CSC172 LAB 3

DOUBLY LINKED LISTS

1 Introduction

The labs in CSC172 will follow a pair programming paradigm. Every student is encouraged (but not strictly required) to have a lab partner. Labs will typically have an even number of components. The two partners in a pair programming environment take turns at the keyboard. This paradigm facilitates code improvement through collaborative efforts, and exercises the programmers cognitive ability to understand and discuss concepts fundamental to computer programming. The use of pair programming is optional in CSC172. It is not a requirement. You can learn more about the pair programming paradigm, its history, methods, practical benefits, philosophical underpinnings, and scientific validation at http://en.wikipedia.org/wiki/Pair_programming

Every student must hand in their own work, but every student must list the name of their lab partner if any on all labs.

This lab has six parts. You and your partner(s) should switch off typing each part, as explained by your lab TA. As one person types the lab, the other should be watching over the code and offering suggestions. Each part should be in addition to the previous parts, so do not erase any previous work when you switch.

The textbook should present examples of the code necessary to complete this lab. However, collaboration is allowed. You and your lab partner may discuss the lab with other pairs in the lab. It is acceptable to write code on the white board for the benefit of other lab pairs, but you are not allowed to electronically copy and/or transfer files between groups.

2 A Doubly Linked List

The goal of this lab it to gain familiarity with doubly linked lists.

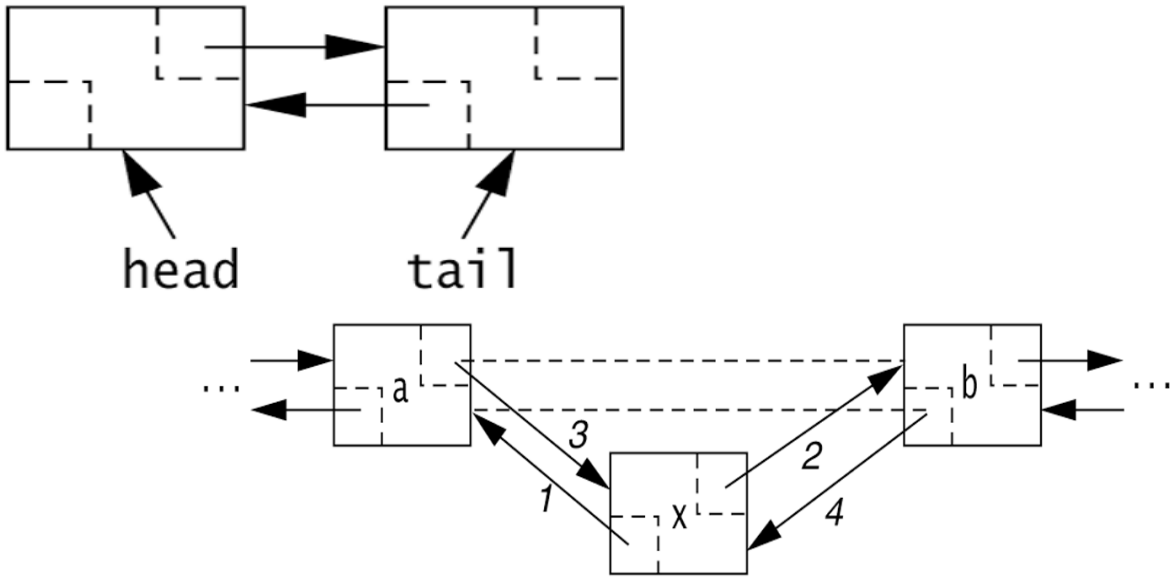
1. Begin this lab by implementing a simple class that represents a “node” in a doubly linked list, as follows. Compile the following class.

```
public class MyDoubleNode<AnyType> {
     public AnyType data;
     public MyDoubleNode<AnyType> next;
     public MyDoubleNode<AnyType> prev;
}
```

2. Have the second member of your pair type in the code for the doubly linked list interface.

```
public interface DoublyLinkedList<AnyType> {
     public void insert(AnyType x);
     public void delete(AnyType x);
     public boolean lookup(AnyType x);
     public boolean isEmpty();
     public void printList();
     public void printListRev();
}
```

3. Implement your own linked list class that implements `DoublyLinkedList`. A doubly linked list class will typically contain two `MyDoubleNode` references for the start and end of the list. Implement a constructor and the `insert()` method. At construction time nodes are constructed to indicate an empty list as indicated in the diagram below. Implement the `isEmpty()` method.



4. Implement the `printList()` and the `printListRev()` methods, which print the lists in forward and reverse order, respectively. Also implement a test program class with a main method that inserts a few objects into your list class and then prints the list in both directions. Include in your comments the expected runtime of the `printList()` method.
5. Implement the `lookup()` method. The lookup method should return true if the object is contained in the list and return false otherwise. Modify your `insert()` method so as to prevent duplicate items (only insert an item if `lookup()` returns false). Modify your test program to demonstrate that the lookup method works.
6. Implement the `delete()` method. The delete method should do nothing if the item is not found in the list. If the item is found then it should modify the list to remove the item.

3 Hand In

Hand in the source code from this lab at the appropriate location on the BlackBoard system at my.rochester.edu. You should hand in a single zip file (compressed archive) containing your source code, README, and OUTPUT files, as described below.

1. A plain text file named README that includes your contact information, your partner's name, a brief explanation of the lab (A one paragraph synopsis. Include information identifying what class and lab number your files represent.), and one sentence explaining the contents of all the other files you hand in.
2. Several Java source code files representing the work accomplished for this lab. All source code files should contain author and partner identification in the comments at the top of the file. It is expected that you will have a file for the Node class, a file for the SimpleLinkedList interface, a file for your own linked list class and a file for the test program class.
3. A plain text file named OUTPUT that includes author information at the beginning and shows the compile and run steps of your code. The best way to generate this file is to cut and paste from the command line.

4 Grading

Your grade will be determined based on the correct implementation of the following (total 90%):

MyDoubleNode class and DoublyLinkedList interfaces – 15%

Generic doubly linked list class and its constructor – 15%

insert() method – 15%

isEmpty() method – 5%

printList() method – 5%

printListRev() method – 5%

lookup() – 15%

delete() method – 15%

README file accounts for the remaining 10%