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FACULTY OF EGINEERING & TECHNOLOGY

DATA STRUCTURE USING C

LECTURE -1

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OUTLINE

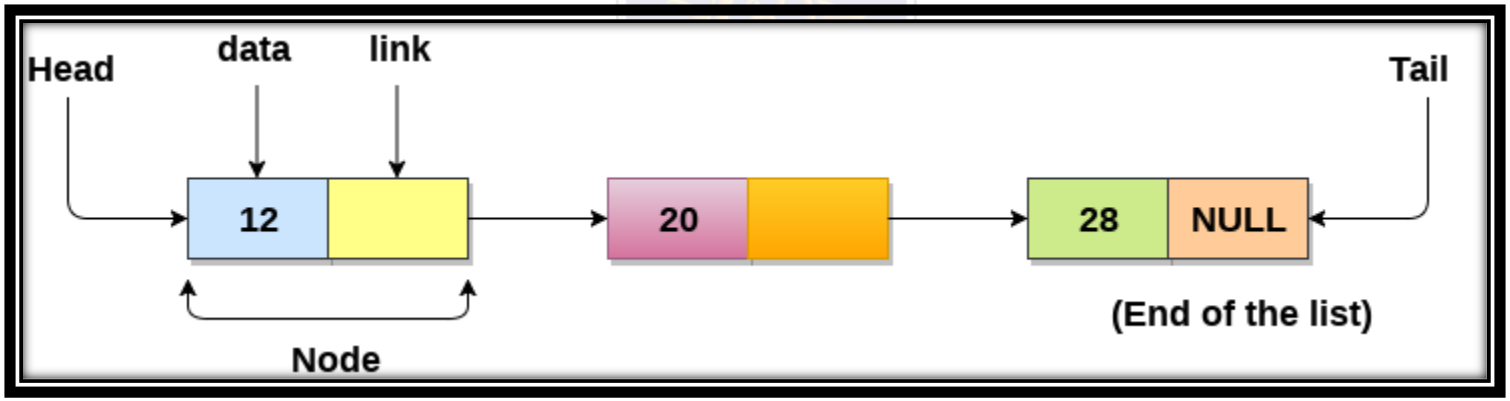
- Introduction to linked list
- Representation of linked lists in Memory
- MCQ
- References

INTRODUCTION OF LINKED LIST

Introduction of Linked List

- A linked list is similar. It is a series of connected "nodes" that contains the "address" of the next node. Each node can store a data point which may be a number, a string or any other type of data.

Linked List Representation



INTRODUCTION OF LINKED LIST

Uses of Linked List

- The list is not required to be contiguously present in the memory. The node can reside any where in the memory and linked together to make a list. This achieves optimized utilization of space.
- list size is limited to the memory size and doesn't need to be declared in advance.
- Empty node can not be present in the linked list.
- We can store values of primitive types or objects in the singly linked list.

Linked list Vs. array?

	Array	Linked List
Strength	• Random Access (Fast Search Time) • Less memory needed per element • Better cache locality	• Fast Insertion/Deletion Time • Dynamic Size • Efficient memory allocation/utilization
Weakness	• Slow Insertion/Deletion Time • Fixed Size • Inefficient memory allocation/utilization	• Slow Search Time • More memory needed per node as additional storage required for pointers

INTRODUCTION OF LINKED LIST

Types of Linked List

- Following are the various types of linked list.
- Simple Linked List − Item navigation is forward only.
- Doubly Linked List − Items can be navigated forward and backward.
- Circular Linked List − Last item contains link of the first element as next and the first element has a link to the last element as previous.

Basic Operations

Following are the basic operations supported by a list.

- Insertion − Adds an element at the beginning of the list.
- Deletion − Deletes an element at the beginning of the list.
- Display − Displays the complete list.
- Search − Searches an element using the given key.
- Delete − Deletes an element using the given key.

INTRODUCTION OF LINKED LIST

Insertion Operation

Add to the beginning

- Allocate memory for new node
- Store data
- Change next of new node to point to head
- Change head to point to recently created node

```
struct node *newNode;
newNode = malloc(sizeof(struct node));
newNode->data = 4;
newNode->next = head;
head = newNode;
```

Add to the End

- Allocate memory for new node
- Store data
- Traverse to last node
- Change next of last node to recently created node

```
struct node *newNode;
newNode = malloc(sizeof(struct node));
newNode->data = 4;
newNode->next = NULL;

struct node *temp = head;
while(temp->next != NULL){
  temp = temp->next;
}

temp->next = newNode;
```

INTRODUCTION OF LINKED LIST

Insertion Operation

Add to the Middle

- Allocate memory and store data for new node
- Traverse to node just before the required position of new node
- Change next pointers to include new node in between

```
struct node *newNode;
newNode = malloc(sizeof(struct node));
newNode->data = 4;

struct node *temp = head;

for(int i=2; i < position; i++) {
    if(temp->next != NULL) {
        temp = temp->next;
    }
}
newNode->next = temp->next;
temp->next = newNode;
```

MCQ

QUESTIONS	OPTION A	OPTION B	OPTION C	OPTION D
Linked lists are not suitable to for the implementation of?	Insertion sort	Radix sort	Polynomial manipulation	Binary search
Linked list is considered as an example of _____ type of memory allocation.	Dynamic	Static	Compile time	Heap
In Linked List implementation, a node carries information regarding _____	Data	Link	Data and Link	Node
Which of the following sorting algorithms can be used to sort a random linked list with minimum time complexity?	Insertion sort	Radix sort	heap sort	Merge Sort
. In the worst case, the number of comparisons needed to search a singly linked list of length n for a given element is	log 2 n	*n*/2	log 2 n – 1	n
A linear collection of data elements where the linear node is given by means of pointer is called?	Linked list	Node list	Primitive list	Unordered list

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