

# Lecture C7: Trees

## Response to 'Muddiest Part of the Lecture Cards'

(8 respondents)

### 1) *Are there traversal algorithms for evaluating non-binary (m-ary) trees?*

Yes there are. The traversal algorithms (Preorder, postorder, and inorder) shown in class all operated on binary trees. For general trees (including m-ary trees), the traversal algorithms are defined with meanings similar to their binary tree counterparts:

- The preorder traversal of a general tree, first visits the root of the tree, then performs a preorder traversal of each subtree from left to right.
- The postorder traversal of a general tree, first traverse the root's subtrees from left to right and then visit the root.
- The Inorder traversal of a general tree does not have a natural definition. You can make up an arbitrary definition, e.g., visit the leftmost subtree in inorder, then the root, then visit the remaining subtrees in inorder. However, inorder traversal is usually not used for general trees.

### 2) *Are there special packages for trees?*

No direct support for trees is included in the pre-defined language libraries. In class today you got a package for handling trees, and if you search the web, I am sure there are other packages available as well.

### 3) *Recursion is still fuzzy ... where should we review the code for recursion algorithm?*

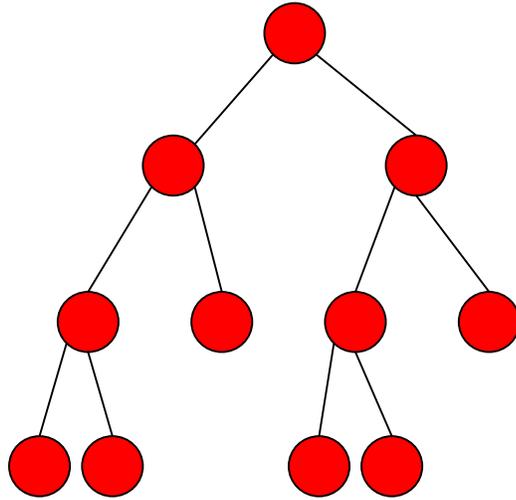
If recursion is fuzzy, then there are a number of different things you can do:

1. Read through Feldman chapter 14, the case study on page 622, and pages 647-650.
2. Read chapter 4.5 in Brookshear.
3. Look at lecture slides from fall term
4. Set up an appointment with me or one of the TAs and see if we can explain it for you.

### 4) *Can you re-explain balanced trees? Why is it not same # of leaves on left and right side?*

A balanced tree is not necessarily one that has the same number of leaves in both the left and the right sub-trees. The definition of a balanced tree  $T$  of height  $H$ , as given in class, said: all leaves will be at level  $H$  or level  $H-1$ . If the tree is full and balanced, you can determine the height of the tree from the number of leaf nodes. This is discussed in greater detail in the next question.

5) *If balanced means height H and H-1, then how is  $H = \lceil \log_2 L \rceil$  ?*



*Which is full and balanced*

$$\lceil \log_2 6 \rceil = 3$$

The definition said  $H = \lceil \log_2 L \rceil$  The difference here being, not using ‘( and )’ but rather the ‘ceiling function’  $\lceil X \rceil$ .

The ceiling of x (written  $\lceil X \rceil$ ) takes real value x and returns the least integer  $\geq x$ . For example  $\lceil 3.4 \rceil = 4$ , and  $\lceil \log_2 6 \rceil = 3$ .

6) *No mud, interesting stuff!, very good lecture, ...* (4 student)