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CS 150-02

Professor Falconi

02/27/2020

Lab 4 Report

Introduction

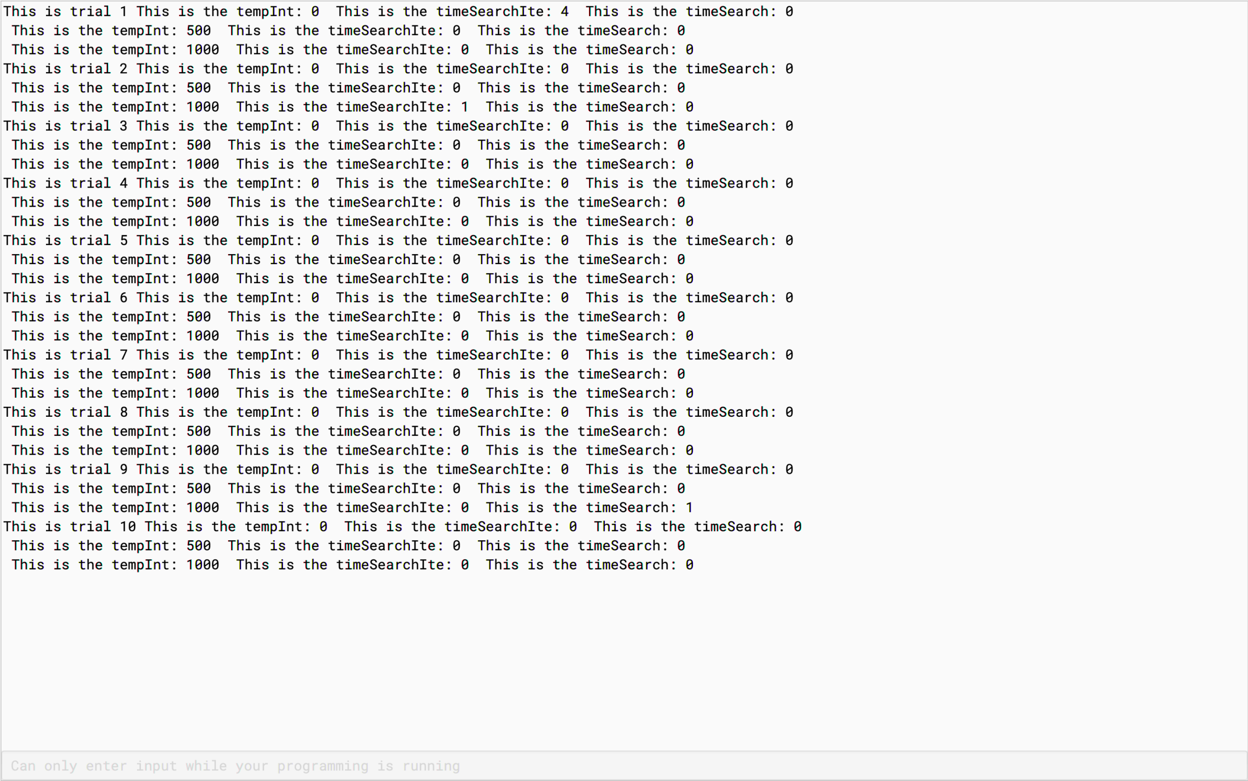
In this lab, we are asked to create our own version of the data type, linkedlist. We are to create a singly linked, non-circular list where each node contains only one link to the next node and the overall list has a head and a tail. In addition, we have to create an iterator for the linkedlist. We also had to implement the linkedlist as a generic class in order to have different types of object use the linkedlist.

Approach

When I was designing the program, I had to create a linkedList class which implemented the iterable interface. The methods in the linkedlist class were iterator(), addFirst(<E>value), addEnd(<E> value), and a getElement(int x). The iterator() method returns an instance of the MyLinkedListIterator class, the addFirst method adds the value that was put in as a parameter to the front of the list, the addEnd method adds the value that was put in as a parameter to the end of the list, and the getElement method takes in a integer to represent the index you want to retrieve the element from and it returns the element at that index. The next classes I created were the Node<E> class and MyLinkedListIterator class which implements the iterator interface. For MyLinkedListIterator class, I made methods hasNext() which checks to see if the node is pointing to a next node to iterate through the list and next() which move to the next node in the list and keeps the iterator going. The next class I created was MyListIntegerContainer which uses the my linkedlist data structure. In this class, I created four methods addToBack(int x), addToFront(int x), SearchIte(int x) and Search(int x). The addToBack and addToFront methods both take in integers and use the linkedlist's addEnd and addFront methods respectively to add those integers to the list. The SearchIte method uses the iterator to search for the integer in the list. The Search method does not use an iterator but still searches the list for the integer. Finally, I unit tested the classes and made sure they worked correctly before getting to the experiment controller class that tested the search methods in the MyListIntegerContainer class.

Data

I collected data to graph by running multiple trials of the timed search methods to see how long it takes the computer on average to search for an element and which methods took more time to complete and how much time it takes certain amounts of MyLinkedList size to take to complete those searches.



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 This is the tempInt: 500  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 1000  This is the timeSearchIte: 0  This is the timeSearch: 0
This is trial 2 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 500  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 1000  This is the timeSearchIte: 1  This is the timeSearch: 0
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 This is the tempInt: 500  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 1000  This is the timeSearchIte: 0  This is the timeSearch: 0
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 This is the tempInt: 500  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 1000  This is the timeSearchIte: 0  This is the timeSearch: 0
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 This is the tempInt: 1000  This is the timeSearchIte: 0  This is the timeSearch: 0
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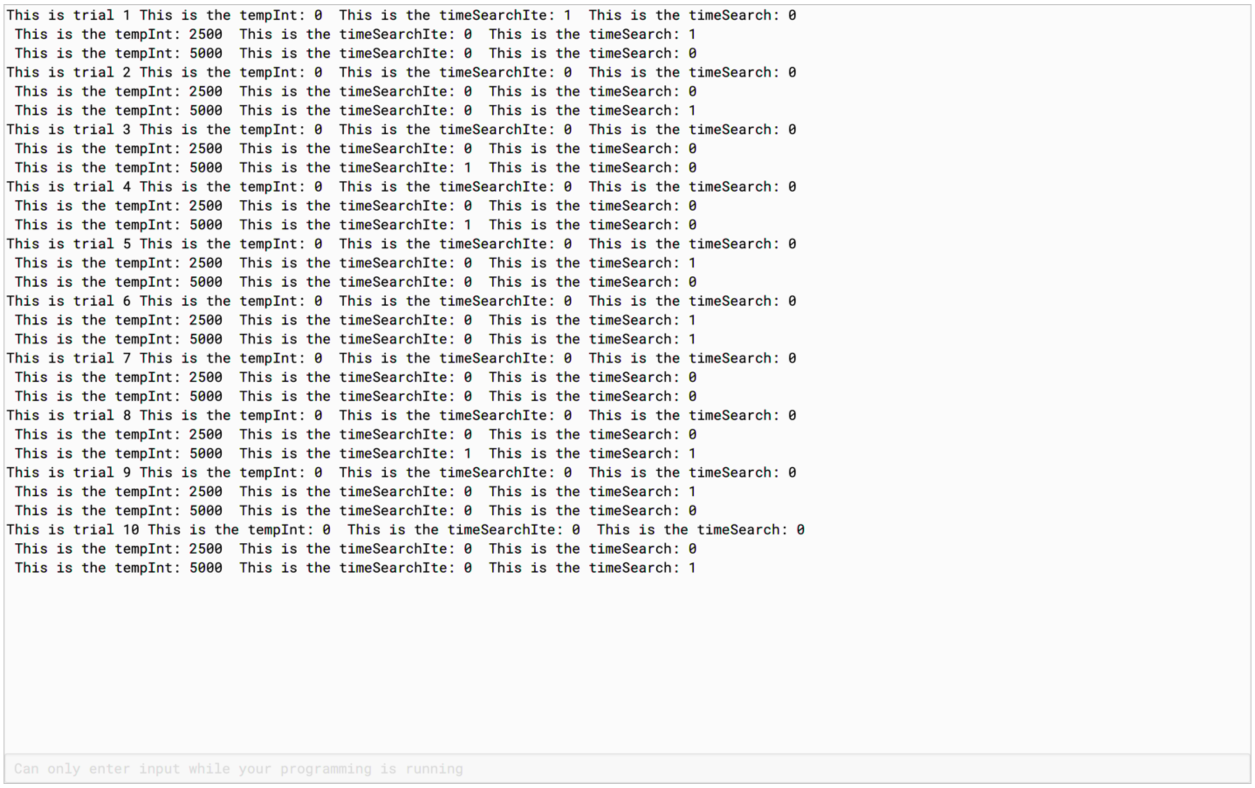

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 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
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 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
This is trial 6 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 2500  This is the timeSearchIte: 0  This is the timeSearch: 1
 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 1
This is trial 7 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 2500  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
This is trial 8 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 2500  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 5000  This is the timeSearchIte: 1  This is the timeSearch: 1
This is trial 9 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 2500  This is the timeSearchIte: 0  This is the timeSearch: 1
 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
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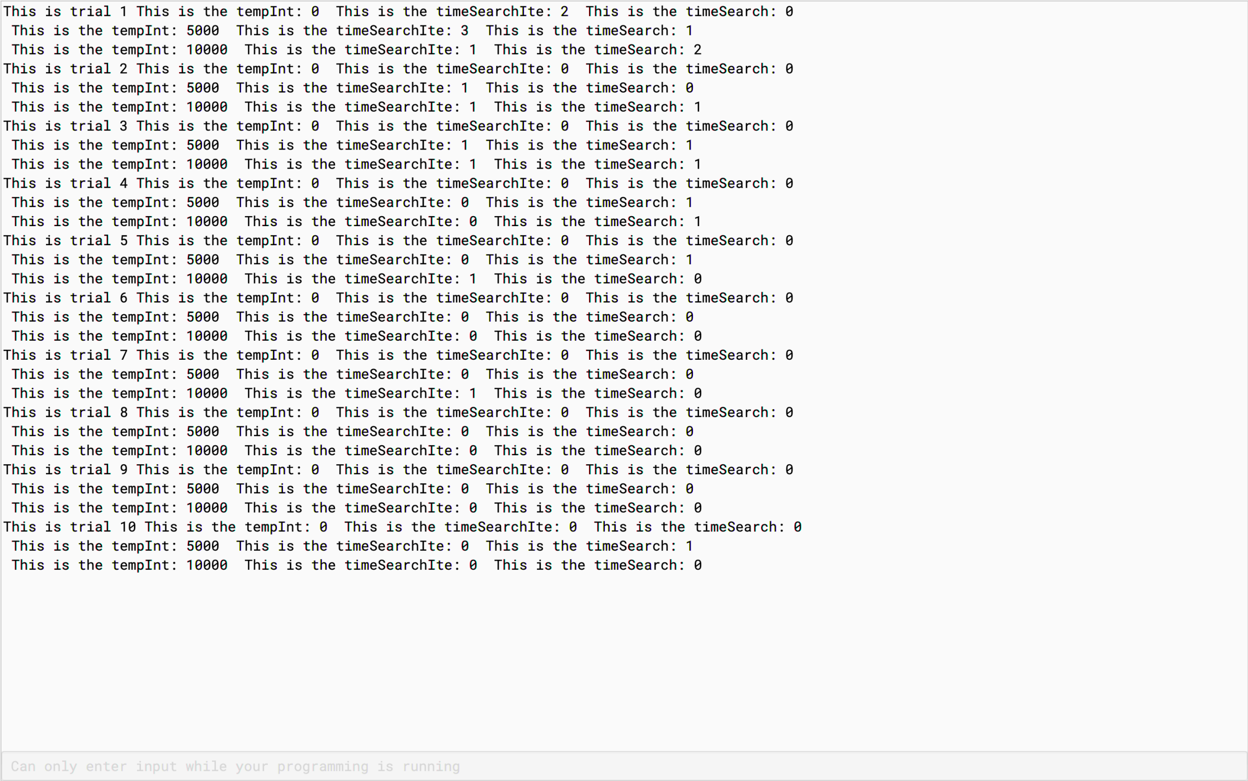

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 This is the tempInt: 10000  This is the timeSearchIte: 1  This is the timeSearch: 2
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 This is the tempInt: 5000  This is the timeSearchIte: 1  This is the timeSearch: 0
 This is the tempInt: 10000  This is the timeSearchIte: 1  This is the timeSearch: 1
This is trial 3 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 5000  This is the timeSearchIte: 1  This is the timeSearch: 1
 This is the tempInt: 10000  This is the timeSearchIte: 1  This is the timeSearch: 1
This is trial 4 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
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 This is the tempInt: 10000  This is the timeSearchIte: 0  This is the timeSearch: 1
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 This is the tempInt: 10000  This is the timeSearchIte: 1  This is the timeSearch: 0
This is trial 6 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 10000  This is the timeSearchIte: 0  This is the timeSearch: 0
This is trial 7 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 10000  This is the timeSearchIte: 1  This is the timeSearch: 0
This is trial 8 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
 This is the tempInt: 5000  This is the timeSearchIte: 0  This is the timeSearch: 0
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This is trial 9 This is the tempInt: 0  This is the timeSearchIte: 0  This is the timeSearch: 0
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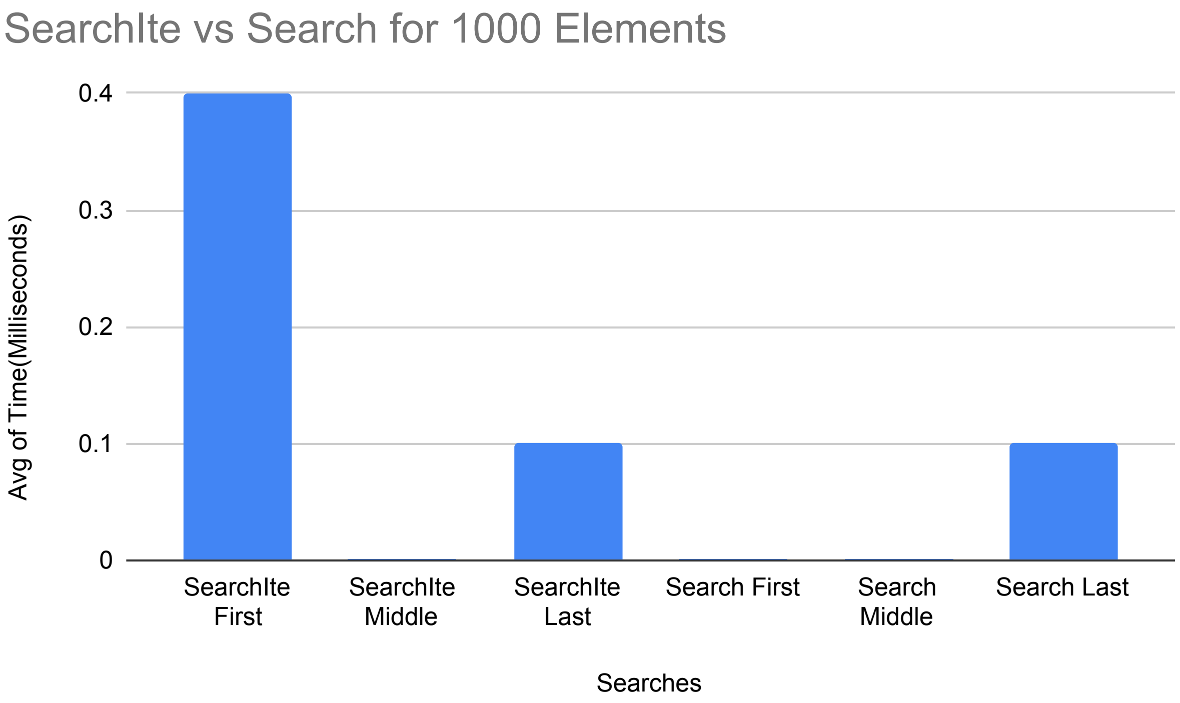
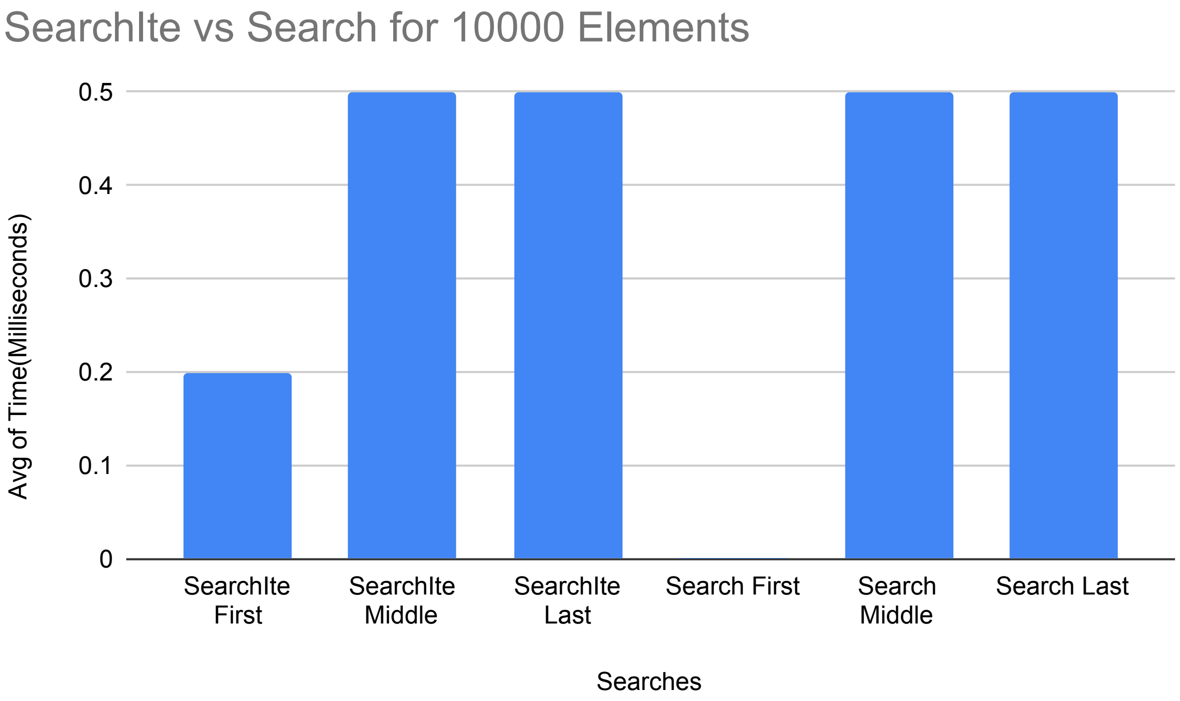
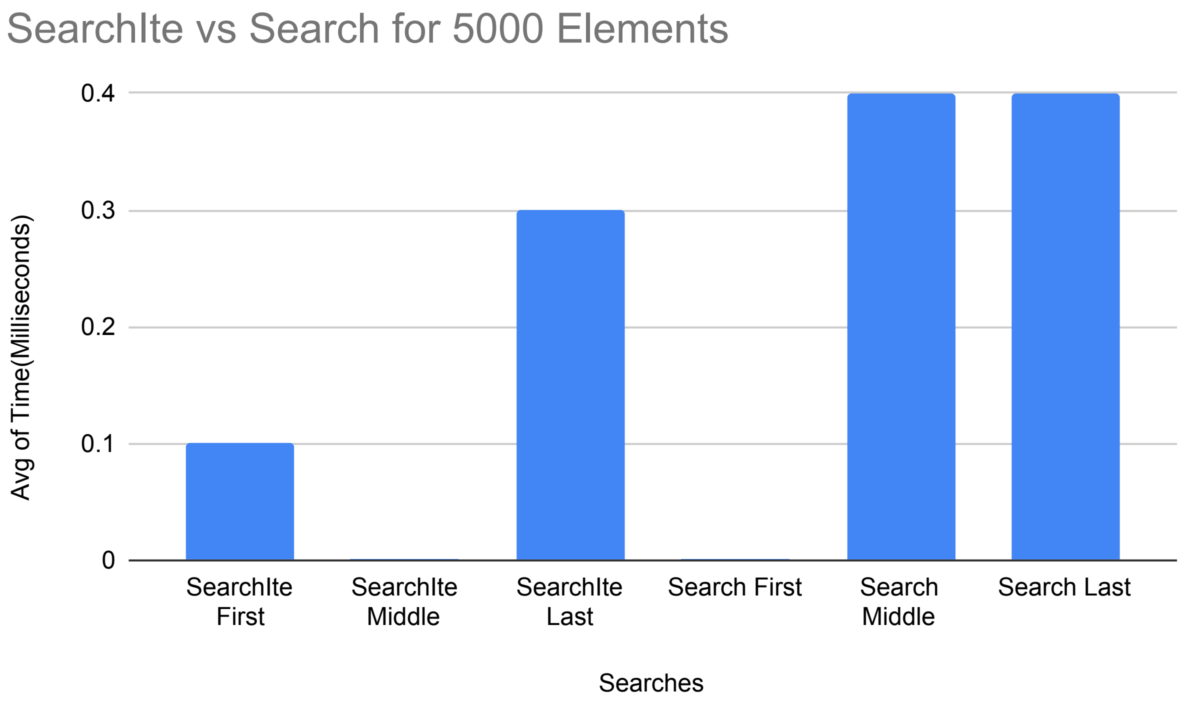

SearchIte vs Search for 1000 Elements
Avg of Time(Milliseconds)
0.4
0.3
0.2
0.1
0
SearchIte First
SearchIte Middle
SearchIte Last
Search First
Search Middle
Search Last
Searches


SearchIte vs Search for 10000 Elements
Avg of Time(Milliseconds)
0.5
0.4
0.3
0.2
0.1
0
SearchIte First
SearchIte Middle
SearchIte Last
Search First
Search Middle
Search Last
Searches



Conclusion

Overall, this program was successful, and it taught me how to implement a LinkedList data structure and learn how to run an iterator through an abstract

References

ArrayList API

Random API

LinkedList API

Iterator API

file:///Users/abiolaolofin/Desktop/CS150Labs/Lab4/doc/MyListIntegerContainer.html
file:///Users/abiolaolofin/Desktop/CS150Labs/Lab4/doc/MyLinkedList.html
file:///Users/abiolaolofin/Desktop/CS150Labs/Lab4/doc/Node.html
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