Lecture#3: Arrays

# Linear Data structures

* Linear form a sequence
* Linear relationship b/w the elements represented by means of sequential memory location
* Link list and arrays are linear relationship

Operation performed by Linear

Structure

* Traversal: Processing each element in the list
* Search : Find the location of the element with a given value or the record with a given key
* Insertion : Adding new element to the list
* Deletion : Removing an element from the list
* Sorting : Arranging the elements in some type of order
* Merging : Combining two list into single list

# Linear Array

• List of finite number N of homogenous data elements (i.e. data elements of same type) or as an ADT any data type such that

* The elements of the array are referenced respectively by an index set consisting of N

consecutive number

* The elements of the array are stored respectively in successive memory location

# Length of Array

• N = length of array

Length = UB – LB + 1

* UB = Upper Bound or Largest Index
* LB= Lower Bound or smallest Index

## Operations on Array

• Traversing a Linear Array

TraverseArray (LA, LB, UB)

Function: This algorithm traverse LA applying an operation PROCESS

to each element of LA

Input: LA is a Linear Array with Lower Bound LB and Upper bound UB

Algorithm:

1. [Initialize Counter] Set K:=LB
2. Repeat Steps 3 and 4 while K≤UB
3. [Visit element] Apply PROCESS to LA[K]
4. [Increase counter] Set K:=K+1

[End of Step 2 loop]

1. Exit

Alternative

Algorithm:

1. Repeat for K:=LB to UB

Apply PROCESS to LA[K]

[End of loop]

1. Exit

## Example: Home Work

Consider the array AUTO which records the number of automobile sold each year from 1932 through 1984.

1. Find the NUM of years during which more than 300 automobiles were sold
2. Print each year and the number of automobile sold in that year

(This is a book example # 4.4)

Operations Cont

• Insert an element in Linear Array

# Operations Cont

InsertElement (LA, ITEM, N, K)

Function: This algorithm insert an element in

a Linear Array at required position

Input: LA is a Linear Array having N elements

ITEM is he element to be inserted at given position K

Precondition: K≤N where K is a +ve integer Algorithm:

1. [Initialize Counter] Set J:=N
2. Repeat Steps 3 and 4 while J≥K
3. [Move Jth element downward] Set LA[J+1] := LA[J]
4. [Decrease counter] Set J:=J-1

[End of Step 2 loop]

1. [Insert element] Set LA[K]:=ITEM
2. [Reset N] N:= N+1
3. Exit

Operation Cont

• Delete an element from a Linear Array

DeleteElement (LA, ITEM, N, K)

Function: This algorithm delete an element from a given position in Linear Array

Input: LA is a Linear Array having N elements

K is the position given from which ITEM needs to be deleted

Output: ITEM is the element deleted from the given position K

Precondition: K≤N where K is a +ve integer

Algorithm:

1. Set ITEM:=LA[K]
2. Repeat for J:=K to N-1
3. [Move Jth element upward] Set LA[J] := LA[J+1]

[End of Step 2 loop]

1. [Reset N] N:= N-1
2. Exit