

LAB SESSION 6: DOUBLY LINKED LIST AND CIRCULAR LINKED LIST

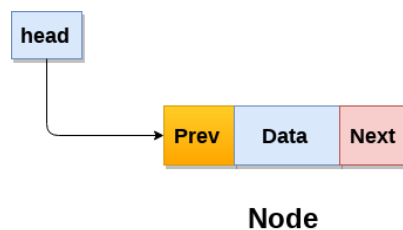
AIM: To implement DOUBLY LINKED LIST AND CIRCULAR LINKED LIST.

PROBLEM DEFINITION:

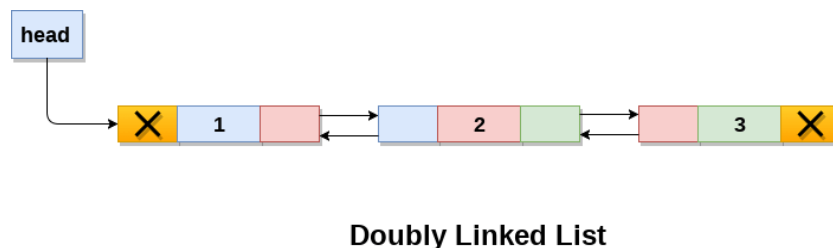
Develop C programs to do the following:

1. Swap the adjacent elements of doubly linked list by rearranging the links.
2. Create a double linked list in which info part of each node contains a digit of a given number. The digits should be stored in reverse order i.e. the least significant digit should be stored in the first node and the most significant digit should be stored in the last node. Eg of number entered is 5678 the list should be 8-> 7 -> 6 -> 5. Write a function to add two numbers using the above linked list representation.
3. Delete alternate nodes from a circular linked list.

THEORY: Doubly linked list is a complex type of linked list in which a node contains a pointer to the previous as well as the next node in the sequence. Therefore, in a doubly linked list, a node consists of three parts: node data, pointer to the next node in sequence (next pointer) , pointer to the previous node (previous pointer). A sample node in a doubly linked list is shown in the figure.



A doubly linked list containing three nodes having numbers from 1 to 3 in their data part, is shown in the following image.



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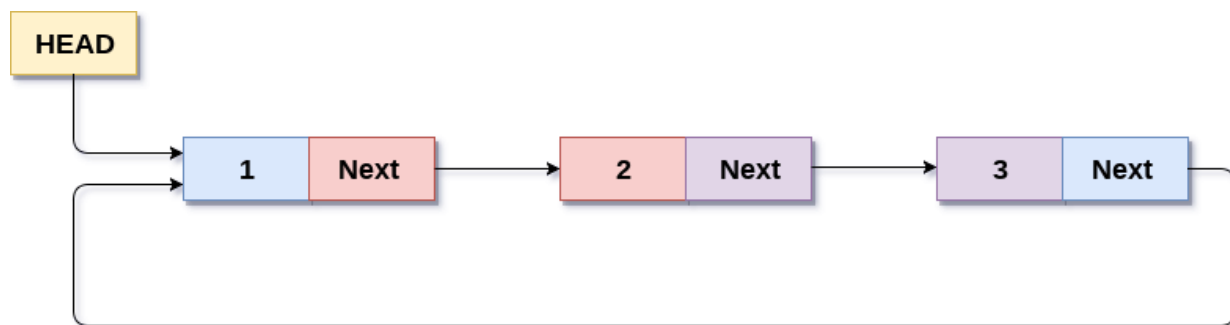
The prev part of the first node and the next part of the last node will always contain null indicating end in each direction.

In a singly linked list, we could traverse only in one direction, because each node contains address of the next node and it doesn't have any record of its previous nodes. However, doubly linked list overcome this limitation of singly linked list. Due to the fact that, each node of the list contains the address of its previous node, we can find all the details about the previous node as well by using the previous address stored inside the previous part of each node.

In a circular Singly linked list, the last node of the list contains a pointer to the first node of the list. We can have circular singly linked list as well as circular doubly linked list.

We traverse a circular singly linked list until we reach the same node where we started. The circular singly linked list has no beginning and no ending. There is no null value present in the next part of any of the nodes.

The following image shows a circular singly linked list.



Circular Singly Linked List

Circular linked list are mostly used in task maintenance in operating systems. There are many examples where circular linked list are being used in computer science including browser surfing where a record of pages visited in the past by the user, is maintained in the form of circular linked lists and can be accessed again on clicking the previous button.

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ALGORITHM AND FLOWCHARTS:

1. Algorithm for Swapping alternate nodes
2. Algorithm to delete alternate nodes in circular list