

DATA STRUCTURE

INTRODUCTION

In order to represent and store data in main memory /secondary memory, we need an appropriate model . the different models used to organize data in main are collectively referred to as *data structure*.

OR

A data structure is a logical model of a particular organization of data. The choice of a particular data structure depends on the following aspects:-

It must be able to represent the inherent relationship of the data in the real world.

It must be simple enough so that it can process efficiently as and when necessary.

CATEGORIES OF DATA STRUCTURE

- Data structure are divided into two categories:-
- **Linear data structures:-** A data structure whose elements form a sequence, and every element in the structure has a unique predecessor and unique successor. As for-Arrays, Link lists, Stack and Queue.
- **Non-linear data structure:-** A data structure whose elements do not form a sequence, there is no unique predecessor or unique successor. As for – Tree and Graph.

ARRAY

- An array is a list of finite number of elements of same data type. The individual elements of an array are accessed using an index to the array. It can be classified as—
 - **One-dimensional array**
 - **Two-dimensional array**

LINKED LIST

- A linked list is a linear collection of data elements, called *nodes*. The linear order is maintained by pointers. Each node is divided into two parts. It can be classified as-
- **Linear linked list (one-way list)**
- **Doubly linked list (two-way list)**
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STACK

- A *stack*, also called a Last-In-First-out (LIFO) system, is a linear list in which insertions and deletions can take place only at one end, called *top*.

QUEUE

- A queue also called a First-In-First-Out (FIFO) system, is a linear list in which insertion can take place at one end of the list called the *rear*, and deletion can take place only at other end of the list, called the *front*.

TREE

- A tree is a data structure that represents a hierarchical relationship between various elements. A binary tree is a tree that can have utmost two children. A binary tree is defined as finite set of elements, called nodes, such that:
 - Either tree is empty ,called the null tree or empty tree, or
 - The tree contains a distinguished node R, called root of tree, and remaining nodes form an ordered pair of binary tree.

GRAPH

- A graph is a ordered set (V, E) , V represent the set of elements, called nodes and E represents the edge between these elements. This data structure is used to represent relationship between pairs of element, which are not necessarily hierarchical in nature.

COMMON OPERATION

- Some common operations perform on data structure
- **Traversal**- Accessing each element exactly once in order to process it.
- **Searching** – Finding the location of a given element.
- **Insertion**- Adding a new element to the structure.
- **Deletion**- Removing a existing element from the structure.
- **Sorting**- Arranging the elements in some logical order. This order may be ascending or descending in case of numeric key or in dictionary order in case of alphanumeric key.
- **Merging**- Combining the elements of two similar sorted structures into a single structure.
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