Doubly Linked List Report

The doubly linked list program allows the user to create a sorted, linked list of integers that is connected via pointers in both directions, rather than just top-down, so it is easy to navigate through the list from either end. In my implementation of this I use a template DoubleList class which implements a doubly linked list of any type, and a ListController class to hold the list and manage the functons according to the users' input. There is also a ListController class to hold an integer type doubly linked list for the program to work with, and call its functions. Its' functions correspond to the user's options in using the program, i.e. for adding and removing

DoubleList Class

The DoubleList class stores pointers to each end of the list, and a Node class which itself contains the list element and two pointers which point to the next and previous nodes in the list. It has functions to add to the list in order, to remove a node from the list, and to print the list either forwards or backwards.

ListController Class

The ListController class simply stores an integer version of a DoubleList, and has functions corresponding to each of the user's options to add a number to the list in order, to remove a given number from the list, and to display the list in either ascending or descending order. These functions interact with the user and manage the calling of the DoubleList's functions. It also has some helper display functions for the user interface such as a function to display the menu.

main()

The main function simply creates a ListController for the session, calls its' menu display methods, and controls the flow through the menu and its' options. It does this by getting the user's validated menu choice and entering a switch statement to call the corresponding ListController's function, on a loop, till the user is done.

Testing

I employed a testing strategy that involved going through and testing the different paths and cases for each main waiting list menu option, with particular focus on boundary cases, as they are the most likely to experience errors and failures of logic (e.g. attempting to work outside the boundaries of an array). I did this because the 4 main option methods call and make use of the other methods, and so testing these methods tests the other methods. For example, testing the option to display the list in either direction involves testing the isEmpy() method for the list in the process, since it is called and used as part of the process. The test results are detailed below; all tests yielded the expected result.

main() / Menu Navigation – Valid Input

Input: [Run program]

Result: [Welcome displayed followed by the menu:]
1. Add a number to the list
2. Delete a number from the list
3. Display list in ascending order

4. Display list in descending order
Please enter the number of your choice:

[Asks user to enter number of their selection]

Input: *1*

Result: [Enters and goes through the for option 2]
[Menu is displayed with a request for the user's choice again]

Input: *2*

Result: [Enters and goes through the for option 2]
[Menu is displayed with a request for the user's choice again]

Input: *3*

Result: [Enters and goes through the for option 3]
[Menu is displayed with a request for the user's choice again]

Input: *4*

Result: [Enters and goes through the for option 4]
[Menu is displayed with a request for the user's choice again]

Input: *0*

Result: [Program ends and exits.]

main() / Menu - Invalid Input

Input: [Run program]

Result: [Welcome displayed followed by the menu:]
1. Add a number to the list
2. Delete a number from the list
3. Display list in ascending order
4. Display list in descending order
Please enter the number of your choice:

[Asks user to enter number of their selection]

Input: *5*

Result: *That's not a valid choice, please enter 1-4, or 0 to exit:*

Input: *g*

Result: *That's not a valid choice, please enter 1-4, or 0 to exit:*

Input: *-1*

Result: *That's not a valid choice, please enter 1-4, or 0 to exit:*

Input: *1.5*

Result: *That's not a valid choice, please enter 1-4, or 0 to exit:*

Option 1 – Add a number to the list

Valid numbers

Input: [Select the add number option from the menu.]

Result: *Please enter the number you'd like to add to the list:*

Input: *1*

Result: *The number 1 was successfully added to the list.*
[Inspection of list reveals it was successfully added in order]

Input: [Select the add number option from the menu.]

Result: *Please enter the number you'd like to add to the list:*

Input: *0*

Result: *The number 0 was successfully added to the list.*
[Inspection of list reveals it was successfully added in order]

Input: [Select the add number option from the menu.]

Result: *Please enter the number you'd like to add to the list:*

Input: *-1*

Result: *The number -1 was successfully added to the list.*
[Inspection of list reveals it was successfully added in order]

Multiple Number Entry – Order Of Insert

Input: [Add the following numbers to the list via option 1:]
9, 6, 2, 332, -7, 5, 7, 2, 2

Result: [List order after each entry:]
9
6, 9
2, 6, 9
2, 6, 9, 332
-7, 2, 6, 9, 332
-7, 2, 5, 6, 9, 332
-7, 2, 5, 6, 7, 9, 332
-7, 2, 2, 5, 6, 7, 9, 332
-7, 2, 2, 2, 5, 6, 7, 9, 332

Invalid Input

Input: [Select the add number option from the menu.]

Result: *Please enter the number you'd like to add to the list:*

Input: *1.5*

Result: *"Sorry, that's not a valid number, please enter integer numbers only:*

Input: [Select the add number option from the menu.]

Result: *Please enter the number you'd like to add to the list:*

Input: *abc*

Result: *"Sorry, that's not a valid number, please enter integer numbers only:*

Option 2 – Delete a number from the list

Invalid Input

Input: [Select the delete number option from the menu.]

Result: *List Contents: -7 2 2 2 5 6 7 9 332*

Please enter the number you'd like to remove from the list:

Input: *-8*

Result: *Sorry, that number isn't in the list to delete, please select one from the list displayed above:*

Input: *abc*

Result: *Sorry, that's not a valid number, please enter integer numbers only:*

Input: *1.5*

Result: *Sorry, that's not a valid number, please enter integer numbers only:*

Input: *334*

Result *Sorry, that number isn't in the list to delete, please select one from the list displayed above:*

Valid Input

Input: [Select the delete number option from the menu.]

Result: *List Contents: -7 2 2 2 5 6 7 9 332*

Please enter the number you'd like to remove from the list:

Input: *-7*

Result: *The number -7 was successfully removed from the list.*
[Inspection of the list reveals it was indeed deleted from the list.]

Input: [Select the delete number option from the menu.]

Result: *List Contents: 2 2 2 5 6 7 9 332*

Please enter the number you'd like to remove from the list:

Input: *332*

Result: *The number 332 was successfully removed from the list.*
[Inspection of the list reveals it was indeed deleted from the list.]

Input: [Select the delete number option from the menu.]

Result: *List Contents: 2 2 2 5 6 7 9*

Please enter the number you'd like to remove from the list:

Input: *5*

Result: *The number 5 was successfully removed from the list.*
[Inspection of the list reveals it was indeed deleted from the list.]

Input: [Select the delete number option from the menu.]

Result: *List Contents: 2 2 2 5 6 7 9*

Please enter the number you'd like to remove from the list:

Input: *2*

Result: *The number 2 was successfully removed from the list.*
[Inspection of the list reveals a 2 was indeed deleted from the list.]

Input: [Select the delete number option from the menu.]

Result: *List Contents: 9*

Please enter the number you'd like to remove from the list:

Input: *9*

Result: *The number 9 was successfully removed from the list.*
[Inspection of the list reveals it was indeed deleted from the list and the list is now empty.]

Displaying the list

Ascending Order

Input: [Select the display in ascending order option from the menu when the list has numbers 1, 2, 3, 4, 5, 6]

Result: *List Contents: 1 2 3 4 5 6*

Input: [Select the display in ascending order option from the menu when the list has nothing in it

Result: *The list is currently empty.*

Descending order

Input: [Select the display in descending order option from the menu when the list has numbers 1, 2, 3, 4, 5, 6]

Result: *List Contents: 6 5 4 3 2 1*

Input: [Select the display in descending order option from the menu when the list has nothing in it]

Result: *The list is currently empty.*

Continuing Use

Input: [Add the numbers 1, 2, 3, 4, 5, 6, then remove them all]
[Select the display in ascending order option]

Result: *The list is currently empty.*

Input: [Select the display in descending order option]

Result: *The list is currently empty.*

Input: [Try to add the numbers 10, 11, 12, 13, 14 and view them via the display options]

Result: [All numbers were added successfully and displayed properly by the display functions]

Input: [Try to delete all of the numbers 10, 11, 12, 13, 14 view the list via the display options]

Result: [All numbers were successfully removed and the display options said:]
The list is currently empty.