

Lab Assignment -1

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Batch: O3

Problem Statement -1:

Write a C program to create a student management system, where the students' information are stored in a doubly circular linked list. Initially, the circular doubly linked list is empty and the student personal data is entered from the filename "StudentData.xlsx" that contains the data of 13 students (name, D.O.B., address and phone no) in tabular form. The StudentData.xlsx file can be converted into a CSV file using Libreoffice or into any other file format readable from your C program. The program should have the following operations: insert, delete, search, modify, sort and print. While inserting, a unique roll number in the linked list is assigned to each student, where the starting roll number should be 101 and the list should always be in sorted according to their roll number (ascending order). However, when a deletion operation is performed, the roll number of the deleted student node is stored in a queue named unusedRollNo. These deleted roll numbers from the unusedRollNo queue will be allotted to the new students on next insertion operations.

DATA STRUCTURES USED:

- Circular Doubly Linked List
- Queue implemented using a circular array

ALGORITHMS USED:

- For sorting the list based on the name field , bubblesort algorithm was used.
- The searches are based on linear search algorithm.

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~/Documents x

Roll No :101
Name :Amit
DOB :19-Sep-88
Address :G-21, Sector 9, Opposite of Community House, Chandigarh
Phone No :9644258744

Roll No :102
Name :Arijit Singh
DOB :25-Apr-94
Address :181, 1st Floor, Aram Nagar Part 2, Andheri, Mumbai
Phone No :9874102563

Roll No :103
Name :Rakesh Kumar Bhadauria
DOB :15-Jun-93
Address :Vice Chief of the Air Staff, Air Headquarters, New Delhi
Phone No :7896325014

Roll No :104
Name :Narendra Modi
DOB :17-Sep-95
Address :Parliament House, Room No.1, South Block, Raisina Hills, New Delhi
Phone No :9630258741
```

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~/Documents x

Phone No :/8/4102563
Enter number corresponding to your option
    1.Print the list
    2.Insert from the file
    3.Delete a roll number
    4.Modify a roll number
    5.Search the list
    6.Sort the list according to name
    7.Exit Program
Sorted it!
Enter number corresponding to your option
    1.Print the list
    2.Insert from the file
    3.Delete a roll number
    4.Modify a roll number
    5.Search the list
    6.Sort the list according to name
    7.Exit Program

Roll No :101
Name :Amit
DOB :19-Sep-88
Address :G-21, Sector 9, Opposite of Community House, Chandigarh
Phone No :9644258744
```

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~/Documents x

Roll No :101
Name :Amit
DOB :19-Sep-88
Address :G-21, Sector 9, Opposite of Community House, Chandigarh
Phone No :9644258744

Roll No :105
Name :Amit
DOB :21-Apr-94
Address :391, 3rd Floor, Aram Nagar Part 2, Andheri, Mumbai
Phone No :7874102563

Roll No :102
Name :Arijit Singh
DOB :25-Apr-94
Address :181, 1st Floor, Aram Nagar Part 2, Andheri, Mumbai
Phone No :9874102563

Roll No :104
Name :Narendra Modi
DOB :17-Sep-95
Address :Parliament House, Room No.1, South Block, Raisina Hills, New Delhi
Phone No :9630258741
```

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~/Documents x

Roll No :101
Name :Amit
DOB :19-Sep-88
Address :G-21, Sector 9, Opposite of Community House, Chandigarh
Phone No :9644258744

Roll No :105
Name :Amit
DOB :21-Apr-94
Address :391, 3rd Floor, Aram Nagar Part 2, Andheri, Mumbai
Phone No :7874102563

Roll No :102
Name :Arijit Singh
DOB :25-Apr-94
Address :181, 1st Floor, Aram Nagar Part 2, Andheri, Mumbai
Phone No :9874102563

Roll No :104
Name :Narendra Modi
DOB :17-Sep-95
Address :Parliament House, Room No.1, South Block, Raisina Hills, New Delhi
Phone No :9630258741
```

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~/Documents x
Name :Narendra Modi
DOB :17-Sep-95
Address :Parliament House, Room No.1, South Block, Raisina Hills, New Delhi
Phone No :9630258741

Roll No :103
Name :Anonymous
DOB :30-Feb 2000
Address :Unknown
Phone No :909090909
Enter number corresponding to your option
    1.Print the list
    2.Insert from the file
    3.Delete a roll number
    4.Modify a roll number
    5.Search the list
    6.Sort the list according to name
    7.Exit Program

real    0m0.005s
user    0m0.001s
sys      0m0.005s
thefox@thebunker:~/Desktop/csn261_assign1(master)
$
```

Problem Statement -2:

Write a C Program for resizable deque using dynamic memory allocation, where a deque can perform the insertion and deletion operations at its both ends. The capacity of the deque depends on the number of elements currently stored in it, according to the following two rules:

- If an element is being inserted into a deque, when it is already full, then its capacity is doubled of its current size.
- After removing an element from a deque, if the number of elements are equal to half of the capacity of the deque, then its capacity is made half of its current size.

The program should have the following three functions: insert(), delete() and print(). The function print() should display the current size of the deque (capacity of deque) in terms of number of bytes.

DATA STRUCTURES USED:

- Dynamic Array
- Deque

ALGORITHMS USED:

- For front end data is copied using memmove and data is copied to or removed from the 0th index
- For rear end data is simply added to next index
- For resizing realloc is used to double the capacity

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~ x
Please Enter The Number Corresponding to your choice:
1.Print the queue
2.Insert from the front end
3.Insert from the rear end
4.Delete from the front end
5.Delete from the rear end
6.Print the capacity of the queue
7.Exit the program
> 2
Enter the number to be inserted
> 12

Please Enter The Number Corresponding to your choice:
1.Print the queue
2.Insert from the front end
3.Insert from the rear end
4.Delete from the front end
5.Delete from the rear end
6.Print the capacity of the queue
7.Exit the program
> 3
Enter the non-negative number to be inserted
> 14
```

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~ x
7.Exit the program
> 1
12,14

Please Enter The Number Corresponding to your choice:
1.Print the queue
2.Insert from the front end
3.Insert from the rear end
4.Delete from the front end
5.Delete from the rear end
6.Print the capacity of the queue
7.Exit the program
> 6
The current capacity of the queue is 2

Please Enter The Number Corresponding to your choice:
1.Print the queue
2.Insert from the front end
3.Insert from the rear end
4.Delete from the front end
5.Delete from the rear end
6.Print the capacity of the queue
7.Exit the program
>
```



```
> 2
Enter the number to be inserted
> 122
Please Enter The Number Corresponding to your choice:
1.Print the queue
2.Insert from the front end
3.Insert from the rear end
4.Delete from the front end
5.Delete from the rear end
6.Print the capacity of the queue
7.Exit the program
> 1
122,12,14
Please Enter The Number Corresponding to your choice:
1.Print the queue
2.Insert from the front end
3.Insert from the rear end
4.Delete from the front end
5.Delete from the rear end
6.Print the capacity of the queue
7.Exit the program
> 5
Removed 14 from the queue
```


> 1

12345,1234,122,12345678,123456789

ROP

Please Enter The Number Corresponding to your choice:

- 1.Print the queue
- 2.Insert from the front end
- 3.Insert from the rear end
- 4.Delete from the front end
- 5.Delete from the rear end
- 6.Print the capacity of the queue
- 7.Exit the program

> 6

The current capacity of the queue is 8

Please Enter The Number Corresponding to your choice:

- 1.Print the queue
- 2.Insert from the front end
- 3.Insert from the rear end
- 4.Delete from the front end
- 5.Delete from the rear end
- 6.Print the capacity of the queue
- 7.Exit the program

>

Problem Statement -3:

Given three 2D arrays (for red, green and blue color pixels) of a digital image. For a particular image pixel, the color shade of that pixel is Red if the pixel value at that position of the matrix corresponding to RED is greater than that of GREEN and BLUE. Same goes for GREEN and BLUE shades also. Write a C program that can perform following operations on the given image file:

- Remove all Red shades.
- Remove all Green shades.
- Remove all Blue shades.
- RedOnly: Preserve any red shades in the image, but remove all green and blue.
- GreenOnly: Preserve any green shades in the image, but remove all red and blue.
- BlueOnly: Preserve any blue shades in the image, but remove all red and green.

Write a function pixelValue() that has x and y as two parameters and displays the current pixel (RED, GREEN and BLUE) values of the input image at the point with coordinates (x, y), where x and y are the row and column numbers in that image file, respectively.

DATA STRUCTURES USED:

- Dynamic Array

ALGORITHMS USED:

- Use of fscanf to read the pixel values
- Use of $O(n^2)$ algorithm for all functions to traverse through the arrays

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~ x
thefox@thebunker:~/Desktop/csn261_assign1(master)
$ ./q3
What do you want to do?
  1.Remove all Red shades
  2.Remove all Blue shades
  3.Remove all Green shades
  4.Red Only
  5.Green Only
  6.Blue Only
1
Now we can print the pixel values at a point
Enter 1 to print pixelvalues or any other to exit
1
Enter x coordinate
123
Enter y coordinate
1234
Red: 0
Green: 86
Blue 67
Enter 1 to print pixelvalues or any other to exit
5
thefox@thebunker:~/Desktop/csn261_assign1(master)
$
```

```
thefox@thebunker: ~/Desktop/csn261_assign1
File Edit View Search Terminal Tabs Help
thefox@thebunker: ~/Desktop/csn261_assign1 x thefox@thebunker: ~ x
thefox@thebunker:~/Desktop/csn261_assign1(master)
$ ./q3
What do you want to do?
  1.Remove all Red shades
  2.Remove all Blue shades
  3.Remove all Green shades
  4.Red Only
  5.Green Only
  6.Blue Only
4
Now we can print the pixel values at a point
Enter 1 to print pixelvalues or any other to exit
1
Enter x coordinate
650
Enter y coordinate
1200
Red: 46
Green: 0
Blue 0
Enter 1 to print pixelvalues or any other to exit
5
thefox@thebunker:~/Desktop/csn261_assign1(master)
$
```