

GIT Department of Computer Engineering

CSE 222/505 – Spring 2020

Homework #3 Part 2 Report

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Analysis of The Performance – Theoretical

Method	LinkedList	Array List
read	add(char) method inside of read method works $O(1)$ because LinkedList holds the linked list tail. This method is called n times. In total, this loop works $O(n)$.	add(char) method inside of read method works $O(n)$ because of resizing. This method is called n times. In total, this loop works $O(n^2)$.
readWithIterator	ListIterator.add(char) method inside of readWithIterator method works $O(1)$. This method is called n times. In total, this loop works $O(n)$.	ListIterator.add(char) method inside of readWithIterator method works $O(n)$. This method is called n times. In total, this loop works $O(n^2)$.
add	ListIterator.add(int,String) method inside of add method works $O(n)$. And String size is m . In total, add method works $O(n.m)$.	ListIterator.add(int,String) method inside of add method works $O(n)$. And String size is m . In total, Add method works $O(n.m)$.
addWithIterator	Creating ListIterator at index is works $O(n)$. ListIterator.add(char) method works $O(1)$. The loop with the ListIterator .add(char) method works $O(n)$. In total, addWithIterator works $O(n)$.	Creating ListIterator at index is works $O(1)$. ListIterator.add(char) works $O(n)$ because of resizing. The loop with ListIterator.add(char) method works n times. In total, addWithIterator works $O(n^2)$.
find	Loop works n (list size) times. Searched text size is m . In total, find method works $O(n.m)$.	Loop works n (list size) times. Searched text size is m . In total, find method works $O(n.m)$.

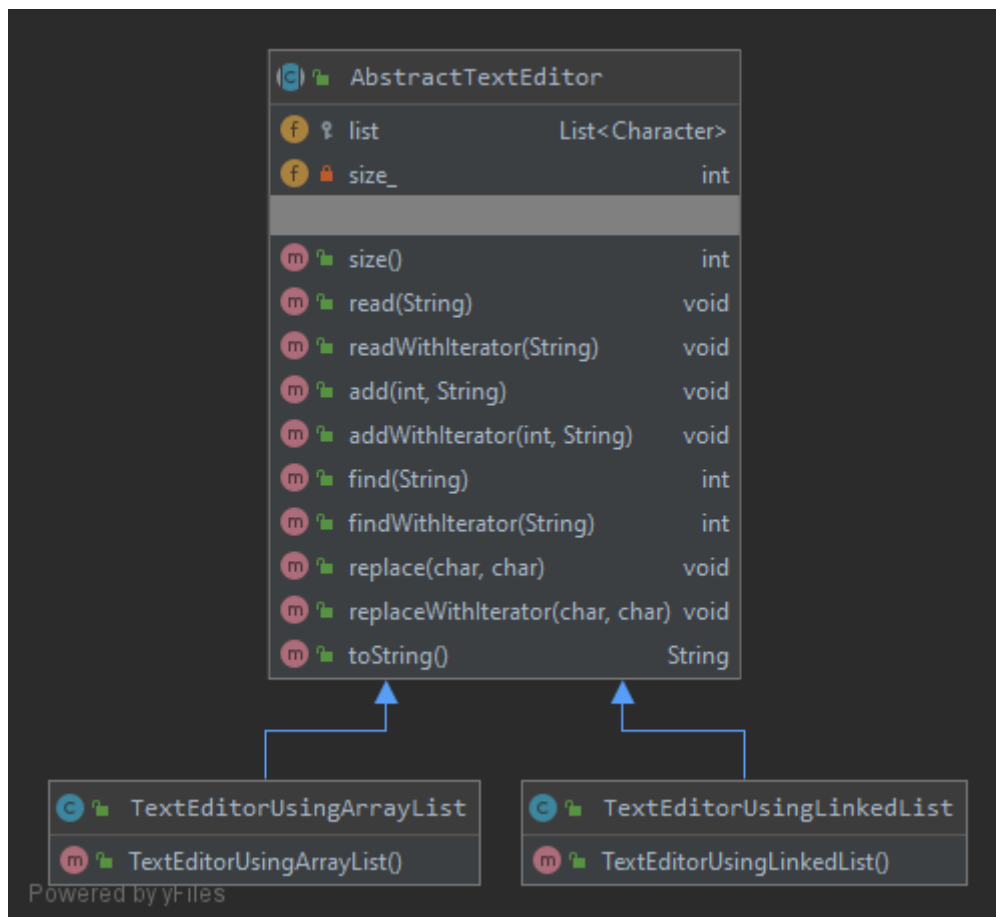
findWithIterator	Creating ListIterator at 0. index is works $O(1)$. Searched text size is m and loop works n times. In total, findWithIterator works $O(n.m)$.	Creating ListIterator at 0. index is works $O(1)$. Searched text size is m and loop works n times. In total, findWithIterator works $O(n.m)$.
replace	get(int) method inside of replace method works $O(n)$. set(int,char) method works $O(n)$. First get method works then get method works in a loop. In total, replace method works $O(n^2)$.	get(int) method inside of replace method works $O(1)$. set(int,char) method is works $O(1)$. The loop with get and set method works n times. In total, replace method works $O(n)$.
replaceWithIterator	Creating ListIterator at 0. index is works $O(1)$. Loop works n times. In total, replaceWithIterator method works $O(n)$.	Creating ListIterator at 0. index is works $O(1)$. Loop works n times. In total, replaceWithIterator method works $O(n)$.

Analysis of The Performance - Experimental

LinkedList – Text Size : 400				
Method	Trial 1 (μ S)	Trial 2 (μ S)	Trial 3 (μ S)	Average (μ S)
read	431	639	801	623,6666667
readWithIterator	237	245	427	303
add	15	18	18	17
addWithIterator	376	307	264	315,6666667
find	349	187	120	218,6666667
findWithIterator	42	49	40	43,66666667
replace	112	242	256	203,3333333
replaceWithIterator	33	81	35	49,66666667

ArrayList – Text Size : 400				
Method	Trial 1 (μS)	Trial 2 (μS)	Trial 3 (μS)	Average (μS)
read	870	968	664	834
readWithIterator	454	675	590	573
add	39	26	38	34,33333333
addWithIterator	80	73	54	69
find	698	580	460	579,3333333
findWithIterator	51	52	50	51
replace	201	107	107	138,3333333
replaceWithIterator	35	30	37	34

Class Diagram



Problem Solution Approach

First, 8 methods for the requested LinkedList and ArrayList classes. Before writing these methods for each class, the difference between these two classes is storage and working time of methods. For this reason, I wrote an abstract class and this class

will make the requested methods for list reference. Afterwards, it will be enough for the classes that have extends from this class to create this list according to their storage format. In this way, I will be saved in the code duplicate.

Test Cases

TEST ID	SCENERIO	TEST DATA	EXPECTED RESULTS	ACTUAL RESULTS	PASS /FAIL
Test 01	Creating TextEditorUsingArrayList	TextEditorUsingArrayList class	Successfully created	As expected	Pass
Test 02	Creating TextEditorUsingLinkedList	TextEditorUsingLinkedList class	Successfully created	As expected	Pass
Test 03	Reading the valid file with the read (fileName) method and building a text editor	fileName : text1.txt	Successfully read and built	As expected	Pass
Test 04	Reading the invalid file with the read (fileName) method and building a text editor	fileName : wrongName.txt	Exception caught and printed message	As expected	Pass
Test 05	Reading the valid file with the readWithIterator (fileName) method and building a text editor	fileName : text1.txt	Successfully read and built	As expected	Pass
Test 06	Reading the invalid file with the readWithIterator (fileName) method and building a text editor	fileName : wrongName.txt	Exception caught and printed message	As expected	Pass
Test 07	add (index, text) method to the valid index	Size : 0 Index : 0 Text : "TEST" Size : 50 Index : 0 Text : "TEST" Index : 25 Text : "TEST" Index : 50 Text : "TEST"	Successfully added	As expected	Pass

Test 08	add (index, text) method to the invalid index	Size : 0 Index : -1 Index : 1 Text : "TEST" Size : 50 Index : -1 Index : 51 Text : "TEST"	IndexOutOfBound Exception thrown	As expected	Pass
Test 09	addWithIterator (index, text) method to the valid index	Size : 0 Index : 0 Text : "TEST" Size : 50 Index : 0 Text : "TEST" Index : 25 Text : "TEST" Index : 50 Text : "TEST"	Successfully added	As expected	Pass
Test 10	addWithIterator (index, text) method to the invalid index	Size : 0 Index : -1 Index : 1 Size : 50 Index : -1 Index : 51	IndexOutOfBound Exception thrown	As expected	Pass
Test 11	find (text) method to the text containing the word	Size : 50 Text : "adipiscin"	Successfully returned right index	As expected	Pass
Test 12	find (text) method to text without the searched word	Size : 0 Text : "TEST" Size : 50 Text : "TEST"	Successfully returned index -1	As expected	Pass
Test 13	findWithIterator (text) method to the text containing the word	Size : 50 Text : "adipiscin"	Successfully returned right index	As expected	Pass
Test 14	findWithIterator (text) method to text without the searched word	Size : 0 Text : "TEST" Size : 50 Text : "TEST"	Successfully returned index -1	As expected	Pass
Test 15	If there is a target character, replace (target, new Character) method	Size : 50 Target : 'o' New Character : 'X'	Successfully replaced	As expected	Pass

Test 16	If there is not a target character, replace (target, new Character) method	Size : 0 Target : 'X' New Character : 'Y' Size : 50 Target : 'X' New Character : 'Y'	Successfully didn't replace	As expected	Pass
Test 17	If there is a target character, replaceWithIterator (target, new Character) method	Size : 50 Target : 'o' New Character : 'X'	Successfully replaced	As expected	Pass
Test 18	If there is not a target character, replaceWithIterator (target, new Character) method	Size : 0 Target : 'X' New Character : 'Y' Size : 50 Target : 'X' New Character : 'Y'	Successfully didn't replace	As expected	Pass

Running and Results

TEST ID : 01

Creating TextEditorUsingArrayList

TextEditorUsingArrayList is created successful.

Size : 0

TEST ID : 02

Creating TextEditorUsingLinkedList

TextEditorUsingLinkedList is created successful.

Size : 0

TEST ID : 03

Reading the valid file with the read("text1.txt") method
and building a text editor

Before reading size : 0

Reading is successful.

After reading size : 50

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

TEST ID : 04

Reading the invalid file with the read("wrongName.txt") method
and building a text editor

Before reading size : 0

Exception caught!

Error! File could not founded!

After reading size : 0

TEST ID : 05

Reading the valid file with the readWithIterator("text1.txt") method
and building a text editor

Before reading size : 0

Reading is successful!

After reading size : 50

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

TEST ID : 06

Reading the invalid file with the readWithIterator("wrongName.txt") method
and building a text editor

Before reading size : 0

Error! File could not founded!

After reading size : 0

TEST ID : 07

add(index, text) method to the valid index

Before adding size : 0

add(0,"TEST")

After adding size : 4

Text : TEST

Before adding size : 50

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

add(0,"TEST")

After adding size : 54

Text : TESTLorem ipsum dolor sit amet, consectetur adipiscing

Before adding size : 50

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

add(25,"TEST")

After adding size : 54

Text : Lorem ipsum dolor sit ameTESTt, consectetur adipiscing

Before adding size : 50

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

add(50,"TEST")

After adding size : 54

Text : Lorem ipsum dolor sit amet, consectetur adipiscingTEST

TEST ID : 08

add(index, text) method to the invalid index

Before adding size : 0

add(-1,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 0

Before adding size : 0

add(1,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 0

Before adding size : 50

add(-1,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 50

Before adding size : 50

add(51,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 50

TEST ID : 09

addWithIterator(index, text) method to the valid index

Before adding size : 0

add(0,"TEST")

After adding size : 4

Text : TEST

Before adding size : 50

add(0,"TEST")

After adding size : 54

Text : TESTLorem ipsum dolor sit amet, consectetur adipiscing

Before adding size : 50

add(25,"TEST")

After adding size : 54

Text : Lorem ipsum dolor sit ameTESTt, consectetur adipiscing

Before adding size : 50

add(50,"TEST")

After adding size : 54

Text : Lorem ipsum dolor sit amet, consectetur adipiscingTEST

TEST ID : 10

addWithIterator(index, text) method to the invalid index

Before adding size : 0

addWithIterator(-1,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 0

Before adding size : 0

addWithIterator(1,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 0

Before adding size : 50

addWithIterator(-1,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 50

Before adding size : 50

addWithIterator(51,"TEST")

java.lang.IndexOutOfBoundsException: Invalid Index!

After adding size : 50

TEST ID : 11

find (text) method to the text containing the word

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

find("adipiscing")

Index : 41

TEST ID : 12

find (text) method to text without the searched word

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

find("TEST")

Index : -1

TEST ID : 13

findWithIterator(text) method to the text containing the word

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

findWithIterator("adipiscing")

Index : 41

TEST ID : 14

findWithIterator(text) method to text without the searched word

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

findWithIterator("TEST")

Index : -1

TEST ID : 15

If there is a target character, replace(target, new Character) method

Before replacing :

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

replace('o','X')

After replacing :

Text : LXrem ipsum dXlXr sit amet, cXnsectetur adipiscing

Size : 50

TEST ID : 16

If there is not a target character, replace(target, new Character) method

Before replacing :

Text :

Size : 0

replace('X','Y')

After replacing :

Text :

Size : 0

Before replacing :

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

replace('X','Y')

After replacing :

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

TEST ID : 17

If there is a target character, replaceWithIterator(target, new Character) method

Before replacing :

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

replaceWithIterator('o','X')

After replacing :

Text : LXrem ipsum dXlXr sit amet, cXnsectetur adipiscing

Size : 50

TEST ID : 18

If there isn't a target character, replaceWithIterator(target, new Character) method

Before replacing :

Text :

Size : 0

replaceWithIterator('X','Y')

After replacing :

Text :

Size : 0

Before replacing :

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50

replaceWithIterator('X','Y')

After replacing :

Text : Lorem ipsum dolor sit amet, consectetur adipiscing

Size : 50