CS 240

Data Structures and Algorithms

Spring 2014

1 Lab 06

1.1 Goal

The goal of this assignment is to practice working with singly linked lists. You should comment your code well and be sure that it works as intended.

2 Implementation

You are to implement the List ADT as defined in the textbook.

2.1 List ADT

Recall that an ADT is a collection of data elements, and the basic operations to act on those elements.

Collection of Data Elements: A sequence with a finite number of data items, all of the same type.

Basic Operations:

- *Construction:* Create an empty list
- *Empty:* Check if the list is empty
- *Insert:* Insert an item into the list
- *Delete:* Remove an item from the list

- *Traverse:* Go through the list or a part of it, accessing and processing the elements in order. This operation is also referred to as iterating through the list.

For the implementation of this ADT, you are to create a class named `LinkedList`. The basic operations should be implemented with methods with the following names:

- `LinkedList()`
- `empty()`
- `insertFront(Element e)` and `insertBack(Element e)`
- `removeFront()` and `removeBack();`, each of these should return the Element (by value) that was removed
- `operator<<`

Additionally, provide the following functionality:

- `insertAt(Element e, int i)`, this inserts a Node with Element e at position i if such a position exists (uses 0-based indexing).
- `removeAt(int i)`, this removes a Node at position i, if such a position exists (uses 0-based indexing), and should return the value of the Element that was removed.
- `find(Element e)`, this returns the position in the List where a Node containing the provided argument is first found (-1 if not found).

Note that you should be using your Node class that you designed and tested in Lab 05. Make sure that any modifications that you make to your Node class after it has been submitted are well-documented and that your Node class maintains the behaviors set forth in the previous assignments. Consider the propagation effects of your Node class when you are writing your LinkedList class. (Is it necessary to overload The Big Three for your Linked List?)

Further note that it is requested that you only maintain a pointer to the beginning of the list.

Remember to thoroughly test your code before coming to lab on Tuesday.