Vg101: Introduction to Computer and Programming

Spring 2021

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Task 3 C Programming: Sorting and Searching

1. Background

Sorting and Searching is one of the most vital topic in programming, data structure and algorithms. Storing and retrieving information is one of the most common application of computers now-a-days. According to time the amount of data and information stored and accessed via computer has turned to huge databases. So many techniques and algorithms have been developed to efficiently maintain and process information in databases. The processes of looking up a particular data record in the database is called searching. The process of ordering the records in a database is called Sorting. Both of them are very important field of study in data structure and algorithms.

2. Problem to be solved

Problem:
Please using C to complete following tasks:
   a) Input: a text file filled with random numbers generate by your program, a number for searching.
   b) Algorithm: implement two different sorting algorithms and two searching algorithms.
   c) Output: For sorting, please output a text file with numbers correctly sorted. For searching, please output in console which number/s (e.g. 15th, 24th) in the input file are the hit/s.

Detailed requirements:
   a) For random numbers in the input file. 20 numbers, ranging from 1 - 15. There numbers should be separated by ';'.
   b) The output file should contain the sorted numbers which are listed line by line. (one line for one number)
   c) At least two sorting functions should be provided. The sorting algorithms can be freely selected from (not limited with) Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, etc..
   d) At least two searching functions should be provided. The searching algorithms can be freely selected from (not limited with) Linear Search, Binary Search, etc..
   e) Searching should be executed on the sorted number list, but the program

should be able to track and output which number it is in the original sequence.

f) Allow user to specify the number for search and which sorting and searching algorithms to use.

g) Print out the list of numbers after the execution of each sorting step to demonstrate the entire process of sorting your 20 numbers..

3. Assessment

a) On-site demo and explanation will be required; (20)
b) Code should be well commented and correctly named;(20)
c) Functionalities implemented;(60)

4. Submission

Demo: on the 5th week of our lab session. (Friday afternoon, Week 13)
Code: should be submitted before the demo. (deadline)
Naming conventions:
[studentID]_[name].c or [studentID]_[name].zip (if you want to hand in multiple files)
e.g. 202012345_张三丰.c or 202012345_张三丰.zip

If you use any external library, please explain it in your comments.

DO NOT submit your project files.

Expecting to receive an All-In-One zip file for each class.

Example
Input file contains:
    12;13;1;13;8;.....
Sorted file:
    1
    3
    8
    ...
Output for searching result:
Target "13" is the 2nd and the 4th number/s in the input file.