Assignment 6

CIS 2168 (Section 001)

Fall 2023

Instructor: Shuvra Chakraborty

Total points: 100

Objectives

In this assignment, you will work with merge, quick, and heap sort.

Merge sort is a stable, divide-and-conquer sorting algorithm. It works by recursively dividing the input list into smaller sub lists until each sub list contains only one element. Then, it merges these sub lists back together in sorted order.

On the other hand, quick Sort is an efficient, in-place sorting algorithm. It selects a 'pivot' element from the list and reorders the elements around the pivot, such that all elements less than the pivot come before it, and the rest come after it. The process is applied recursively to the sub-lists created on either side of the pivot until the complete list is sorted.

Heap sort is a comparison-based sorting technique based on the Binary Heap data structure. You may assume that this is a min-heap.

[Hint: consult the class lecture and helpful resources provided on sorting]

Problem description

You may assume that arrays are being used for this assignment. Show the output for each of the following cases. Your program should show output for each individual pass of sorting.

1. 9 8 7 6 5 43 2 1
2. 23 45 78 98 1 34 30 67
3. 29 56 78 92 34 71 2 7 9

Task 1: (15 points)

Create a Java program that implements merge sort.

Task 2: (3x15 points)

Create a Java program that implements quick sort where a) pivot is the first element, b) pivot is the last element, and c) pivot is the middle element in the array.

Task 3: 30 points

Create a Java program that implements heap sort.

Submission Instruction

The assignment should be submitted through the available link on course Canvas shell. The assignment rubric is as follows:

1. Source code and demonstration [90 points]:

Provide the source code in zip file. Each file should have proper comments (e.g., explanations for methods, class and so on). It will be graded based on accuracy (e.g., program execution), clarity of the necessary comments, and short demonstration as instructed by TA or instructor.

2. Status.txt [10 points]:

In this text file, you need to report:

- The status of your program (completed or not; partial credit will be given even if the program is not completed).
- The design of your program (what and how the objectives have been accomplished).
- Support and advice (if any) you get from TA and/or your classmates.
- Comments and suggestions to improve this assignment.
- If you have completed the extra credit part [if any], mention it explicitly.
- If you are doing late submission, you should mention the number of days you are late since the due date. According to our policy, for N days of late submission, you get a deduction of Nx3 points per day even if your submission completes all the requirements. That said, if you are late for 5 days, your maximum point can be up to 85 out of 100.

Please have the source codes and status files zipped into a single file DSAssign6-LastnameFirstname.zip and upload the file on Canvas.