CSE-281: Data Structures and Algorithms

Classification of Data Structure

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Data Structure

❑ Data Structure is a way of collecting and organizing data in such a way that we can perform operations on these data in an effective way...

❑ Searching data.

❑ Need to manage processor speed.

❑ Serve multiple request simultaneously.

Characteristics of a Data Structure

❑ Time Complexity - Running time or the execution time of operations of data structure must be as small as possible.

❑ Space Complexity - Memory usage of a data structure operation should be as little as possible. .

Execution Time Cases

There are three cases which are usually used to compare various data structures execution time :

❑ Worst Case — when a particular data structure operation takes maximum time.

❑ Average Case — This is the scenario depicting the average execution time of an operation of a data structure.

❑ Best Case — This is the scenario depicting the least possible execution time of an operation of a data structure.

Types Of Data Structures

➢ Primitive data structures

➢ Non-primitive data structure

    ➢ Linear DS

    ➢ Non Linear DS

➢ **Primitive** Data Structures are the basic data structures that directly operate upon the machine instructions.

Example: int , float, char, and pointer

Types Of Data Structures

Non-primitive Data Structures

➢ are more complicated data structures and are derived from primitive data structures.

➢ emphasize on grouping same or different data items with r elationship between each data item.

➢ Example : Array, List

Types Of Data Structures

Linear DS:

➢ every item is related to its previous and next time.

➢ data is arranged in linear sequence.

➢ data items can be traversed in a single run.

➢ implementation is easy

Example: Stack , Queue

Types Of Data Structures

Non-linear DS:

➢ every item is attached with many other items.

➢ data is not arranged in sequence.

➢ data cannot be traversed in a single run.

➢ implementation is difficult.

Example: Tree, Graph

Static and Dynamic DS

Static

➢ Static data structures are those whose sizes and structures associated memory locations are fixed at compile time. Example: Array

Dynamic

➢ Dynamic structures are those which expands or shrinks depending upon the program need and its execution. Also, their associated memory locations changes. Example: Linked List created using pointers

Cont.

Homogeneous

➤ In homogeneous data structures, all the elements are of same type.

Example: Array

Non-Homogeneous

➤ In Non-Homogeneous data structure, the elements may or may not be of the same type.

Example: Structures

What is an Algorithm?

➢ A process or set of rules to be followed in calculations or other problem-solving operations, especially by a computer.

Formal Definition :

➢ An algorithm is a finite set of instructions that are carried in a specific order to perform specific task.

Algorithm Characteristics

➢ Algorithms typically have the following characteristics

➢ Inputs : 0 or more input values.

➢ Outputs : 1 or more than 1 output.

➢ Unambiguity : clear and simple instructions.

➢ Finiteness : Limited number of instructions.

➢ Effectiveness : Each instruction has an impact on the overall process.

Thank You