Lab 2 in TND002

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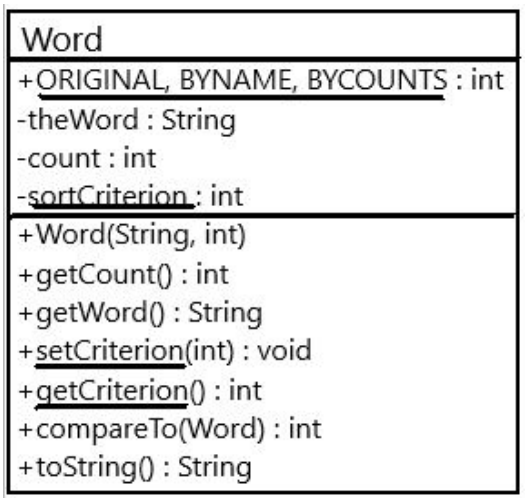
January 30, 2023

1 Summary

The aim of this lab is to familiarize you with how Java reads from and writes data to the console and hard disk. You will also handle exceptions and use try-catch blocks. You will read in text from an external file, break it up into words, store the words in a dynamic array that serves as a dictionary and sort them using various criteria. You will input text from the console and save data to an external file. You implement three classes. **Word** contains variables and methods that are relevant for individual words of your text. **Dictionary** stores all words and provides methods that are applied to the ensemble of words. **Lab2** contains *main(..)* and handles all the reading and writing from and to the console and external files.

2 Task1: The class Word



Word has the class diagram shown to the left. Set the class constants to the values 0, 1, and 2 when you declare them. Use the name of the constants in your code (in all classes) since that makes the code easier to read. Initialize *sortCriterion* with *ORIGINAL* when you declare it.

The instance variables *theWord* and *count* are initialized in the constructor.

getCount() and *getWord()* return the values of *count* and *theWord*.

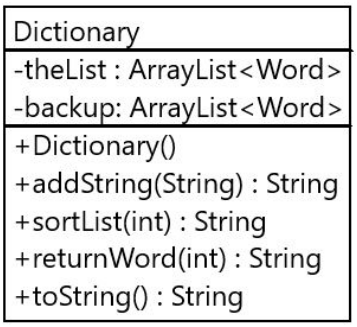
setCriterion(arg) changes the value of *sortCriterion* to one of the class constants and *getCriterion()* returns its value.

compareTo(arg) should always return 2 if *sortCriterion* == *ORIGINAL*. Otherwise, it compares two instances of **Word** either by the values of *theWord* or by those of *count*. Which one, depends on the value of *sortCriterion*. If *sortCriterion* equals *BYNAME*, *compareTo(arg)* should compare the values of *theWord* alphabetically. Use the instance

method *compareTo(..)* of **String** with the same name as yours (which compares two instances of **Word**) to compare the values of both strings *theWord* alphabetically. If *sortCriterion* equals *BYCOUNTS*, then your *compareTo(..)* method should compare the values of *count* numerically. For these two criteria, your *compareTo(arg)* method should send back one of the possible values -1, 0, or 1. It should return a value -1 if the value of the instance variable (either *count* or *theWord*) of the calling instance of **Word** is smaller than that of *arg* in the argument list of *compareTo(arg)*. It should return 0 if the values of the instance variables match. If the value of the instance variable of the calling instance is larger than that of its counterpart in *arg*, *compareTo(arg)* should return 1.

toString() returns a formatted string. It starts with "Word:" followed by the value of *word* in a column 10 characters wide and aligned to the right. You leave 3 empty spaces and write "Count:" followed by the value of *count* in a column 3 characters wide.

3 Task 2: The class Dictionary



The instance variables of this class are *theList* and *backup*. You initialize *backup* to *null* when you declare it. *theList* is initialized in the constructor.

addString(arg) takes in the string *arg*. If *arg* is not yet contained in any element of *theList*, then *addString(arg)* creates a new instance of **Word** with a value *count* = 1 and adds it to *theList*. If there is already an instance of **Word** with a value of *theWord* equal to *arg*, then it increases its value of *count* by 1. Use only the methods listed in the class diagram of **Word** (don't implement a method that changes *count*). *addString(String)* should return the return value of *toString()* of the added or updated instance of **Word**.

sortList(arg) sorts the instances of **Word** in *theList* according to the value of *arg*. If *sortList(arg)* is called for the first time, then it should attach a deep copy of *theList* to *backup*. If *arg* of *sortList(arg)* has the value of the class constant *ORIGINAL*, then it should (shallow) copy the address of *backup* to *theList*, set the value of *sortCriterion* to that of *ORIGINAL*, and return "Word list was reset".

If *arg* has the value of one of the other class constants, then you set *sortCriterion* to *arg* and you start off with a loop over all elements of *theList*. Use the method *compareTo(arg)* of **Word** to compare the instance of **Word** at the current position in *theList* to the instances in the slots with a higher index. If the result of *compareTo(arg)* is -1, you swap both instances of **Word**. In the end, you get a list that is either sorted by the number of *count* or alphabetically by the value of *theWord*. The elements of *theList* will be sorted in descending order. *sortList(arg)* should return "Sorted by counts" or "Sorted alphabetically" depending on the value of *sortCriterion*.

returnWord(arg) checks if *theList* has an instance of **Word** at the slot with the index *arg*. If *arg* exceeds the largest index of *theList*, the method should return "end". Otherwise, it should return the return value of *toString()* of that instance of **Word**.

toString() should return a string that starts with "Content: " followed by a line break. It should call the *toString()* methods of all elements of *theList* and concatenate their return strings to one large string. There should be a line break between each. The method should return the concatenated string.

4 Task 3: The class Lab2

The method *main(..)* of **Lab2** deals with IO from the console and from/to external files. You throw the IOExceptions from the console and you catch IOExceptions from the file access (to practice both). Know the difference between both schemes as the lab assistant will ask you for it.

Initialize a global console reader in **Lab2** and create in *main(..)* an instance of **Dictionary** called *theDictionary*.

Write "Type filename:" to the console and read in a string from the console. Initialize with it an instance of **File** and check if the file exists. If it does not exist, read another filename from the console and try again. If your code cannot find the file after three attempts, the program should end. If it finds the file, then you should read in all the lines of the file and create one long string with it. Trim it using the instance method *trim()* of **String** to avoid getting empty characters at the beginning or end.

You split the string at one or more empty spaces, creating a static array of individual strings. You send all strings of the static array, which are not numbers, into the *addString(arg)* method of *theDictionary* and write the return value of this method to the console. This helps you keeping track if the value of *count* increases as it should when you send in a word that already exists.

Write the return value of *toString()* of *theDictionary* to the console.

Sort the list in *theDictionary* by counts and write the return string of *sort(..)* to the console. Write the return value of *toString()* of *theDictionary* to the console.

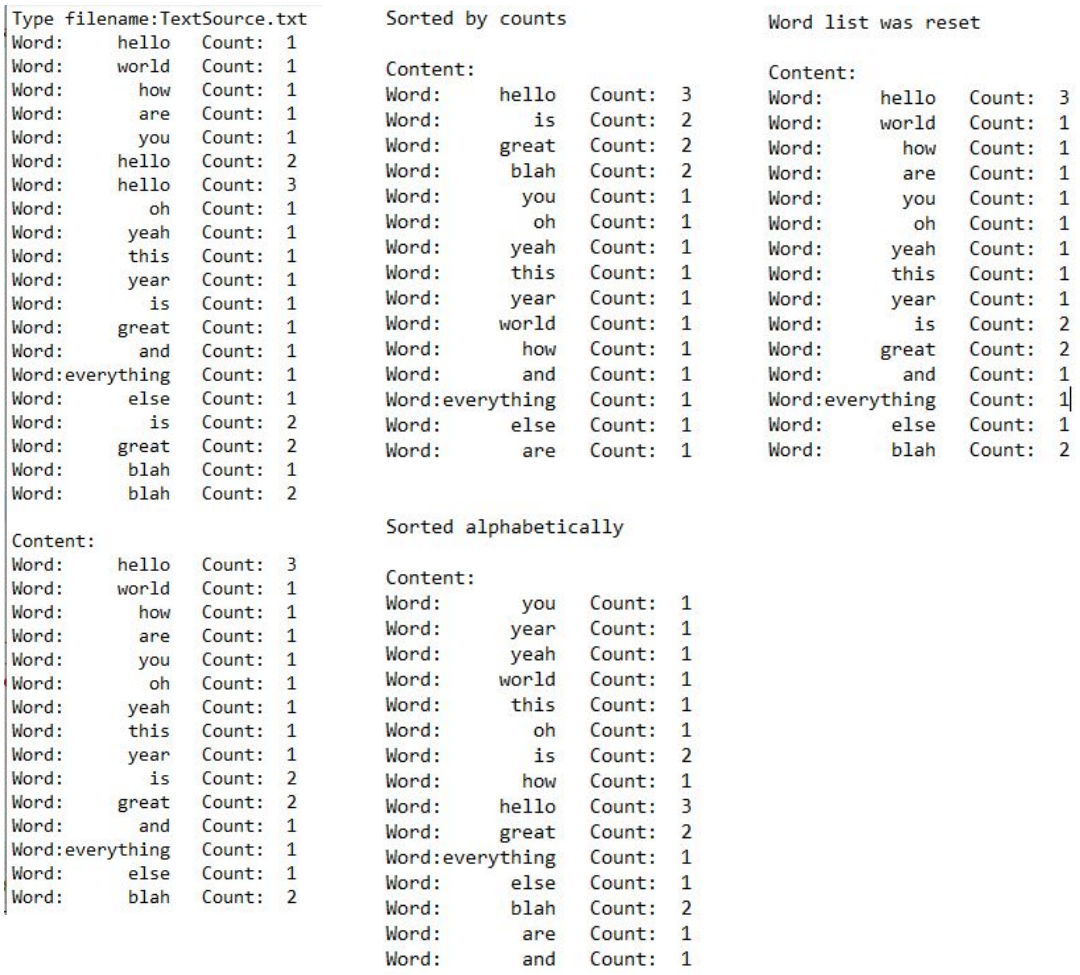
Sort the list in *theDictionary* alphabetically and write the return string of *sort(..)* to the console. Write the return value of *toString()* of *theDictionary* to the console.

Restore the original list and write the return value of *sort(..)* to the console. Write the return value of *toString()* of *theDictionary* to the console.

Finally, you create a file called "result.txt". You go through all elements of *theList*, get the return values of their *toString()* methods, and write them to the file until you reach the end of the list (return value "end" of returnWord(arg)). You write each return value to its own line. Close all readers and writers when you are done.

5 Console output:

The text in the file "result.txt" should equal that in the right column.



```
Type filename:TextSource.txt
Word:     hello   Count:  1
Word:     world   Count:  1
Word:       how   Count:  1
Word:       are   Count:  1
Word:       you   Count:  1
Word:     hello   Count:  2
Word:     hello   Count:  3
Word:        oh   Count:  1
Word:      yeah   Count:  1
Word:      this   Count:  1
Word:      year   Count:  1
Word:        is   Count:  1
Word:     great   Count:  1
Word:       and   Count:  1
Word:everything   Count:  1
Word:      else   Count:  1
Word:        is   Count:  2
Word:     great   Count:  2
Word:      blah   Count:  1
Word:      blah   Count:  2

Content:
Word:     hello   Count:  3
Word:     world   Count:  1
Word:       how   Count:  1
Word:       are   Count:  1
Word:       you   Count:  1
Word:        oh   Count:  1
Word:      yeah   Count:  1
Word:      this   Count:  1
Word:      year   Count:  1
Word:        is   Count:  2
Word:     great   Count:  2
Word:       and   Count:  1
Word:everything   Count:  1
Word:      else   Count:  1
Word:      blah   Count:  2
```

```
Sorted by counts

Content:
Word:     hello   Count:  3
Word:        is   Count:  2
Word:     great   Count:  2
Word:      blah   Count:  2
Word:       you   Count:  1
Word:        oh   Count:  1
Word:      yeah   Count:  1
Word:      this   Count:  1
Word:      year   Count:  1
Word:     world   Count:  1
Word:       how   Count:  1
Word:       and   Count:  1
Word:everything   Count:  1
Word:      else   Count:  1
Word:       are   Count:  1

Sorted alphabetically

Content:
Word:       you   Count:  1
Word:      year   Count:  1
Word:      yeah   Count:  1
Word:     world   Count:  1
Word:      this   Count:  1
Word:        oh   Count:  1
Word:        is   Count:  2
Word:       how   Count:  1
Word:     hello   Count:  3
Word:     great   Count:  2
Word:everything   Count:  1
Word:      else   Count:  1
Word:      blah   Count:  2
Word:       are   Count:  1
Word:       and   Count:  1
```

```
Word list was reset

Content:
Word:     hello   Count:  3
Word:     world   Count:  1
Word:       how   Count:  1
Word:       are   Count:  1
Word:       you   Count:  1
Word:        oh   Count:  1
Word:      yeah   Count:  1
Word:      this   Count:  1
Word:      year   Count:  1
Word:        is   Count:  2
Word:     great   Count:  2
Word:       and   Count:  1
Word:everything   Count:  1
Word:      else   Count:  1
Word:      blah   Count:  2
```