

Lab 2: Sorting

Each student chooses either of the following sets for further requirements.

- **Set 1** (7 algorithms): Selection Sort, Insertion Sort, Bubble Sort, Heap Sort, Merge Sort, Quick Sort, and Radix Sort.
- **Set 2** (12 algorithms): Selection Sort, Insertion Sort, Binary-Insertion Sort, Bubble Sort, Shaker Sort, Shell Sort, Heap Sort, Merge Sort, Quick Sort, Counting Sort, Radix Sort, and Flash Sort.

1 Programming

1.1 Algorithms

- Students are required to implement all sorting algorithms (for **ascending order** only) from the chosen set using *C/C++* language.

1.2 Experiments

```
for each Data Order  $S_1$ :
  for each Data Size  $S_2$ :
    for each Sorting Algorithm  $S_3$ :
      1. Create an array with Data Order  $S_1$  and Data Size  $S_2$ 
      2. Sort the created array using the Sorting Algorithm  $S_3$ 
         and measure the running time (millisecs) of the implementation
      3. Take note  $S_1$ ,  $S_2$ ,  $S_3$  and the running time
```

1.2.1 Input Data Order

- Examine the chosen sorting algorithms with data of different arrangements, including:
 - Random Order Data
 - Nearly Sorted Data
 - Sorted Data
 - Reverse Data

See `DataGenerator.cpp` for more information.

1.2.2 Input Size

- Examine the chosen sorting algorithms with data of the following sizes: 3,000; 10,000; 30,000; 100,000; 300,000.

2 Report

Include the following contents:

1. Presentation on installed algorithms: ideas, algorithms (step-by-step), algorithm's review (time complexity, space complexity if possible).
2. Presentation on experimental results and comments.
 - How to present experimental results: instead of giving runtime numbers, we should visualize graphs; thus, it will be easier to observe and comment. You will draw 4 graphs corresponding to the 4 input data states. In particular, each graph has a vertical axis as the data size, the horizontal axis is the run time (as shown in Figure 1)

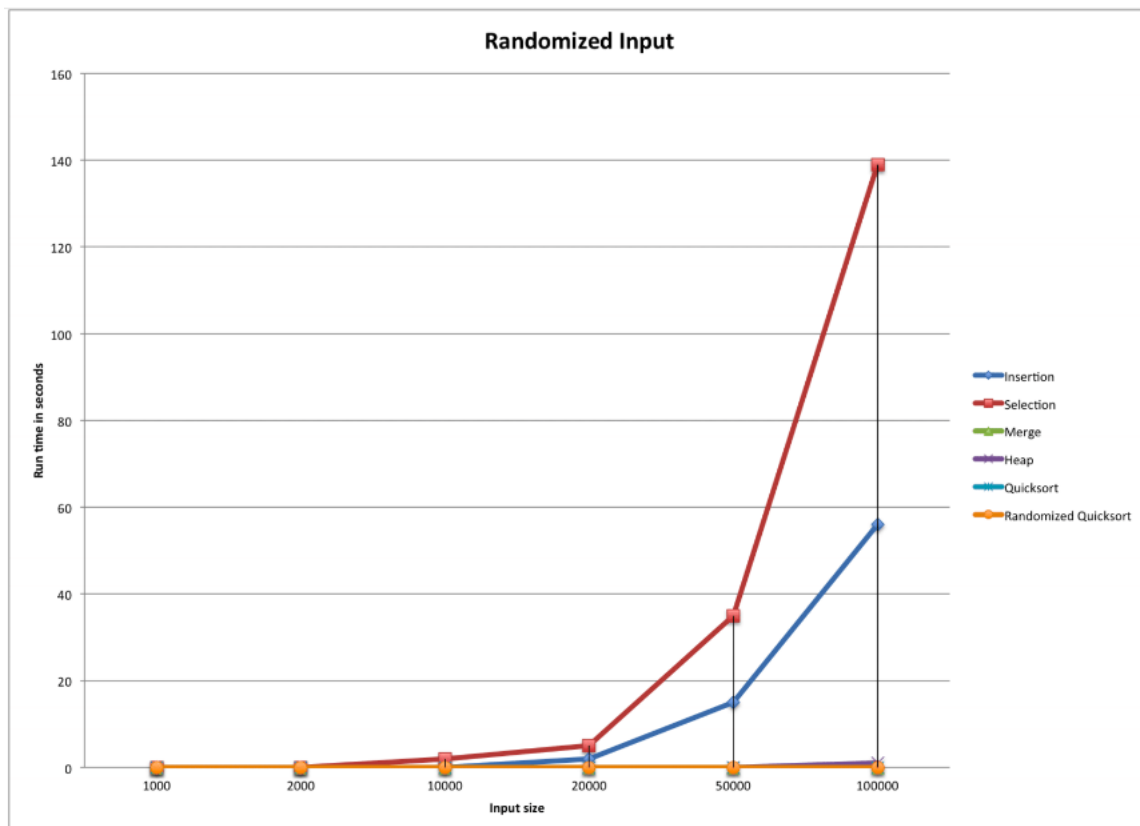


Figure 1: Illustration Graph

- Comments on the graphs which are drawn (the fastest / slowest algorithm(s) in each case, time acceleration of algorithms, etc.). Explain.
- Overall comments of algorithms on all Data order and all Data size (the fastest / slowest algorithms overall, grouping the stable/unstable algorithms, etc.)

Submission regulation

- Students create a folder <Student's ID> containing the contents following:
 - <Code> folder: contains the whole project. (Only files with **.cpp** and **.h** extension is required.)
 - <Report.pdf> file: is the file containing the report.
- Compress the above folder into Student's ID.rar(.zip) for submission.
- Submission with wrong regulation will result in a "0" (zero).
- Plagiarism and Cheating will result in a "0" (zero) for the entire course and will be subject to appropriate referral to the Management Board for further action.