Homework 2
CSE 246 Analysis of Algorithms, Spring 2016
Due 28.04.2019 Sunday 23:59

Design an experiment to compare following five sorting algorithms:

1. Insertion-sort,
2. Merge-sort,
3. Quick-sort,
4. Heap-sort,
5. Counting-sort[1].

There is a range restriction in the inputs. An input can be an array of any size, but it may only include integers between 0 and 1000. There can be large amount of duplicate values.

You should design your experiment in your own. You should implement all the above algorithms in any programming language. You have to decide on some sample inputs (large lists with different characteristics) to best clarify the differences between the above algorithms. While doing your emprical analysis, you may use physical unit of time, count actual number of basic operation's executions, or both. You are also expected to compare your findings with theoretical complexity values. You should provide extensive comments on your results.

This homework has three main steps:

Step 1: Designing the Experiment: This step includes:
(a) Deciding on reasonable inputs / generating reasonable sample inputs[2].
(b) Deciding on reasonable metrics (for complexity measurement).
You should clearly describe all these decisions and reasons behind your decisions in your detailed report.

Step 2: Coding and Running: All algorithms should be implemented in any programming language and experiments should be performed for decided input lists, and results should be evaluated in terms of decided metrics.

Step 3: Illustrating and Analyzing Results: This step includes:
(a) Providing some plots or tables to illustrate performance of the algorithms.
(b) Comparing the performance of all the five algorithms for different kind of inputs with various sizes.
(c) Comparing the empirical results with the theoretical results. Describe whether your findings meet theoretical expectations.
You should provide detailed comments for your findings in these comparisons.

Each of the above three steps will be graded separately.

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[1] Note 1: Counting sort (sort by counting) is described in Section 7 of your book.
[2] Note 2: Inputs should reflect best and worst cases. Also you need to use enough (as many as possible) sample inputs to find a reasonable average case time complexity. Also use different inputs with different sizes.
Note 3: You may do this homework in groups of two.
Note 4: Read chapter 2.6 in order to learn guidelines for performing a timing experiment.
Note 5: Please submit your commented source codes, input files and detailed report in a zip file that includes both your name(s) and surname via google classroom.
Note 6: Do not forget that your grade will mostly determined by quality of your REPORT!