1

Categories

1.1 Primative Types

Primatives: Wiki Link

These are the basic elements:

1. Bool
2. char
3. float
4. double
5. int
6. string
7. reference
8. enum

1.2 Composite Types

Composites: Wiki Link

1.3 Abstract Data Types

Abstract Types: Wiki Link

1.4 Linear Data Structures

2

Abstract Data Types

Abstract data types (ADT) → its only a data structure if you're talking about the implimentation

2.1 Trees

Tree: Wiki Link

A tree is a data structure made up of nodes connected by edges without having a cycle in it (a node cannot call itself in anyway). A linear list is a trivial tree.

Search Tree

Search Tree: Wiki Link

Nodes	A vertex connected to other vertexes by edges, in a tree nodes are connected by edges
Edge	Connections to other nodes
Subtrees	A connected group of children nodes connected to a parentthats not the root
Digraph	
Root	Top node of a tree
Child	A node directly connected to another, away from the root
Parent	Directly connected node towards the root. Can only have 1 parent as this causes cycles.
Sibling	Node with same parent
Decendant	Node accessible by parent to child
Ancestor	Node accessible by traversing child to parent
Leaf	(or external node) A node with no children (degree 1)
Branch	(or internal node) A node with children (degree >1)
Degree	The number of edges on a nodes
Path	Sequence of nodes and edges to reach another node
Level	1+connections to root of a node. (R)-( )-( )-(A) A has level4.
Node Height	Number of edges on the longest path between that node and a leaf.
Depth	Number of edges from the root to a given node
Forest	A set of disjointed trees
Branching Factor	Maximum number of children per node

Tree data structure used for locating specific keys from within a set. Needs to be relatively balanced to be efficient.

Binary Trees

Binary Trees: Allisons Link
Binary Trees: Wiki Link

Hash Tree

Hash Array Tree: Wiki Link
Merkle Tree: Wiki Link

2.2 Trie

Trie: Wiki Link

Type of search tree. No node stores the key associated with its node, the position in the tree decides its key. All of the decendants of a node have the same prefix, the root is an empty string.
Commonly used for autocomplete and predictive text.
A trie can replace hash table:

- Worst case lookup is better
- No key collisions
- Buckets are only necessary if a key identifies multiple values
- Can provide alphabetical ordering

Drawbacks:

- Tends to be slower than a hash for lookups
- Floats can cause nasty long search chains
- Can require more memory as the keys are split up instead of contiguous

2.3 Sets

Sets: Wiki Link

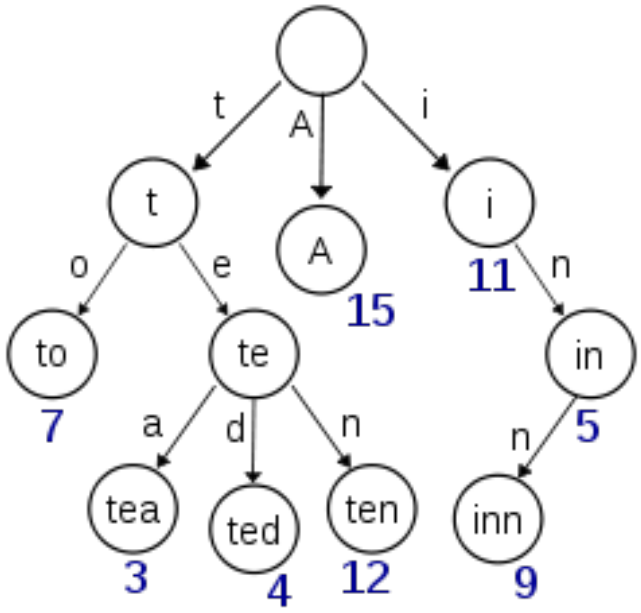


Table 2.1: **Time Complexity**

Algo	Ave	Worst
Space	O(n)	O(n)
Search	O(1)	O(n)
Insert	O(1)	O(n)
Delete	O(1)	O(n)

Table 2.2: Hash table terms

Key	The name of a value/ attribute
Bucket	The array elements. Typically a dynamic array
Slot	Synonym for bucket
Hash function	computes the index from a key
Load Factor	$\frac{entries}{buckets}$ The higher the load factorthe slower the search, the lower the load facter the more memory wasted.

2.4 Hashes

Hash function

Hash Table

Hash Table: Wiki Link

Hash tables tend to be faster than other table data structures, degrading to the same average lookup time of an unordered array only in the worst case senario. If the hash function is complex and the entry count small, this advantage can be lost.

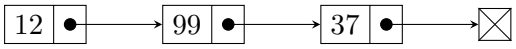
A hash table is an associative array (i.e. a dictionary) that maps keys to values. Puts a key through a hash function to find/retrieve an index to an array of buckets

Collision Resolution

Separate Chaining	Buckets have a list of their own entries to a single has, if the hash matches and the key doesn't do a linear search of the list
Open Addressing	On a collision, the new entry takes the next open slot. Useful if memory is an issue and the entries are smaller that $\sim 4\times$ sizeof(*)

2.5 Linked Lists

Singley linked lists



Doubley linked lists

2.6 Queue

Queue: Wiki Link

Fifo

2.7 Heap

The Heap: Wiki Link

2.8 Stack

The Stack: Wiki Link

Opposite of a queue $\rightarrow$ LIFO

2.9 Ring Buffer

Ring Buffer: Wiki Link

Union

Tagged Union