Mohammad Ali Jinnah University

Chartered by Government of Sindh - Recognized by HEC

Lab Linked List 2

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Subject: Data Structures and Algorithms Lab (CS 2511)

Section: AM

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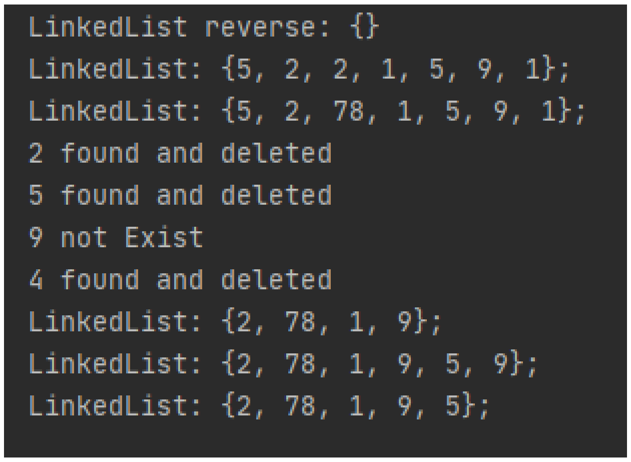
Task:

Implement Singly Linked List with following operations:

1) **Insertion**
2) **Insertion at index**
3) **Deletion by value**
4) **Printing list**

Output:



```
LinkedList reverse: {}
LinkedList: {5, 2, 2, 1, 5, 9, 1};
LinkedList: {5, 2, 78, 1, 5, 9, 1};
2 found and deleted
5 found and deleted
9 not Exist
4 found and deleted
LinkedList: {2, 78, 1, 9};
LinkedList: {2, 78, 1, 9, 5, 9};
LinkedList: {2, 78, 1, 9, 5};
```

Code:

```
public class PracticeQuestion {
    public static void main(String[] args) {
        Linkedlist list = new Linkedlist();
        System.out.println(list.Displayreverse()); //Q2

        list.insert(1); // Q3
        list.insertAtstart(2); //Q4
        list.insert(5,2); //Q5 at any postion or mid
        list.insert(9,2);
        list.insert(1); // Q3
        list.insertAtstart( 2); //Q4
        list.insert( 5,0); //Q5 at any postion or mid

        System.out.println(list.Display());

        list.update( 2,78); //Q5 at any postion or mid

        System.out.println(list.Display());

        list.deleteFront();
        list.deleteByValue(5);
        list.deleteBykey(9);
```

```java
        list.delete();
        System.out.println(list.Display());

        list.insert( 5);
        list.insert( 9);
        System.out.println(list.Display());

        list.deleteDuplicate();
        System.out.println(list.Display());

    }
}
```

Main class(class in which object of the linked list used).

Linkedlist class

```java
package com.company.Linkedlist;

import java.util.HashSet;

public class Linkedlist {
    private static Node head;

    static class Node{
        private int Value;
        private Node pointer;

        Node(int data){
            Value = data;
            pointer = null;
        }
    }

    static int getLenght() {
        int i = 0;
        Node last = head;
        while (last.pointer != null) {
            i++;
            last = last.pointer;
        }
        return i;
    }
    static boolean isEmpty() {
        boolean condition = true;

        if (head == null)
            condition = false;

        return condition;
    }
```

```
// add the element in the linked list
static void insert(int data) {
    Node new_node = new Node(data);
    new_node.pointer = null;

    if (!isEmpty())
        head = new_node;
    else {
        Node last = head;
        while (last.pointer != null)
            last = last.pointer;

        last.pointer = new_node;
    }
}
static void insert( int data, int key) {
    int size = getLenght();
    Node new_node = new Node(data);
    Node prev = null;
    Node current = head;

    if(key == 0)
        insertAtstart(data);
    else if(key > size-1)
        insert(data);
    else{
        for(int i = 0; i < key; i++)
            current = (prev = current).pointer;

        new_node.pointer = current;
        prev.pointer = new_node;
    }
}
static void insertAtstart(int data) {
    Node new_node = new Node(data);

    if (!(isEmpty()))
        head = new_node;
   else {
        new_node.pointer = head;
        head = new_node;
    }
}

// delete the element in the linked list
static void deleteByValue(int key){
    Node currNode = head,
            prev = null;

    if (currNode != null && currNode.Value == key) {
        head = currNode.pointer;
        System.out.println(key + " found and deleted");
        return;
    }
```

```
        while (currNode != null && currNode.Value != key)
            currNode = (prev = currNode).pointer;


        if (currNode != null) {
            prev.pointer = currNode.pointer;
            System.out.println(key + " found and deleted");
        }

        if (currNode == null)
            System.out.println(key + " not found");

    }
    static void deleteBykey(int key){
        int size = getLenght();
        Node currNode = head,
                prev = null;

        if (size < key) {
            System.out.println(key + " not Exist");
            return;
        }

        if (key == 0){
            head = currNode.pointer;
            System.out.println((currNode.pointer).Value + " found and deleted");
            return;
        }

        for (int i=0; i<key; i++)
            currNode = (prev = currNode).pointer;

        prev.pointer = currNode.pointer;
        System.out.println(key + " found and deleted");

    }
    static void delete(){
         deleteBykey(getLenght());
    }
    static void deleteFront(){
        deleteBykey(0);
    }
    static void deleteDuplicate(){
        HashSet<Integer> hs = new HashSet<>();

        Node current = head;
        Node prev = null;
        while (current != null) {
            if (hs.contains(current.Value)) prev.pointer = current.pointer;
            else {
                hs.add(current.Value);
                prev = current;
            }
            current = current.pointer;
        }
    }
```

```java
// update the element in the linked list
static void update( int index, int value){
    Node currNode = head;
    if (getLenght() < index) {
        System.out.println("Index not Exist! ");
        return;
    }

    for (int i = 0; i < index; i++)
        currNode = currNode.pointer;

    currNode.Value = value;
}

// search the element in the linked list
static Boolean Search( int key) {
    Node currNode = head;
    Boolean condition = false;

    if (currNode == null)
        return condition;


    while (currNode.Value != key)
        currNode = currNode.pointer;

    if (currNode != null) condition = true;
    else System.out.println(key + " not Exist(404 Error)");

    return condition;
}

//Sorting the Element in the
static void sortList() {
    Node current = head, index = null;
    int temp;

    if(current == null) {
        return;
    }
    else {
        while(current != null) {
           index = current.pointer;

            while(index != null) {
                if(current.Value > index.Value) {
                    temp = current.Value;
                    current.Value = index.Value;
                    index.Value = temp;
                }
                index = index.pointer;
            }
            current = current.pointer;
        }
    }
```

```
}

//Merge Two linked list in the element
static Linkedlist Merge(Linkedlist list1,Linkedlist list2){
    Linkedlist list = new Linkedlist();
    int l1 = getLenght(),l2 = getLenght();
    Node current = list1.head;

    for (int i = 0; i <= (l1+l2)+1; i++) {
        list.insert(current.Value);
        if (l1 != i) current = current.pointer;
        else current = list2.head;
    }
    return list;
}

//count the odd and even nodes
static int countOdd(){
    int count = 0;
    Node current = head;
    while (current.pointer != null){
        if (current.Value % 2 == 0)
            count++;
        current = current.pointer;
    }
    return count;
}
static int countEven(){
    int count = 0;
    Node current = head;
    while (current.pointer != null){
        if (current.Value % 2 != 0)
            count++;
        current = current.pointer;
    }
    return count;
}

//swap the number
static void swap(Node n1,Node n2){
    int temp = n1.Value;
    n1.Value = n2.Value;
    n2.Value = temp;
}
static void swapAdj(){
    int count = 0;
    Node current = head;
    while (current.pointer != null) {
        swap(current,(current = current.pointer));
        current = current.pointer;
    }
}


//Display methods
static String Display(){
        Node currNode = head;
        String display = "LinkedList: {";

        while (currNode != null) {
            display += currNode.Value + ", ";
            currNode = currNode.pointer;
        }
        display += "\b\b};";
        return display;
    }
    static String Displayreverse (){
        Node currNode = head;
        String display = "}";

        while (currNode != null) {
            display += currNode.Value + " ";
            currNode = currNode.pointer;
        }
        display += "{";

        display = "LinkedList reverse: " +(new StringBuilder(display)).reverse();
        return display;
    }

}
```