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DATA STRUCTURE (CAT-201)

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Arrays

A linear array is a list of finite number n of homogeneous data elements such that :

a) The elements of the array are referenced respectively by an index set consisting of n consecutive numbers.

b) The elements of the array are stored respectively in successive memory locations.

- The number n of elements is called the length or size of the array.
- Three numbers define an array : lower bound, upper bound, size.
- a. The lower bound is the smallest subscript you can use in the array (usually 0)
- b. The upper bound is the largest subscript you can use in the array
- c. The size / length of the array refers to the number of elements in the array , It can be computed as upper bound - lower bound + 1

Arrays

Example :

- A linear array DATA consisting of the name of six elements:

1	247
2	56
3	429
4	135
5	87
6	156

DATA[1] = 247

DATA[2] = 56

DATA[3] = 429

DATA[4] = 135

DATA[5] = 87

DATA[6] = 156

Chapter 3 Seymour Lipschutz, Schaum's Outlines Series Data structures TMH

Arrays

Example :

- An automobile company uses an array AUTO to record the number of auto mobile sold each year from 1932 through 1984.
- AUTO[k] = Number of auto mobiles sold in the year K
- LB = 1932
- UB = 1984
- Length = UB – LB+1 = 1984 – 1930+1 =55

Representation of linear array in memory

Let LA be a linear array in the memory of the computer. The memory of the computer is a sequence of addressed locations.

- The computer does not need to keep track of the address of every element of LA, but needs to keep track only of the first element of LA, denoted by
- Base(LA)
- Called the base address of LA. Using this address Base(LA), the computer calculates the address of any element of LA by the following formula :
- LOC(LA[k]) = Base(LA) + w(K – lower bound)
- Where w is the number of words per memory cell for the array LA

Arrays

Print the contents of each element of DATA or Count the number of elements of DATA with a given property. This can be accomplished by traversing DATA, That is, by accessing and processing (visiting) each element of DATA exactly once.

- **Algorithm 2.3:** Given DATA is a linear array with lower bound LB and upper bound UB . This algorithm traverses DATA applying an operation PROCESS to each element of DATA.

```
    1. Set K : = LB.
1. Repeat steps 3 and 4 while K<=UB:
2. Apply PROCESS to DATA[k]
3. Set K : = K+1.
4. Exit.
```

Arrays

Example :

- An automobile company uses an array AUTO to record the number of auto mobile sold each year from 1932 through 1984.
- a) Find the number NUM of years during which more than 300 automobiles were sold.
- b) Print each year and the number of automobiles sold in that year

```
1. Set NUM : = 0.
2. Repeat for K = 1932 to 1984:
if AUTO[K]> 300, then : set NUM : = NUM+1
3. Exit.
```

```
1. Repeat for K = 1932 to 1984:
Write : K, AUTO[K]
2. Exit.
```

Array Insertion

INSERTING AN ELEMENT INTO AN ARRAY:

- **Insert (LA, N, K, ITEM)**
- Here LA is linear array with N elements and K is a positive integer such that K<=N. This algorithm inserts an element ITEM into the Kth position in LA.
- **ALGORITHM**
- Step 1. [Initialize counter] Set J:=N
- Step 2. Repeat Steps 3 and 4] while J>=K
- Step 3. [Move Jth element downward] Set LA [J+1]: =LA [J]
- Step 4. [Decrease counter] Set J:=J-1
- [End of step 2 loop]
- Step 5 [Insert element] Set LA [K]: =ITEM
- Step 6. [Reset N] Set N:=N+1
- Step 7. Exit

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Arrays Deletion

DELETING AN ELEMENT FROM A LINEAR ARRAY

- **Delete (LA, N, K, ITEM)**
- **ALGORITHM**
- Step 1. Set ITEM: = LA [K]
- Step 2. Repeat for J=K to N-1
- [Move J+1st element upward] Set LA [J]: =LA [J+1]
- [End of loop]
- Step 3 [Reset the number N of elements in LA] Set N:=N-1
- Step 4. Exit

LINEAR SEARCH

Example : Linear Search :

- Algorithm 2.4 : A linear array DATA with N elements and a specific ITEM of information are given. This algorithm finds the location LOC of ITEM in the array DATA or sets LOC = 0.

1. **Set K : = 1, LOC : =0.**
2. **Repeat steps 3 and 4 while LOC = 0 and K<=N:**
3. **If ITEM = DATA[K], then : Set LOC : =K .**
4. **Set K : = K+1.**

– **[End of step 2 loop]**

5. **[Successful?]**

– **If LOC = 0, then :**
– **Write : ITEM is not in the array DATA.**
– **Else :**
– **Write : LOC is the location of ITEM.**
– **[End of if structure]**

6. **Exit.**

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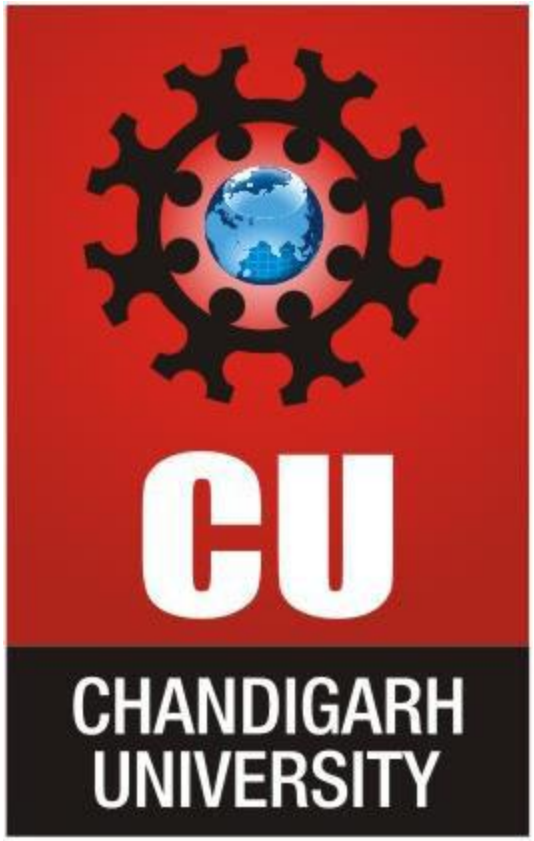
FAQ

- How insertion and deletion is performed in arrays?
- What is base address.
- Define memory representation in an array.

Bibliography

- Seymour Lipschutz, Schaum's Outlines Series Data structures TMH
- Introduction to Data Structures Applications, Trembley&Soreson, Second Edition, Pearson Education
- www.geeksforgeeks.org/analysis-of-algorithms-set-3asymptotic-notations/
- www.tutorialspoint.com/data_structures_algorithms/asymptotic_analysis.htm



Thank You