

Class

- value
- pointer to the root
- pointer to the right child
- pointer to the left child

- traverse it —
- get the value —
- define values