GeeksforGeeks

A computer science portal for geeks

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Applications of tree data structure

Difficulty Level: Rookie

Why Tree?
Unlike Array and Linked List, which are linear data structures, tree is hierarchical (or non-linear) data structure.

1) One reason to use trees might be because you want to store information that naturally forms a hierarchy. For example, the file system on a computer:

file system
———

```
      /    <-- root
   /       \
...         home
      /           \
   ugrad         course
    /          /    |    \
  ...       cs101 cs112 cs113
```

2) If we organize keys in form of a tree (with some ordering e.g., BST), we can search for a given key in moderate time (quicker than Linked List and slower than arrays). Self-balancing search trees like AVL and Red-Black trees guarantee an upper bound of O(Logn) for search.

3) We can insert/delete keys in moderate time (quicker than Arrays and slower than Unordered Linked Lists). Self-balancing search trees like AVL and Red-Black trees guarantee an upper bound of O(Logn) for insertion/deletion.

4) Like Linked Lists and unlike Arrays, Pointer implementation of trees don't have an upper limit on number of nodes as nodes are linked using pointers.

As per Wikipedia, following are the common uses of tree.
1. Manipulate hierarchical data.
2. Make information easy to search (see tree traversal).
3. Manipulate sorted lists of data.
4. As a workflow for compositing digital images for visual effects.
5. Router algorithms

References:
http://www.cs.bu.edu/teaching/c/tree/binary/
http://en.wikipedia.org/wiki/Tree_%28data_structure%29#Common_uses

Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above.

Related Topics:

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- Advantages of BST over Hash Table
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- Vertex Cover Problem | Set 2 (Dynamic Programming Solution for Tree)
- Check whether a binary tree is a complete tree or not | Set 2 (Recursive Solution)
- Check whether a binary tree is a full binary tree or not

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cbt • 9 months ago

i have noticed a lot forums citing file systems as an example and most of the academics cover binary tress with two children. However, in file systems we have multiple children in the hierarchy. which tree flavor is implemented here?

2 • Reply • Share ›

thevagabond85 ➚ cbt • 5 months ago

even in above example the course node has three children - course
cs101 cs112 cs113(and not two) obviously its a n-tree and not binary tree.

• Reply • Share ›

candycrush • 2 years ago

how can these trees be implemented in a file system..

9 • Reply • Share ›

Gayathri Ganesan • 2 years ago

explain more details regarding red black trees.

• Reply • Share ›

Gayathri Ganesan • 2 years ago

explain more details regarding red black trees.

1 • Reply • Share ›

Nishant Mishra • 3 years ago

Isn't the Expression Parser of our C compiler uses Binary tree for Parsing...??

```
/* Paste your code here (You may delete these lines if not writing code) */
```

• Reply • Share ›

DS+Algo=Placement ➚ Nishant Mishra • a year ago

Can u explain, how?

1 • Reply • Share ›

sandyg • 3 years ago

Binary Search Tree - Used in many search applications where data is constantly entering/leaving, such as the map and set objects in many languages' libraries.
Binary Space Partition - Used in almost every 3D video game to determine what objects need to be rendered.
Binary Tries - Used in almost every high-bandwidth router for storing router-tables.

Hash Trees - used in p2p programs and specialized image-signatures in which a hash needs to be verified, but the whole file is not available.
Heaps - Used in heap-sort; fast implementations of Dijkstra's algorithm; and in implementing efficient priority-queues, which are used in scheduling processes in many operating systems, Quality-of-Service in routers, and A* (path-finding algorithm used in AI applications, including video games).
Huffman Coding Tree (Chip Uni) - used in compression algorithms, such as those used by the .jpeg and .mp3 file-formats.
GGM Trees - Used in cryptographic applications to generate a tree of pseudo-random numbers.
Syntax Tree - Constructed by compilers and (implicitly) calculators to parse expressions.
Treap - Randomized data structure used in wireless networking and memory allocation.
T-tree - Though most databases use some form of B-tree to store data on the drive, databases which keep all (most) their data in memory often use T-trees to do so

28 ^ | v • Reply • Share ›

Chan sandyg • 2 years ago
very useful information.
6 ^ | v • Reply • Share ›

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  try understanding with an example.. first try...

  Delete nodes which have a greater value on right side · 2 minutes ago

- Mr. Lazy

  seriously dude? :P...

  Dynamic Programming | Set 4 (Longest Common Subsequence) · 3 minutes ago

- xtreme

  a slighty simplified-
  http://ideone.com/puDM7c

  Delete nodes which have a greater value on right side · 8 minutes ago

- Mr. Lazy

  No, It shouldn't be because we are looping from...

  Dynamic Programming | Set 4 (Longest Common Subsequence) · 9 minutes ago

- Manish M Berwani

  Yeah its d simplest of all and the first thing...

  Find k-th smallest element in BST (Order Statistics in BST) · 47 minutes ago

- hackdown

  Was the online test arranged by them on some...

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