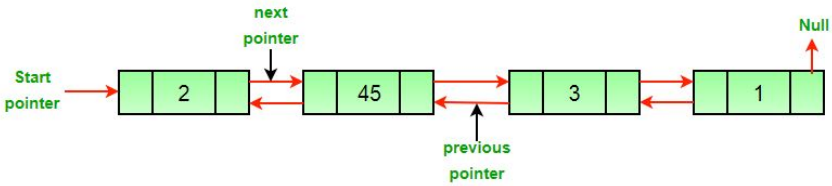
Delete a node in a Doubly Linked List

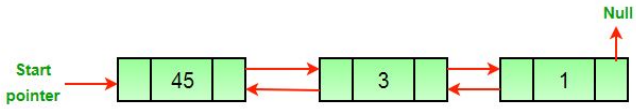
Doubly Link List Set 1| Introduction and Insertion

Write a function to delete a given node in a doubly linked list.

(a) Original Doubly Linked List

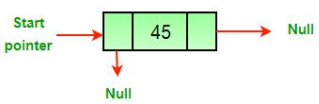


(a) After deletion of head node



(a) After deletion of middle node

(a) After deletion of last node



Recommended: Please solve it on "*PRACTICE*" first, before moving on to the solution.

Algorithm

Let the node to be deleted is *del*.

1) If node to be deleted is head node, then change the head pointer to next current head.

2) Set *next* of previous to *del*, if previous to *del* exists.

3) Set *prev* of next to *del*, if next to *del* exists.

C++

```
// C++ program to delete a node from
// Doubly Linked List
#include <bits/stdc++.h>
using namespace std;

/* a node of the doubly linked list */
class Node
{
    public:
    int data;
    Node* next;
    Node* prev;
};

/* Function to delete a node in a Doubly Linked List.
head_ref --> pointer to head node pointer.
del --> pointer to node to be deleted. */
void deleteNode(Node** head_ref, Node* del)
{
    /* base case */
    if (*head_ref == NULL || del == NULL)
        return;

    /* If node to be deleted is head node */
    if (*head_ref == del)
        *head_ref = del->next;

    /* Change next only if node to be
    deleted is NOT the last node */
    if (del->next != NULL)
        del->next->prev = del->prev;

    /* Change prev only if node to be
    deleted is NOT the first node */
    if (del->prev != NULL)
        del->prev->next = del->next;

    /* Finally, free the memory occupied by del*/
    free(del);
    return;
}

/* UTILITY FUNCTIONS */
/* Function to insert a node at the
beginning of the Doubly Linked List */
void push(Node** head_ref, int new_data)
{
    /* allocate node */
    Node* new_node = new Node();

    /* put in the data */
    new_node->data = new_data;

    /* since we are adding at the beginning,
    prev is always NULL */
    new_node->prev = NULL;

    /* link the old list off the new node */
    new_node->next = (*head_ref);

    /* change prev of head node to new node */
    if ((*head_ref) != NULL)
        (*head_ref)->prev = new_node;

    /* move the head to point to the new node */
    (*head_ref) = new_node;
}

/* Function to print nodes in a given doubly linked list
```

```
This function is same as printList() of singly linked lsit */
void printList(Node* node)
{
    while (node != NULL)
    {
        cout << node->data << " ";
        node = node->next;
    }
}

/* Driver code*/
int main()
{
    /* Start with the empty list */
    Node* head = NULL;

    /* Let us create the doubly linked list 10<->8<->4<->2 */
    push(&head, 2);
    push(&head, 4);
    push(&head, 8);
    push(&head, 10);

    cout << "Original Linked list ";
    printList(head);

    /* delete nodes from the doubly linked list */
    deleteNode(&head, head); /*delete first node*/
    deleteNode(&head, head->next); /*delete middle node*/
    deleteNode(&head, head->next); /*delete last node*/

    /* Modified linked list will be NULL<-8->NULL */
    cout << "\nModified Linked list ";
    printList(head);

    return 0;
}

// This code is contributed by rathbhupendra
```

C

```
#include <stdio.h>
#include <stdlib.h>

/* a node of the doubly linked list */
struct Node {
    int data;
    struct Node* next;
    struct Node* prev;
};

/* Function to delete a node in a Doubly Linked List.
   head_ref --> pointer to head node pointer.
   del  -->  pointer to node to be deleted. */
void deleteNode(struct Node** head_ref, struct Node* del)
{
    /* base case */
    if (*head_ref == NULL || del == NULL)
        return;

    /* If node to be deleted is head node */
    if (*head_ref == del)
        *head_ref = del->next;

    /* Change next only if node to be deleted is NOT the last node */
    if (del->next != NULL)
        del->next->prev = del->prev;

    /* Change prev only if node to be deleted is NOT the first node */
    if (del->prev != NULL)
        del->prev->next = del->next;

    /* Finally, free the memory occupied by del*/
    free(del);
    return;
}

/* UTILITY FUNCTIONS */
/* Function to insert a node at the beginning of the Doubly Linked List */
```

```
void push(struct Node** head_ref, int new_data)
{
    /* allocate node */
    struct Node* new_node = (struct Node*)malloc(sizeof(struct Node));

    /* put in the data  */
    new_node->data = new_data;

    /* since we are adding at the beginning,
    prev is always NULL */
    new_node->prev = NULL;

    /* link the old list off the new node */
    new_node->next = (*head_ref);

    /* change prev of head node to new node */
    if ((*head_ref) != NULL)
        (*head_ref)->prev = new_node;

    /* move the head to point to the new node */
    (*head_ref) = new_node;
}

/* Function to print nodes in a given doubly linked list
   This function is same as printList() of singly linked lsit */
void printList(struct Node* node)
{
    while (node != NULL) {
        printf("%d ", node->data);
        node = node->next;
    }
}

/* Drier program to test above functions*/
int main()
{
    /* Start with the empty list */
    struct Node* head = NULL;

    /* Let us create the doubly linked list 10<->8<->4<->2 */
    push(&head, 2);
    push(&head, 4);
    push(&head, 8);
    push(&head, 10);

    printf("\n Original Linked list ");
    printList(head);

    /* delete nodes from the doubly linked list */
    deleteNode(&head, head); /*delete first node*/
    deleteNode(&head, head->next); /*delete middle node*/
    deleteNode(&head, head->next); /*delete last node*/

    /* Modified linked list will be NULL<-8->NULL */
    printf("\n Modified Linked list ");
    printList(head);

    getchar();
}
```

Java

```
// Java program to delete a node from
// Doubly Linked List

// Class for Doubly Linked List
public class DLL {
    Node head; // head of list

    /* Doubly Linked list Node*/
    class Node {
        int data;
        Node prev;
        Node next;

        // Constructor to create a new node
        // next and prev is by default initialized
        // as null
```

```
    Node(int d) { data = d; }
}

// Adding a node at the front of the list
public void push(int new_data)
{
    // 1. allocate node
    // 2. put in the data
    Node new_Node = new Node(new_data);

    // 3. Make next of new node as head
    // and previous as NULL
    new_Node.next = head;
    new_Node.prev = null;

    // 4. change prev of head node to new node
    if (head != null)
        head.prev = new_Node;

    // 5. move the head to point to the new node
    head = new_Node;
}

// This function prints contents of linked list
// starting from the given node
public void printlist(Node node)
{
    Node last = null;

    while (node != null) {
        System.out.print(node.data + " ");
        last = node;
        node = node.next;
    }

    System.out.println();
}

// Function to delete a node in a Doubly Linked List.
// head_ref --> pointer to head node pointer.
// del --> data of node to be deleted.
void deleteNode(Node head_ref, Node del)
{

    // Base case
    if (head == null || del == null) {
        return;
    }

    // If node to be deleted is head node
    if (head == del) {
        head = del.next;
    }

    // Change next only if node to be deleted
    // is NOT the last node
    if (del.next != null) {
        del.next.prev = del.prev;
    }

    // Change prev only if node to be deleted
    // is NOT the first node
    if (del.prev != null) {
        del.prev.next = del.next;
    }

    // Finally, free the memory occupied by del
    return;
}

// Driver Code
public static void main(String[] args)
{
    // Start with the empty list
    DLL dll = new DLL();

    // Insert 2. So linked list becomes 2->NULL
    dll.push(2);

    // Insert 4. So linked list becomes 4->2->NULL
    dll.push(4);
```

```
        // Insert 8. So linked list becomes 8->4->2->NULL
        dll.push(8);

        // Insert 10. So linked list becomes 10->8->4->2->NULL
        dll.push(10);

        System.out.print("Created DLL is: ");
        dll.printlist(dll.head);

        // Deleting first node
        dll.deleteNode(dll.head, dll.head);

        // List after deleting first node
        // 8->4->2
        System.out.print("\nList after deleting first node: ");
        dll.printlist(dll.head);

        // Deleting middle node from 8->4->2
        dll.deleteNode(dll.head, dll.head.next);

        System.out.print("\nList after Deleting middle node: ");
        dll.printlist(dll.head);
    }
}
```

Python

```
# Program to delete a node in a doubly linked list

# for Garbage collection
import gc

# A node of the doublly linked list
class Node:

    # Constructor to create a new node
    def __init__(self, data):
        self.data = data
        self.next = None
        self.prev = None

class DoublyLinkedList:
     # Constructor for empty Doubly Linked List
    def __init__(self):
        self.head = None

   # Function to delete a node in a Doubly Linked List.
   # head_ref --> pointer to head node pointer.
   # dele --> pointer to node to be deleted

    def deleteNode(self, dele):

        # Base Case
        if self.head is None or dele is None:
            return

        # If node to be deleted is head node
        if self.head == dele:
            self.head = dele.next

        # Change next only if node to be deleted is NOT
        # the last node
        if dele.next is not None:
            dele.next.prev = dele.prev

        # Change prev only if node to be deleted is NOT
        # the first node
        if dele.prev is not None:
            dele.prev.next = dele.next
        # Finally, free the memory occupied by dele
        # Call python garbage collector
        gc.collect()


    # Given a reference to the head of a list and an
    # integer, inserts a new node on the front of list
    def push(self, new_data):
```

```
        # 1. Allocates node
        # 2. Put the data in it
        new_node = Node(new_data)

        # 3. Make next of new node as head and
        # previous as None (already None)
        new_node.next = self.head

        # 4. change prev of head node to new_node
        if self.head is not None:
            self.head.prev = new_node

        # 5. move the head to point to the new node
        self.head = new_node


    def printList(self, node):
        while(node is not None):
            print node.data,
            node = node.next


# Driver program to test the above functions

# Start with empty list
dll = DoublyLinkedList()

# Let us create the doubly linked list 10<->8<->4<->2
dll.push(2);
dll.push(4);
dll.push(8);
dll.push(10);

print "\n Original Linked List",
dll.printList(dll.head)

# delete nodes from doubly linked list
dll.deleteNode(dll.head)
dll.deleteNode(dll.head.next)
dll.deleteNode(dll.head.next)
# Modified linked list will be NULL<-8->NULL
print "\n Modified Linked List",
dll.printList(dll.head)

# This code is contributed by Nikhil Kumar Singh(nickzuck_007)
```

C#

```
// C# program to delete a node from
// Doubly Linked List
using System;

// Class for Doubly Linked List
public class DLL
{
    Node head; // head of list

    /* Doubly Linked list Node*/
    public class Node
    {
        public int data;
        public Node prev;
        public Node next;

        // Constructor to create a new node
        // next and prev is by default
        // initialized as null
        public Node(int d) { data = d; }
    }

    // Adding a node at the front of the list
    public void push(int new_data)
    {
        // 1. allocate node
        // 2. put in the data
        Node new_Node = new Node(new_data);

        // 3. Make next of new node as head
        // and previous as NULL
```

```
        new_Node.next = head;
        new_Node.prev = null;

        // 4. change prev of head node to new node
        if (head != null)
            head.prev = new_Node;

        // 5. move the head to point to the new node
        head = new_Node;
    }

    // This function prints contents of linked list
    // starting from the given node
    public void printlist(Node node)
    {
        Node last = null;

        while (node != null)
        {
            Console.Write(node.data + " ");
            last = node;
            node = node.next;
        }

        Console.WriteLine();
    }

    // Function to delete a node in a Doubly Linked List.
    // head_ref --> pointer to head node pointer.
    // del --> data of node to be deleted.
    void deleteNode(Node head_ref, Node del)
    {

        // Base case
        if (head == null || del == null)
        {
            return;
        }

        // If node to be deleted is head node
        if (head == del)
        {
            head = del.next;
        }

        // Change next only if node to be deleted
        // is NOT the last node
        if (del.next != null)
        {
            del.next.prev = del.prev;
        }

        // Change prev only if node to be deleted
        // is NOT the first node
        if (del.prev != null)
        {
            del.prev.next = del.next;
        }

        // Finally, free the memory occupied by del
        return;
    }

    // Driver Code
    public static void Main()
    {
        // Start with the empty list
        DLL dll = new DLL();

        // Insert 2. So linked list becomes 2->NULL
        dll.push(2);

        // Insert 4. So linked list becomes 4->2->NULL
        dll.push(4);

        // Insert 8. So linked list becomes 8->4->2->NULL
        dll.push(8);

        // Insert 10. So linked list becomes 10->8->4->2->NULL
        dll.push(10);
```

```
        Console.Write("Created DLL is: ");
        dll.printlist(dll.head);

        // Deleting first node
        dll.deleteNode(dll.head, dll.head);

        // List after deleting first node
        // 8->4->2
        Console.Write("\nList after deleting first node: ");
        dll.printlist(dll.head);

        // Deleting middle node from 8->4->2
        dll.deleteNode(dll.head, dll.head.next);

        Console.Write("\nList after Deleting middle node: ");
        dll.printlist(dll.head);
    }
}

// This code is contributed by PrinciRaj1992
```

Output:

```
Original Linked list 10 8 4 2
 Modified Linked list 8
```

Time Complexity: O(1)

Please write comments if you find any of the above codes/algorithms incorrect, or find better ways to solve the same problem.

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