Department of Computer Science

COS212: Practical 9

Deadline: Friday 3 June 2022, 11:59

Objectives

The aim of this practical is to learn how to implement and use efficient sorting algorithms.

Instructions

Complete the tasks below. Certain classes have been provided for you in the *files* zip archive of the practical. You have also been given a main file which will test some code functionality, but it is by no means intended to provide extensive test coverage. You are encouraged to edit this file and test your code more thoroughly. Remember to test boundary cases. Upload **only** the given source files with your changes in a compressed archive before the deadline. Please comment your name **and** student number in at the top of each file.

Sorting

Sorting functions are very useful utilities for many programming tasks. You have been given a partially implemented `Sort` class to use. Your task is to implement the following methods in the `Sort` class according to the given specification.

Task 1: Implement Merge Sort [25]

You are required to implement the following merge sort function for generic data type arrays:

```
void mergesort(T[] data, int first, int last, boolean debug)
```

This merge sort function should be implemented recursively as described on page 527 of the textbook. The array `data[]` contains a list of unsorted objects, that needs to be sorted in place. The parameters `first` and `last` indicate the beginning and end of the portion of the `data[]` array that needs to be sorted at a specific invocation. The parameter `debug` enables output for marking purposes. The `mergesort()` function should make use of the helper function `merge()` to put the two sorted halves back together. The parameter `debug` from the `mergesort()` function needs to be passed on to this helper function.

Task 2: Implement Counting Sort [15]

You are required to implement the following counting sort function for integer numbers:

```
void countingsort(int[] data, boolean debug)
```

This counting sort function should be implemented iteratively as described on page 533 of the textbook. The array `data[]` contains a list of unsorted integers, that needs to be sorted. The parameter `debug` enables output for marking purposes.

Submission

You need to submit your source files on the Assignment website `https://ff.cs.up.ac.za/`. All tasks need to be implemented (or at least stubbed) before submission. Place **Sort.java** file in a zip or tar/gzip archive (you need to compress your tar archive) named uXXXXXXXX.zip or uXXXXXXXX.tar.gz where XXXXXXXX is your student number. You have 4 days to complete this practical, regardless of which practical session you attend. Upload your archive to the *Practical 9* slot on the Assignment website. Submit your work before the deadline. No late submissions will be accepted.