



ADVANCED DATA STRUCTURES AND ALGORITHMS

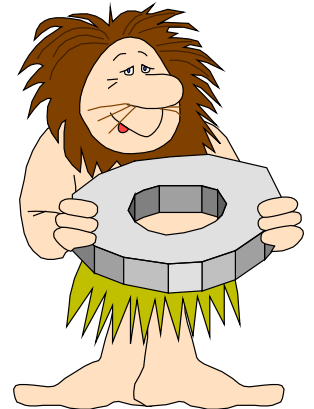
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What this Lecture is about:

- ⚙ Data Structures
- ⚙ Algorithms
- ⚙ Dynamic and Static data structures
- ⚙ Data types
- ⚙ Types of Data structures
 - ❖ Linear data structure
 - ❖ Nonlinear data structure



Data Structures

A **data structure** is a collection of data items stored in memory, in addition a number of operations are provided by the software to manipulate that data structure.

A data structure means there is a relationship of some kind between the data items.

Some of the more commonly used data structures include **lists**, **arrays**, **stacks**, **queues**, **heaps**, **trees**, and **graphs**.



Data Structures



Typical operations on a data structure are:



ADD

INSERT

DELETE or
REMOVE

FIRST

NEXT

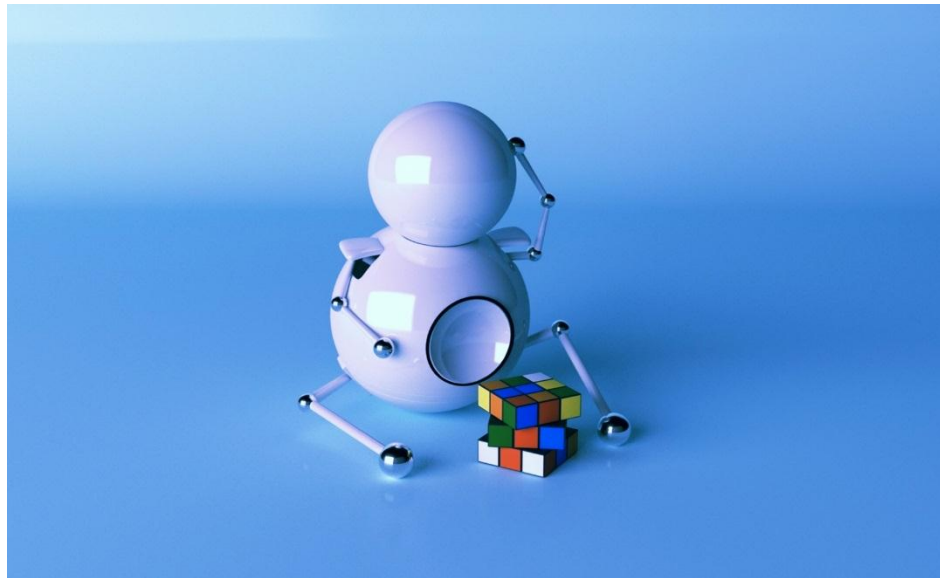
LAST

LOCATE

Algorithms

Commonly used algorithms include are useful for:

- A.** Searching for a particular data item (or record).
- B.** Sorting the data.
- C.** Iterating through all the items in a data structure.



Dynamic and Static data structures

- ❖ With a static data structure, the size of the structure is fixed. Static data structures are very good for **storing a well-defined number of data items**.
- ❖ There are many situations where the number of items to be stored is not known before **dynamic data structure**hand. In this case the programmer will consider using a.

STATIC ARRAY

Example: `int array [9];`

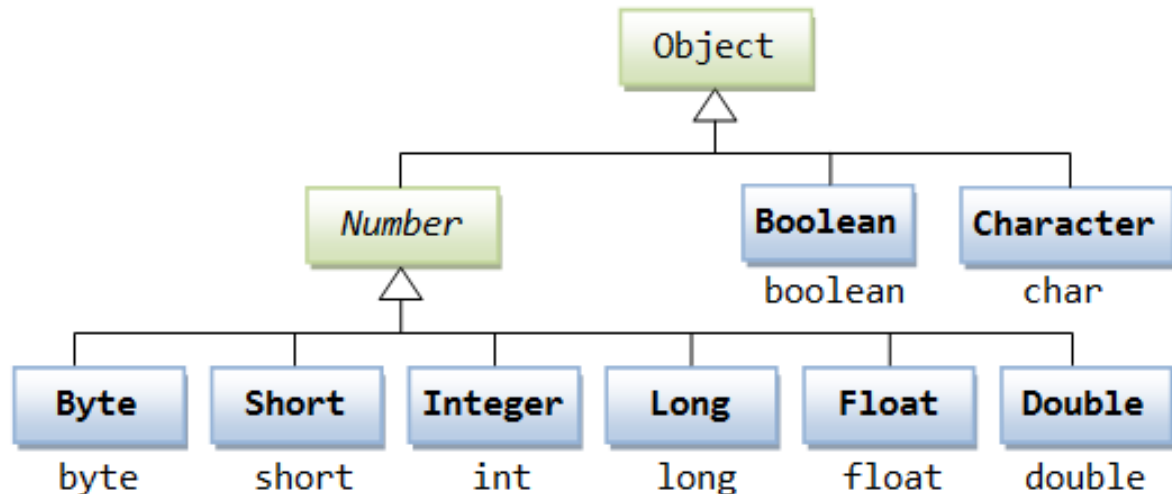
0	1	2	3	4	5	6	7	8
---	---	---	---	---	---	---	---	---

array

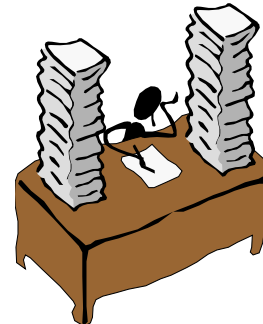
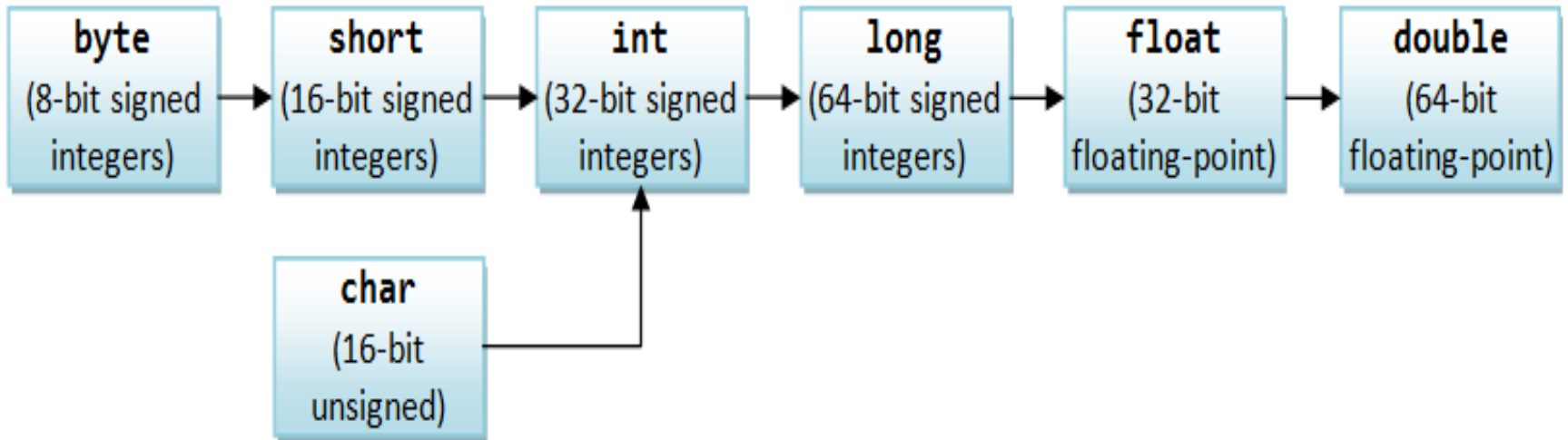
Data types

A data *type* is a well-defined collection of data with a well-defined set of operations on it.

- ❖ Boolean
- ❖ Character
- ❖ Number
- ❖ Double
- ❖ Float



Data types

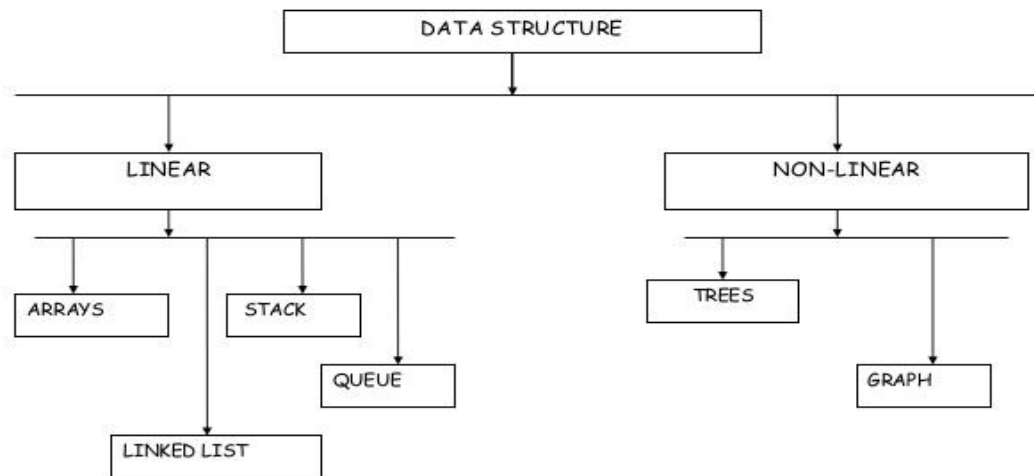


Types of Data structures

There are two types of data structure Linear and Nonlinear

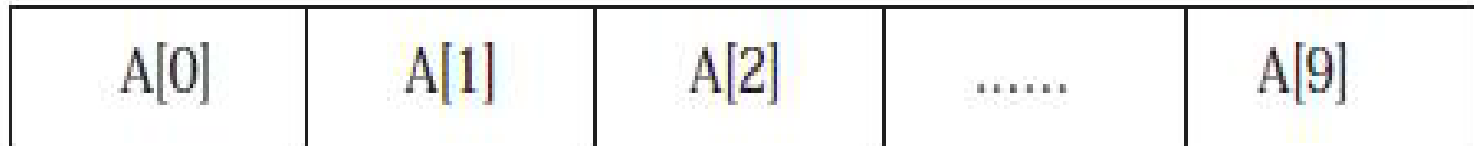
- 1) Linear data structure
- 2) Nonlinear data structure

Types of Data Structures

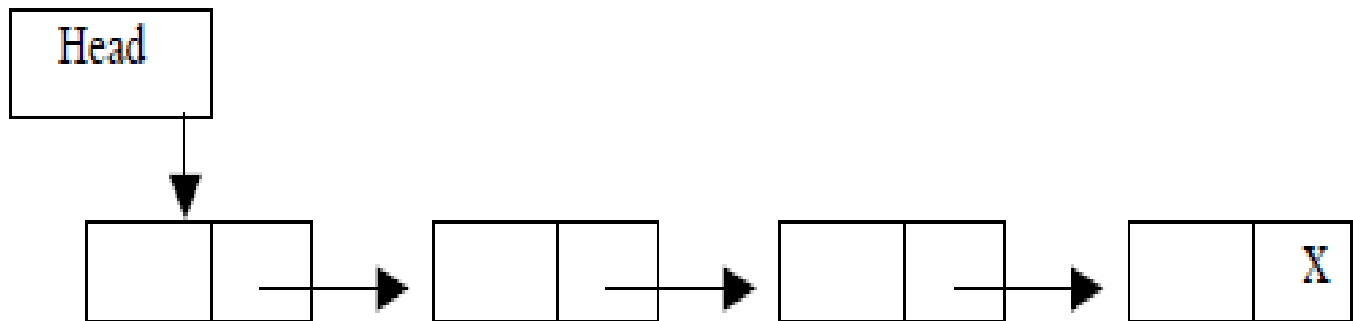


Array

Array is a data structure consisting of a collection of elements (values or variables), each identified by at least one array index or key.

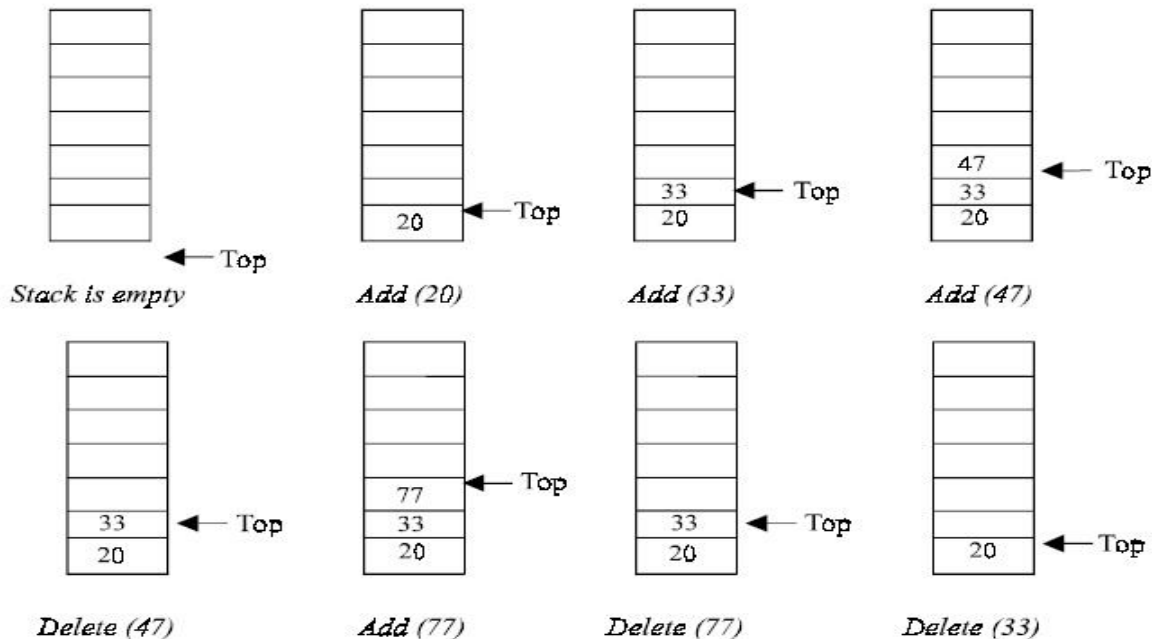


A **list** represented by displaying the relationship between the adjacent elements is said to be a linear list. Each element is referred to as nodes.



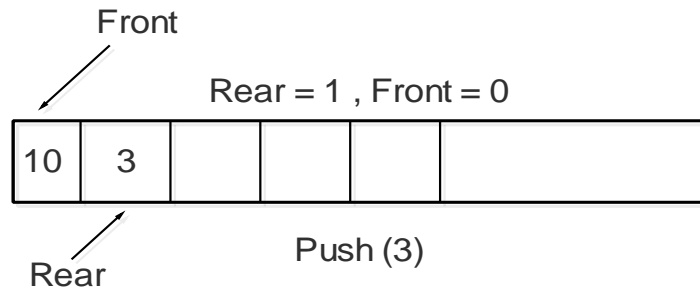
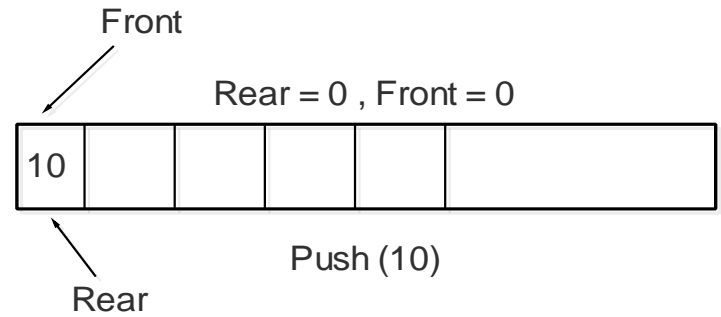
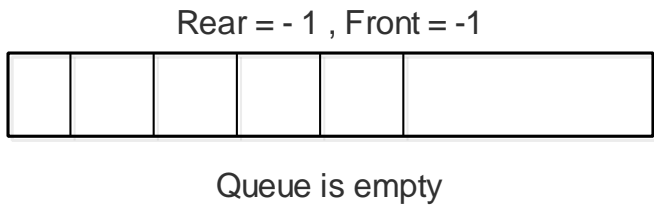
stack

- A **stack** is one of the most important of data structure. The items may be added and deleted from one end called top of the **stack**.



Queue

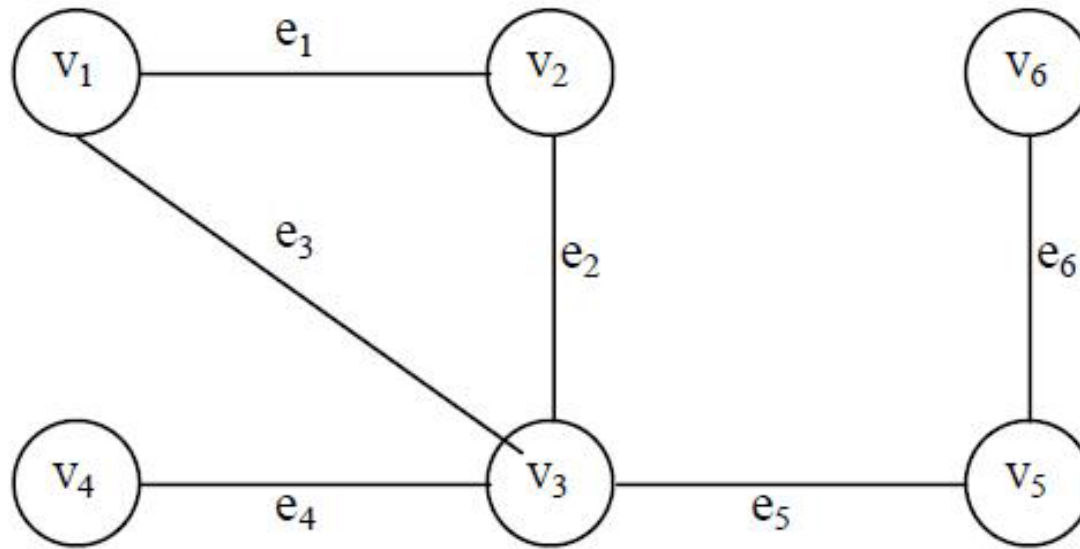
A **queue** is logically a first in first out (FIFO or first come first serve) linear data structure.



Graph

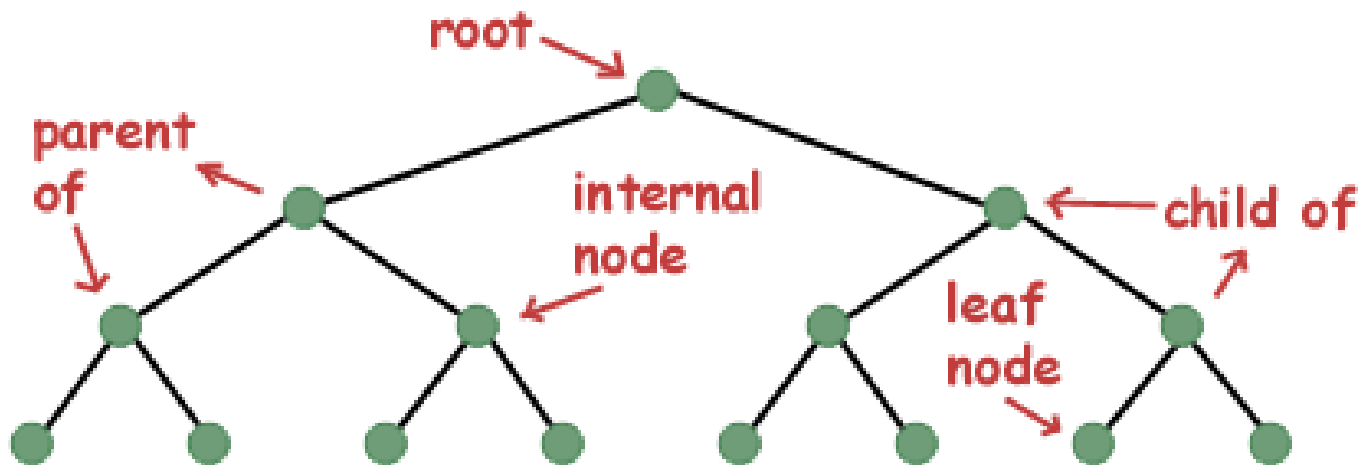
A graph G consist of

1. Set of vertices V (called nodes), ($V = \{v_1, v_2, v_3, v_4, \dots\}$) and
2. Set of edges E (i.e., $E \{e_1, e_2, e_3, \dots, e_m\}$)



Trees

- **Trees** are very flexible, variant and powerful data structure that can be used to represent data items possessing hierarchical relationship between the grand father and his children and grandchildren as so on.



Trees



Thank you

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