# **Lab 5\_1**

# **Looking at Java’s ArrayList and LinkedList classes**

# **Week beginning 9th October 2023**

# The following table is from Thinking In Java 4 by Bruce Eckel (<http://sd.blackball.lv/library/Thinking_in_Java_4th_edition.pdf>) in

# Choosing between Lists in Chapter 11.

# It gives the time in milliseconds for multiple runs of various methodsof ArrayList and LinkedList.

---------------------ArrayList ---------------------

size add get set iteradd insert remove

10 121 139 191 435 3952 446

100 72 141 191 247 3934 296

1000 98 141 194 839 2202 923

10000 122 144 190 6880 14042 7333

---------------------LinkedList ---------------------

size add get set iteradd insert remove

10 182 164 198 658 366 262

100 106 202 230 457 108 201

1000 133 1289 1353 430 136 239

10000 172 13648 13187 435 255 239

(Note: Example of application: using ArrayList/LinkedList to store a dictionary in spelling check)

In this lab we will write some code to compare ArrayList and LinkedList. We will compare the get() method of both List types.

What is the Big Oh value for the get() method of each List type?

In your code, populate an ArrayList and a LinkedList with data from a large dataset.

There are datasets available to download from github (and elsewhere) e.g.

<https://github.com/dwyl/english-words/blob/master/words_alpha.zip>

Download this file – Choose View Raw. Save the file to desktop and then extract it to the desktop. This is just a file with 370099 words that you could use as a dictionary. You might come up with a better file to use as a dictionary. Let us know if you do!

Put the file in the root folder of your project in IntelliJ.

In IntelliJ, create a new project and add Lab5.java. Also add the words\_alpha.txt.

Run the program in the usual way and check that it works.

It should output the time for multiple “gets” for ArrayList and LinkedList, initially of size 10. Run it for various size, 10, 100 etc. See table below.

Note: in the code there is a variable reps which you may need to experiment with for your system.

Whatever value you chose for it, note that the same value of reps must be used for all runs of the program.

It should be big enough to allow you to distinguish between the two types of List for all the different sizes, but not so big that the code takes forever to run!

The time for ArrayList may be very small if you run it for small values of reps.

Time the tests on the two types of list. Look at System class for a method that gives you can use to time method calls.

Fill in the following table:

Specify the value you used for reps \_\_\_**1000\_**\_\_\_

ArrayList get() method

|  |  |
| --- | --- |
| size | Time taken |
| 10  100  1000  10000  100000 | 0.2680 ms  1.4231 ms  2.1752 ms  15.2957 ms  No output |

LinkedList get() method

|  |  |
| --- | --- |
| size | Time taken |
| 10  100  1000  10000  100000 | 0.3906 ms  2.4660 ms  133.1777 ms  14670.7043 ms  No output |

Here is graph created by me in Python using Matplotlib

A graph with a red line and a blue line

Description automatically generated

Obtained with \_\_\_\_ **11th Gen Intel(R) Core(TM) i7-1165G7**\_\_\_\_\_\_\_ processor, \_\_\_ **2.80 GHz**\_\_\_\_\_\_ GHz, Java Version \_**17\_**\_, Windows 11

Check if your results are comparable to Eckels. Based on the Big Oh values for the respective get() methods, are the values as you would expect?

My results for ArrayList align with the expected O(1) complexity but they show an unexpected jump at the largest size. LinkedList align with the expected O(n) complexity, having increase as size increases. Eckels' results had absolutely different values.