DATA STRUCTURES AND NUMERICAL METHODS

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Introduction to Data Structure

Operation on Data Structures

Design of efficient data structure must take operations to be performed on the data structures into account. The most commonly used operations on data structure are broadly categorized into following types

1. **Create**

   The create operation results in reserving memory for program elements. This can be done by declaration statement. Creation of data structure may take place either during compile-time or run-time. malloc() function of C language is used for creation.

2. **Destroy**

   Destroy operation destroys memory space allocated for specified data structure. free() function of C language is used to destroy data structure.

3. **Selection**

   Selection operation deals with accessing a particular data within a data structure.

4. **Updation**

   It updates or modifies the data in the data structure.

5. **Searching**

   It finds the presence of desired data item in the list of data items, it may also find the locations of all elements that satisfy certain conditions.

6. **Sorting**

   Sorting is a process of arranging all data items in a data structure in a particular order, say for example, either in ascending order or in descending order.

7. **Merging**

   Merging is a process of combining the data items of two different sorted list into a single sorted list.

8. **Splitting**

   Splitting is a process of partitioning single list to multiple list.

9. **Traversal**

Traversal is a process of visiting each and every node of a list in systematic manner.

Array

One Dimensional Array

- Simplest data structure that makes use of computed address to locate its elements is the one- dimensional array or vector; number of memory locations is sequentially allocated to the vector.
- A vector size is fixed and therefore requires a fixed number of memory locations.
- Vector A with subscript lower bound of "one" is represented as below….

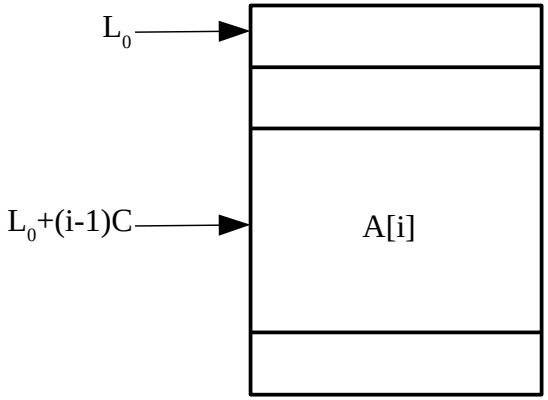

Figure- 1.1

- L_0 is the address of the first word allocated to the first element of vector A.
- C words are allocated for each element or node.
- The address of $\mathbf{A_i}$ is given equation $\mathbf{Loc\ (A_i) = L_0 + C\ (i-1)}$
- Let's consider the more general case of representing a vector **A** whose lower bound for it's subscript is given by some variable **b**. The location of **Ai** is then given by $\mathbf{Loc\ (A_i) = L_0 + C\ (i-b)}$

Introduction to Data Structure

Two Dimensional Array

- Two dimensional arrays are also called table or matrix, two dimensional arrays have two subscripts.
- Two dimensional array in which elements are stored column by column is called as column major matrix.
- Two dimensional array in which elements are stored row by row is called as row major matrix.
- First subscript denotes number of rows and second subscript denotes the number of columns.
- Two dimensional array consisting of two rows and four columns as above Fig is stored sequentially by columns : **A [1, 1], A [2 , 1], A [1 , 2], A [2 , 2], A [1 , 3], A [2 , 3], A [1, 4], A [2, 4].**
- The address of element **A [i , j]** can be obtained by expression **Loc (A [i , j]) = L_0 + (j-1)*2 + i-1.**
- In general for two dimensional array consisting of **n** rows and **m** columns the address element **A [i , j]** is given by **Loc (A [i , j]) = L_0 + (j-1)*n + (i – 1)**.