National University of Computer & Emerging Sciences (NUCES) Islamabad,
Department of Computer Science

DATA STRUCTURES – FALL 2021

LAB 06

Circular Linked List and Doubly Linked List

Learning Outcomes

In this lab you are expected to learn the following:

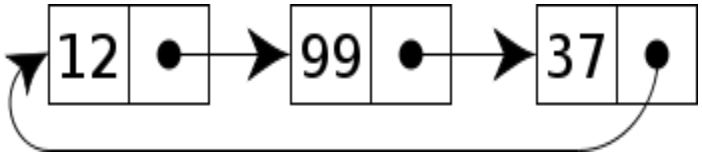
- Circular linked-List
- Doubly Linked List

Objective

In this lab session we will enhance singly-linked lists with another feature: we'll make them circular and doubly Linked List.

A Circular linked list overview:

- ✔ A circular singly linked list is a singly linked list which has the last element linked to the first element in the list. Being circular it really has no ends.
- ✔ The first node in the list is called the head or first.



Inserting a Node in a Circular-linked List

A node may be inserted before a node containing a given key, or after it. Both cases imply searching for that key, and, if that key exists, creating the node to insert, and adjusting links accordingly.

Removing a Node from a Circular-linked List

Following aspects are to be taken into account before removing a node from a Circular-linked list:

- **list may be empty**
- **list may contain a single node**
- **list has more than one node**

Doubly Linked Lists Review

A doubly linked list is a linked list in which every node has a next pointer and a back pointer. Every node contains the address of the next node (except the last node), and every node contains the address of the previous node (except the first node). A doubly linked list can be traversed in either direction.

Note: The Doubly Circular-Linked List implementation must be Generic. Create a proper menu in Main Class so that the user can perform different functionalities on the Doubly Circular-Linked List. You can use the Main Class from previous lab and make appropriate changes to it. Keep in mind that all the functions are to be performed on same list so initialize the Doubly Circular-Linked List carefully in Main Class.

Tasks 1

Create your own class of **Doubly** Circular-Linked List, a Node Class and a Main Class.

- Display all element of doubly circular linked list
- Insertion at the end of list
- Insertion at the beginning of list
- Insertion before a node
- Insertion After a node
- Delete the first node
- Delete the middle node
- Delete the last node
- Delete a Specific node.

Task 2

Write a function in JAVA for doubly Circular linked list and Sort the list using any sorting technique.

Original Doubly linked list:

12 4 6 10 8

Doubly linked list after Sorting:

4 6 8 10 12

Task 3

Write a function in JAVA for doubly Circular linked list and remove the duplicates from a list. Make sure that the doubly linked list you are using is sorted.

Original Doubly linked list:

4 4 4 4 6 8 8 10 12 12

Doubly linked list after removing duplicates:

4 6 8 10 12