DATA STRUCTURES USING ‘C’

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DEFINITION

- Data structure is representation of the logical relationship existing between individual elements of data.
- In other words, a data structure is a way of organizing all data items that considers not only the elements stored but also their relationship to each other.

INTRODUCTION

- **Data structure affects the design of both structural & functional aspects of a program.**
- **Program=algorithm + Data Structure**
- **You know that a algorithm is a step by step procedure to solve a particular function.**

INTRODUCTION

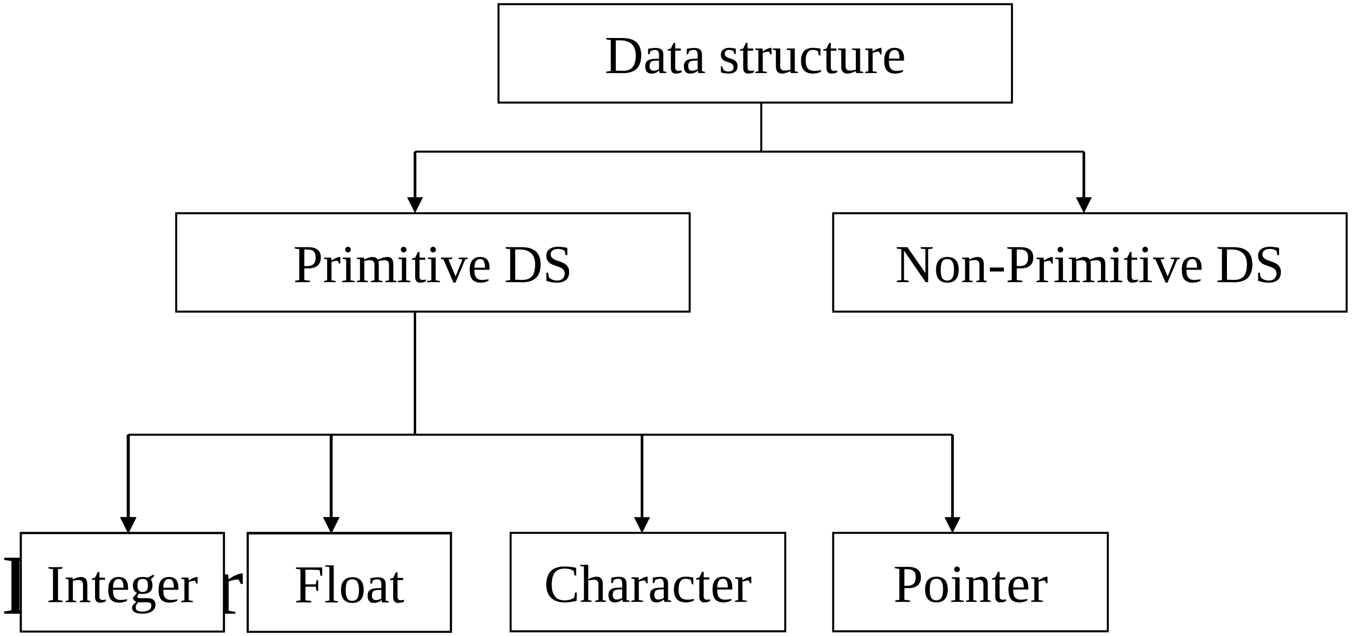
- **That means, algorithm is a set of instruction written to carry out certain tasks & the data structure is the way of organizing the data with their logical relationship retained.**
- **To develop a program of an algorithm, we should select an appropriate data structure for that algorithm.**
- **Therefore algorithm and its associated data structures from a program.**

CLASSIFICATION OF DATA STRUCTURE

Data structure are normally divided into two broad categories:

- Primitive Data Structure
- Non-Primitive Data Structure

CLASSIFICATION OF DATA STRUCTURE



Data structure

Primitive DS

Non-Primitive DS

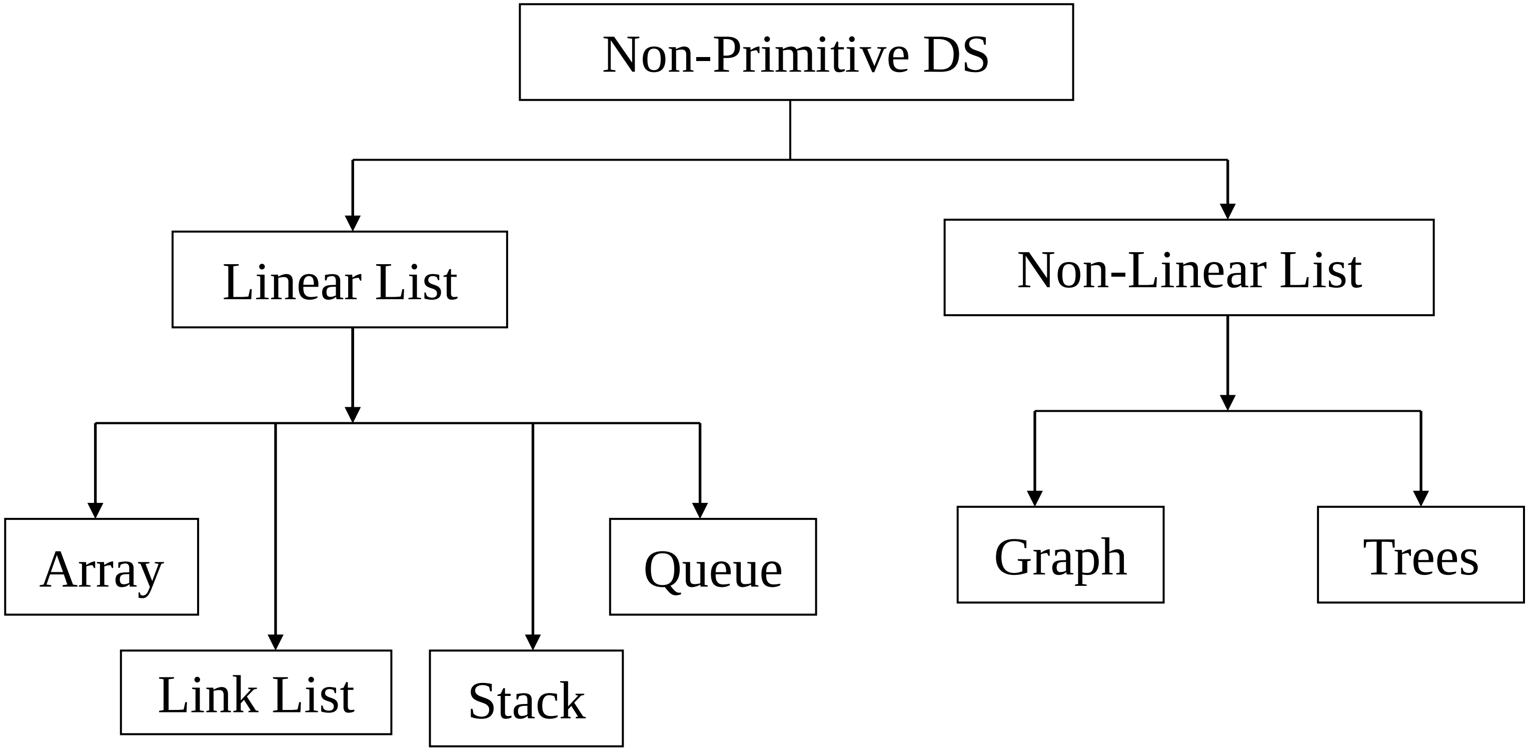
Integer

Float

Character

Pointer

CLASSIFICATION OF DATA STRUCTURE



PRIMITIVE DATA STRUCTURE

- **There are basic structures and directly operated upon by the machine instructions.**
- **In general, there are different representation on different computers.**
- **Integer, Floating-point number, Character constants, string constants, pointers etc, fall in this category.**

NON-PRIMITIVE DATA STRUCTURE

- There are more sophisticated data structures.
- These are derived from the primitive data structures.
- The non-primitive data structures emphasize on structuring of a group of homogeneous (same type) or heterogeneous (different type) data items.

NON-PRIMITIVE DATA STRUCTURE

- **Lists, Stack, Queue, Tree, Graph are example of non-primitive data structures.**
- **The design of an efficient data structure must take operations to be performed on the data structure.**

NON-PRIMITIVE DATA STRUCTURE

The most commonly used operation on data structure are broadly categorized into following types:

- Create
- Selection
- Updating
- Searching
- Sorting
- Merging
- Destroy or Delete

DIFFERENT BETWEEN THEM

- **A primitive data structure is generally a basic structure that is usually built into the language, such as an integer, a float.**
- **A non-primitive data structure is built out of primitive data structures linked together in meaningful ways, such as a or a linked-list, binary search tree, AVL Tree, graph etc.**

DATA STRUCTURES : ARRAYS

- **An array is defined as a set of finite number of homogeneous elements or same data items.**

- **It means an array can contain one type of data only, either all integer, all float-point number or all character.**

ARRAYS

Simply, declaration of array is as follows:

```
int arr[10]
```

Where int specifies the data type or type of elements arrays stores.

“arr” is the name of array & the number specified inside the square brackets is the number of elements an array can store, this is also called sized or length of array.

ARRAYS

Following are some of the concepts to be remembered about arrays:

- The individual element of an array can be accessed by specifying name of the array, following by index or subscript inside square brackets.
- The first element of the array has index zero[0]. It means the first element and last element will be specified as:arr[0] & arr[9]

  Respectively.

ARRAYS

- The elements of array will always be stored in the consecutive (continues) memory location.
- The number of elements that can be stored in an array, that is the size of array or its length is given by the following equation:

  (Upperbound-lowerbound)+1

ARRAYS

- For the above array it would be

  (9-0)+1=10,where 0 is the lower bound of array and 9 is the upper bound of array.

- Array can always be read or written through loop. If we read a one-dimensional array it require one loop for reading and other for writing the array.

ARRAYS

- For example: Reading an array

```
For(i=0;i<=9;i++)
      scanf(“%d”,&arr[i]);
```

- For example: Writing an array

```
For(i=0;i<=9;i++)
      printf(“%d”,arr[i]);
```

ARRAYS

- If we are reading or writing two-dimensional array it would require two loops. And similarly the array of a N dimension would required N loops.
- Some common operation performed on array are:
  - Creation of an array
  - Traversing an array

ARRAYS

- Insertion of new element
- Deletion of required element
- Modification of an element
- Merging of arrays