Department of Information Systems and Technologies

CTIS152 – Algorithms and Data Structures

FALL 2024 - 2025

Lab Guide #17 – Week 11 -2

OBJECTIVE : Queue Library and Queue Exercises

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Copy the queue_int.h file from C:\Program Files (x86)\Microsoft Visual Studio\20XX (version)\Professional (or community)\VC\Tools\ MSVC\14.14.26428 (may change)\include directory to each of your local project folders to modify it.

Q1. Write a C program that gets a number from the user until a negative number is entered. Then, it checks if the number is multiple of 6 or not. If it is multiple of 6 inserts the number to the queue until a negative number is entered. Then, it displays the queue content.
Write the following function: **displayQueue.**

Example Run:

```
Enter a number (or negative to STOP) : 61
Enter a number (or negative to STOP) : 54
Enter a number (or negative to STOP) : 19
Enter a number (or negative to STOP) : 12
Enter a number (or negative to STOP) : 37
Enter a number (or negative to STOP) : 30
Enter a number (or negative to STOP) : -99

Queue Content
--------------------------
54      12      30
```

Project Name: LG17_Q1
File Name: Q1.cpp

Q2. Make the necessary changes in the header file to create a **string** queue.
A group of people has arrived to the bus stop and are lined up. When a bus arrived to the bus stop some of them will get on the bus. Now you will simulate it using the following information;

The names of the passengers are given in order in the "**busStop.txt"**. Write a C program that will read the names of the passengers from the text file into a queue **with size 20**. Then, display the list of all passengers at the bus stop.
When a bus arrived at the bus stop some of the passengers (***n*** passengers) will get on the bus. The user will give the number of passengers (***n***) and the ***n*** passengers to be removed from the queue. The program displays the passengers' names boards to the bus and also displays the waiting passengers. Please examine the example run.

Write the following function: **displayQueue.**

Example Run:

```
Waiting passengers:
James
Kirk
Lars
Jason
Anselmo
Max
Igor
Brain
Joe
Robert
Mark

The bus arrived to the bus stop!
How many passengers getting on the bus? 5

The list of passengers getting on the bus:
James
Kirk
Lars
Jason
Anselmo

Waiting passengers:
Max
Igor
Brain
Joe
Robert
Mark
```

busStop.txt

```
James
Kirk
Lars
Jason
Anselmo
Max
Igor
Brain
Joe
Robert
Mark
```

Project Name: LG17_Q2
File Name: Q2.cpp

Q3. Make the necessary changes in the header file to create a **structure** queue.

In a study center, the names of the classes and the total number of questions solved in a day are kept in the "classes.txt" file.

Write a C program that reads the information from the file and inserts those information into a **structure queue** (**className**, **questions**) . The program displays the list of all classes on the screen. Then, it finds and displays "the class of the day" by checking the number of questions solved in a day.

Try to write the following functions; **`fillQueue, displayQueue, classOfTheDay.`**

Note: displayQueue and classOfTheDay functions will not affect to the original queue.

Project Name: LG17_Q3
File Name: Q3.cpp

Example Run :

```
The list of all classes;

Class Name    # of Questions
***************************
SAY101          5801
EA201           4850
SOZ301          6105
SAY110          1220
SOZ310          4570
EA210           3492
SAY111          1540
SOZ333          3247
EA222           9410

The Class of the day
********************
EA222      9410
```

classes.txt

```
SAY101 5801
EA201 4850
SOZ301 6105
SAY110 1220
SOZ310 4570
EA210 3492
SAY111 1540
SOZ333 3247
EA222 9410
```

Additional Questions

AQ1. Arya is a bright student and she will enter an exam for the university. She already knows all of the topics. However, she should solve questions for math to being quicker. She cannot decide that which topic she should solve.

Write a C program that reads file named **"math.txt"** into an array of structure queues (topic and level) according to the their levels. To exemplify, if the question level is "Easy", its topic should be stored in a queue and other levels should be stored in other queues. Then, the program displays the content of the queues and asks the user "Do you want to add any topic?" If answer is 'Y', it gets the information and adds it to the correct queue. Then, it asks the same question again until 'N' is entered. If answer is 'N', it gets the level of the question to select a topic and it will display a topic from the queue according to the answer as in the example run. Write the **`displayQueue`** function to display the content of the queue.

Example Run #1:

```
Easy Topics;
             Topic        Level
*******************************
    Rational Number       Easy
    Rate Proportion       Easy
           Clusters       Easy
           Problems       Easy
            Numbers       Easy

Medium Topics;
             Topic        Level
*******************************
          Inequality    Medium
     Absolute Value     Medium
           Functions    Medium
          Statistics    Medium
         Permutation    Medium

Hard Topics;
             Topic        Level
*******************************
Exponential Numbers       Hard
           Equations      Hard
         Combination      Hard
         Possibility      Hard
            Parabola      Hard

Do you want to add any topic? (Y/N): Y

Enter the topic: Logic

  Enter the level of the question: Medium
               Topic        Level
  *******************************
            Inequality    Medium
       Absolute Value     Medium
             Functions    Medium
            Statistics    Medium
           Permutation    Medium
                  Logic   Medium

  Do you want to add any topic? (Y/N): Y

  Enter the topic: Algebra

  Enter the level of the question: Hard
               Topic        Level
  *******************************
  Exponential Numbers       Hard
             Equations      Hard
           Combination      Hard
           Possibility      Hard
              Parabola      Hard
                Algebra     Hard

  Do you want to add any topic? (Y/N): N
```

```
  Which level do you prefer to solve
  questions? : Medium
You should solve the Inequality question.
Good Luck :)
```

Example Run #2:

```
Easy Topics;
            Topic        Level
*******************************
    Rational Number      Easy
    Rate Proportion      Easy
           Clusters      Easy
           Problems      Easy
            Numbers      Easy

Medium Topics;
            Topic        Level
*******************************
         Inequality    Medium
   Absolute Value    Medium
        Functions    Medium
       Statistics    Medium
      Permutation    Medium

Hard Topics;
            Topic        Level
*******************************
Exponential Numbers      Hard
          Equations      Hard
        Combination      Hard
        Possibility      Hard
           Parabola      Hard

Do you want to add any topic? (Y/N): n

Which level do you prefer to solve
questions? : Easy
You should solve the Rational Number
question. Good Luck :)
```

Project Name: LG17_AQ1
File Name: AQ1.cpp

AQ2. Due to some calamity, all the roads near Hatrus University got damaged. The villages situated near by began experiencing a shortage of food. Hatrus University took the initiative to supply them with sufficient food till some external help reached the village. Hatrus has its own flying club which decided to drop food packages to the houses. Note that, the basic motive is to feed all the houses.

Write a C program that reads the information of households from the txt file named **"village.txt"** into a structure queue (houseHolder, distance, noOfPeople, noOfPackage). NoOfPackage will be calculated during the input process. A package can be given at most two people. Display the structure queue as in the example run. Then, the program asks "Do we have damaged package?" If the answer is 'Y', it will get the information of the household having a damaged package, remove this person from the list, insert his/her again to the queue with the correct noOfPackage (if the searched person is not in the list then a warning message will be displayed) and display again the content of the queue. Otherwise, it will display an appropriate message as thank you.

Write the function **removeFromQueue** that takes the queue and the name of the householder as input parameters, and removes that person from the queue if it exists. The function returns the information of the deleted person and also returns **1** or **0** depending on the success of the delete operation.

Write the **fillQueue, displayQueue** functions to fill and display the content of the queue.

village.txt

```
Ajay Devgan:2 4
Ranveer Singh:4 2
Ranbir Kapoor:10 1
Akshay Kumar:16 6
Rani Mukherjee:25 2
Hrithik Roshan:30 2
Amitabh Bachchan:37 1
Madhuri Dixit:41 7
Salman Khan:48 5
Shahrukh Khan:65 2
```

Example Run:

```
The list of people;

    House Holder       Distance        # of People        # of Package
*************************************************************************
      Ajay Devgan          2                4                2
    Ranveer Singh          4                2                1
    Ranbir Kapoor         10                1                1
     Akshay Kumar         16                6                3
   Rani Mukherjee         25                2                1
   Hrithik Roshan         30                2                1
 Amitabh Bachchan         37                1                1
    Madhuri Dixit         41                7                4
      Salman Khan         48                5                3
    Shahrukh Khan         65                2                1

All of the packages were distributed.
Do we have damaged package? (Y / N): Y

Enter the household: Ali Yilmaz
There is no householder with the specified name!

The list of people;

    House Holder       Distance        # of People        # of Package
*************************************************************************
      Ajay Devgan          2                4                2
    Ranveer Singh          4                2                1
    Ranbir Kapoor         10                1                1
     Akshay Kumar         16                6                3
   Rani Mukherjee         25                2                1
   Hrithik Roshan         30                2                1
 Amitabh Bachchan         37                1                1
```

```
    Madhuri Dixit         41               7               4
      Salman Khan         48               5               3
    Shahrukh Khan         65               2               1

All of the packages were distributed.
Do we have damaged package? (Y / N): Y

Enter the household: Madhuri Dixit

How many package was damaged? : 2

The list of people;

    House Holder       Distance        # of People        # of Package
*****************************************************************************
      Ajay Devgan          2               4               2
    Ranveer Singh          4               2               1
    Ranbir Kapoor         10               1               1
     Akshay Kumar         16               6               3
   Rani Mukherjee         25               2               1
   Hrithik Roshan         30               2               1
 Amitabh Bachchan         37               1               1
      Salman Khan         48               5               3
    Shahrukh Khan         65               2               1
    Madhuri Dixit         41               7               2

All of the packages were distributed.
Do we have damaged package? (Y / N): Y

Enter the household: Ranbir Kapoor

How many package was damaged? : 1

The list of people;

    House Holder       Distance        # of People        # of Package
*****************************************************************************
      Ajay Devgan          2               4               2
    Ranveer Singh          4               2               1
     Akshay Kumar         16               6               3
   Rani Mukherjee         25               2               1
   Hrithik Roshan         30               2               1
 Amitabh Bachchan         37               1               1
      Salman Khan         48               5               3
    Shahrukh Khan         65               2               1
    Madhuri Dixit         41               7               2
    Ranbir Kapoor         10               1               1

All of the packages were distributed.
Do we have damaged package? (Y / N): N

Thank you for your help :)
```

Project Name: LG17_AQ2
File Name: AQ2.cpp