CS 200 Data Structures

Lab 5: Linked Lists and Deques

Submission

- Upload all code and answers to questions in a single zip folder to Lab 5 assignment folder on Kodiak.

Goal: Understand a doubly linked list and implement a Deque scenario using linked lists.

Part I

A deque (pronounced "deck") is a special kind of list where you can only add and remove from the beginning and end of the list. Answer the questions below, defending your answers with running times and other information from class. Note that your answers may be inter-related, so read all questions before answering any of them. Your goal should be to answer the questions in a way that leads to adding and removing being at the front and back of the list.

1. Would it be better to implement a deque as a singly linked list or a doubly linked list? Why?
2. Would it be better to implement a deque as a circularly linked list or not? Why or why not?
3. Would an implementation of a deque benefit from maintaining a tail reference? Why or why not? If yes, would it be in addition to or instead of a head reference?

Place your answers in report.txt

Part II

The file doubly_linked_node.py contains a skeleton implementation of a DoublyLinkedNode class. Complete it by implementing each of its methods. The PowerPoint file (dll-insert-delete.pptx) may help in your understanding of how to insert and delete nodes in a doubly linked structure.

doubly_linked_node_test.py contains test methods. Use these to help you understand what each method is supposed to do. When you are done, all of the test functions should be enabled (i.e., not commented out) and passing.

Part III

deque.py contains a skeleton implementation of a Deque class. Use your answers to Part I to guide your implementation. However, do use the DoublyLinkedNode you created in Part II. You still need to decide:

a. Whether to use a head pointer, a tail pointer, or both.

b. Whether to use a circular structure or not.

c. Whether to use sentinel nodes or not.

All methods (except __str__) should run in time.

You may include other public or private methods if you wish. However, there must not be any methods that allow insertion or removal from anywhere other than the beginning or end of the list.

deque_test.py contains test functions for Deque. When you are done, all of the test functions should be enabled (i.e., not commented out) and passing.

What to Submit

Submit a zip file, named FirstName_LastName_lab5, containing all code and report.txt.