**[75 pts] COMALGO/ALGOCOM Reporting 1: Comparing Performance Time of Number Searching**

By pairs

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**GENERAL INSTRUCTIONS**

Perform a performance benchmark of linear search and binary search, by creating a program that accepts a **sorted** array of N numbers (binary search is applicable only for sorted arrays), and then searches for a given input number, using either linear or binary search algorithm. The purpose of this experiment is to prove that the underlying theories of an algorithm’s complexity holds true no matter what hardware the algorithm is run. The students are encouraged to run their experiments in multiple trials or multiple devices.

For this programming exercise, the program **will not be collected** as part of your submission. Only a written report is required.

**Specific Instructions**

* It is up for the students what input sizes they will use for the experiment to yield observable results. They may choose to follow the input size: 100, 500, 1,000, 5,000, 10,000, 25,000, 50,000, 75,000, 100,000, 300,000, 500,000, 750,000 and 1,000,000.
* The program/application should only be run on a single thread.

**TECHNICAL REPORTING INSTRUCTIONS**

Written reports are to be formatted the same way as this document. Settings are **Times New Roman, 10**, **0.5** margin on all sides, and letter-size paper. You may choose to write your report with your own sections and discussions, provided that the following guide questions and important points are answered in your report:

* Indicate device specifications. Processor and speed, memory, windows/mobile, etc.
* What are your input sizes? Indicate how you populated the arrays, given an input size.
* Specify the algorithm of the linear search and binary search in **PSEUDOCODE** form.
* What is your experiment setup? Did you perform multiple trials?
* Analyze the performance of both search algorithms, by providing a discussion on the **BEST, AVERAGE** and **WORST** cases.
* Provide meaningful graphs to justify your explanation.
* Specify your conclusion. What are your findings?
* Provide a table of results as Appendix. See Table 1 below.

**Table 1: Using Linear Search. Operation Executed 100 times.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Input Size** | **Best Time in Milliseconds** | **Average Time in Milliseconds** | **Worst Time in Milliseconds** | **Times number has been found** | **Times number has not been found** |
| 100 | 1.59 | 1.7 | 1.9 | 55 | 45 |
| 500 | 1.9 | 2 | 1.9 | 62 | 38 |
| 1000 | 1.66 | 2.3 | 2.3 | 49 | 51 |

**Submission Instructions**

1. Submit your report on Canvas, as **a PDF document**. Submit on or before the deadline.
2. Document format is single space font size 10, font style is Bookman Old Style. 0.5” margin on all sides, letter-size.
3. The rubric assessment will be uploaded in the softcopy of this document.

**Grading Scheme**

|  |  |  |  |
| --- | --- | --- | --- |
| **Correctness of the Experiment** | | | |
| 0 points | 4 – 8 points | 9 – 12 points | 13 – 15 points |
| No discussion of the experiment was given. | There is a major flaw in the experiment setup and clearly affects the outcome. | There is an observable flaw in the experiment setup, but it is minor and does not really affect the overall outcome of the experiment.  OR  While the experiment seems correct, it is not thoroughly written or explained in the paper. | The experiment setup for proving the best, average, and worst-case complexities is correct and thoroughly written. |
| **Thoroughness of Testing and Validation** | | | |
| 0 points | 3 – 6 points | 7 – 12 points | 13 – 15 points |
| No discussion of how the simulation was performed. | It is unclear how the simulation was performed  OR  It was tested only on 1 platform, and with very limited number of trials. | The simulation was not thoroughly tested or there’s insufficient trials to show evidences for proving the complexity. | The simulation was tested on multiple platforms with varying input sizes wherever necessary.  Alternatively, several trials were performed to show evidences for proving the complexity of the algorithms. |
| **Correctness of Results** | | | |
| 0 points | 6 points | 9 - 12 points | 13 – 15 points |
| No discussion of results was provided. | The result is not correct and contradicts the theory being proven. | While the result is correct, it was not explained well in the document. | The results are overall correct and justified. It is explained well in the document. |
| **Data Visualization** | | | |
| 0 points | 4 – 7 points | 8 - 10 points |  |
| No figures/tables were provided. | Figures and tables are sufficiently given with proper captions.  The figures are difficult to understand, or a different type of visualization should be used to properly display the data. | Figures and tables are sufficiently given with proper captions.  The figures are easy to understand, and the data/result is correctly plotted or visualized. |  |
| **Overall Documentation** | | | |
| 0 – 4 points | 5 – 7 points | 8 - 10 points |  |
| The document is haphazardly written. | The document is easy to follow and organized in sections, but statements contain grammatical errors that hampers the reader’s understanding. | The document is well-written with few to no grammatical errors. |  |
| **Appendix of Results** | | | |
| 0 points | 5 – 7 points | 8 – 10 points |  |
| No appendix was given. | An appendix was given but does not show all the data/results used in the main document. | An appendix was given to support the experiment results. It serves as clear evidence of the correctness of the experiment and the results. |  |