

GTU Department of Computer Engineering
CSE 222/505 - Spring 2023
Homework #06 Report

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Problem Solution Approach

In this homework we are asked to rearrange a given input String to appropriate form and perform merge sorting with given objects.

We have 3 given class with names **myMap.java**, **info.java**, **mergeSort.java**, and a **Main.java** class to test other classes.

Part A (Preprocess)

In this part we are taking an input string and preprocessed to make sure it contains only small lower-case letters with **rearrange()** method in **myMap** class.

Part B (Build Map)

In this part we are creating a **LinkedHashMap<Character, info>** to keep the number of occurrences of each letter within the string along with the words, that it was seen with the **buildMap()** function in **myMap** class. This method adds every character to map and holds **info** objects as values that has the number of occurrences of all characters and a **words[]** array to keep words that keeps words list of characters. To add new words to this array info class uses **push()** method and increases the array's capacity by one.

Part C (Merge Sort)

In **MergeSort** class we are using standart merge sort algorithm with maps. To do this we are using **mergeSort()** and **merge()** helper methods with **sort()** method. In **mergeSort()** method we are calling same method recursively to split the map until we cannot anymore. Then merging these splitted maps in increasing order with **merge()** method comparing the values of the two maps and adding them into new one. To comparing the values we are using **getFirstEntry()** method to return first entry of the given map.

Compiling commands:

```
cd homework6  
javac *.java  
cd..
```

Running commands:

```
java homework6.Main
```

```
C:\Users\Administrator\Desktop\OKUL\cse222\homework6>java Main.java  
Original string:      Buzzing bees buzz.  
Preprocessed string: buzzing bees buzz
```

The original (unsorted) map:

```
Letter: b - Count: 3 - Words: [buzzing, bees, buzz]  
Letter: u - Count: 2 - Words: [buzzing, buzz]  
Letter: z - Count: 4 - Words: [buzzing, buzzing, buzz, buzz]  
Letter: i - Count: 1 - Words: [buzzing]  
Letter: n - Count: 1 - Words: [buzzing]  
Letter: g - Count: 1 - Words: [buzzing]  
Letter: e - Count: 2 - Words: [bees, bees]  
Letter: s - Count: 1 - Words: [bees]
```

The sorted map:

```
Letter: i - Count: 1 - Words: [buzzing]  
Letter: n - Count: 1 - Words: [buzzing]  
Letter: g - Count: 1 - Words: [buzzing]  
Letter: s - Count: 1 - Words: [bees]  
Letter: u - Count: 2 - Words: [buzzing, buzz]  
Letter: e - Count: 2 - Words: [bees, bees]  
Letter: b - Count: 3 - Words: [buzzing, bees, buzz]  
Letter: z - Count: 4 - Words: [buzzing, buzzing, buzz, buzz]
```

```
C:\Users\Administrator\Desktop\OKUL\cse222\homework6>java Main.java  
Original string:      'Hush, hush!' whispered the rushing wind.  
Preprocessed string: hush hush whispered the rushing wind
```

The original (unsorted) map:

```
Letter: h - Count: 7 - Words: [hush, hush, hush, hush, whispered, the, rushing]  
Letter: u - Count: 3 - Words: [hush, hush, rushing]  
Letter: s - Count: 4 - Words: [hush, hush, whispered, rushing]  
Letter: w - Count: 2 - Words: [whispered, wind]  
Letter: i - Count: 3 - Words: [whispered, rushing, wind]  
Letter: p - Count: 1 - Words: [whispered]  
Letter: e - Count: 3 - Words: [whispered, whispered, the]  
Letter: r - Count: 2 - Words: [whispered, rushing]  
Letter: d - Count: 2 - Words: [whispered, wind]  
Letter: t - Count: 1 - Words: [the]  
Letter: n - Count: 2 - Words: [rushing, wind]  
Letter: g - Count: 1 - Words: [rushing]
```

The sorted map:

```
Letter: p - Count: 1 - Words: [whispered]  
Letter: t - Count: 1 - Words: [the]  
Letter: g - Count: 1 - Words: [rushing]  
Letter: w - Count: 2 - Words: [whispered, wind]  
Letter: r - Count: 2 - Words: [whispered, rushing]  
Letter: d - Count: 2 - Words: [whispered, wind]  
Letter: n - Count: 2 - Words: [rushing, wind]  
Letter: u - Count: 3 - Words: [hush, hush, rushing]  
Letter: i - Count: 3 - Words: [whispered, rushing, wind]  
Letter: e - Count: 3 - Words: [whispered, whispered, the]  
Letter: s - Count: 4 - Words: [hush, hush, whispered, rushing]  
Letter: h - Count: 7 - Words: [hush, hush, hush, hush, whispered, the, rushing]
```