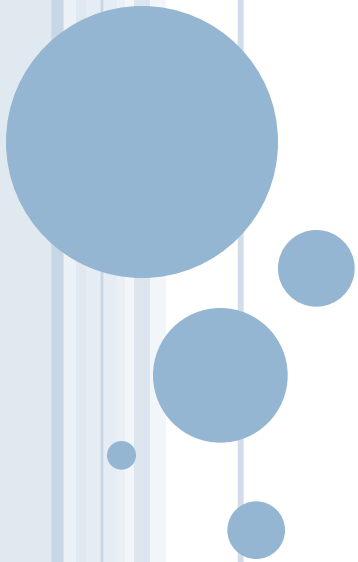


LECTURE - 1

INTRODUCTION AND OVERVIEW OF DATA STRUCTURES



OBJECTIVES

- Know the basics of Data Structures
- Types of data structures
- Main Operations on Data Structures

DATA TYPE AND DATA STRUCTURE

Data type

- Values for variables
- Operations on those values

Ex : int, float, char ... etc.

Data Structure

The logical and mathematical model of a particular organization of data is called a data structure.

A **data structure** is a particular way or an arrangement of storing and organizing data in a computer's memory or disk storage so that it can be used efficiently.

AN EXAMPLE OF SEVERAL COMMON DATA STRUCTURES:

- Arrays
- Stacks
- Queues
- Trees
- Graph
- Linked lists

TYPES OF DATA STRUCTURES

Primitive Data Structures

- Integer
- Real
- Character
- Boolean

Non- Primitive Data Structures

- Linear Data Structure
- Non-linear or Hierarchical Structure

TYPES OF DATA STRUCTURES

Linear Data Structure

A data structure is said to be linear if its elements form a sequence or in the other words a linear list.

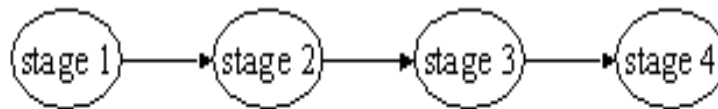
- Arrays
- linked lists
- Stacks and
- Queues

Non-linear or Hierarchical Structure

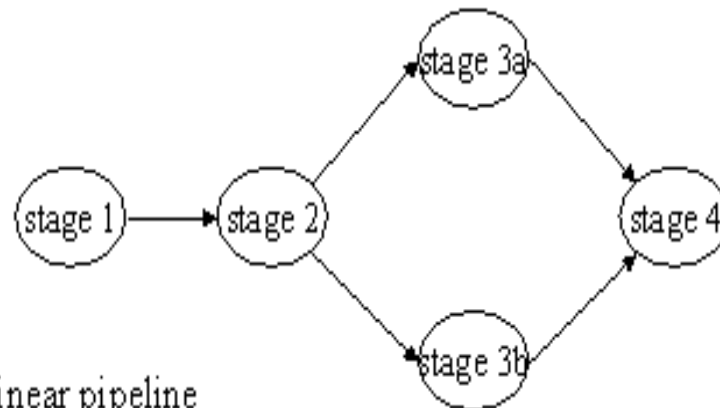
A non linear data structure mainly used to represent data containing a hierarchical relationship between items.

- Trees
- Graphs
- Heaps

DIFFERENCE BETWEEN LINEAR AND NON LINEAR DATA STRUCTURES



linear pipeline



non-linear pipeline

DATA STRUCTURE OPERATIONS

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The following four operations play a major role:

Traversing

Accessing each record exactly once so that certain items in the record may be processed. (This accessing or processing is sometimes called 'visiting' the records.)

Searching

Finding the location of the record with a given key value, or finding the locations of all records, which satisfy one or more conditions.

Inserting

Adding new records to the structure.

Deleting

Removing a record from the structure.

DATA STRUCTURE OPERATIONS (CONTINUED)

The following two operations, which are used in special situations, will also be considered:

Sorting:

Arranging the records in some logical order

Merging:

Combining the records in two different sorted files into a single sorted files

ALGORITHMS

An Algorithm is a finite step – by – step list of well defined instructions for solving a particular problem. It is used to manipulate the data contained in the data structures as in searching and sorting. It states explicitly how the data will be manipulated.

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COMPLEXITY

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The complexity of an algorithm is a function describing the efficiency of the algorithm in terms of the amount of data the algorithm must process. There are two main complexity measures of the efficiency of an algorithm:

Time complexity is a function describing the amount of time an algorithm takes in terms of the amount of input to the algorithm.

Space complexity is a function describing the amount of memory (space) an algorithm takes in terms of the amount of input to the algorithm.

Discussion

- Once data is organized into forms such as trees, stacks and queues, standard algorithms can be used to process them.
- Properly organized data lead to easy-to understand.

○ Questions?