Bioinformatics Group

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Algorithms and Data Structures
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http://www.bioinf.uni-freiburg.de/Lehre/

Exercise sheet 8

Deadline: Tuesday, 11.12.2018 12:00 AM

In this exercise sheet you will compare the following two procedures, given a sequence of n integer numbers:

(A) = Sort the n numbers

(B) = Insert the n numbers into an initially empty hash table

Exercise 1 (5 points)

How many operations does (A) need in the worst case? How many operations does (B) need in the worst case? How many block operations does (A) need in the worst case? How many block operations does (B) need in the worst case? For your considerations use Quicksort for (A) (as described in the last lecture) and universal hashing (as described in lecture 5) for (B). It is sufficient to give $\Theta(\dots)$. Please state your opinion on which of the two procedures you think is faster in practice and under which circumstances.

Exercise 2 (5 points)

Write a program that generates a set of n random whole numbers (range $1 \dots n$) and measures the runtime for both (A) and (B) with n as input. Repeat the measurement three times for each procedure and take the mean.

Exercise 3 (5 points)

Calculate the averaged runtime from exercise 2 for $n = 2^{17}, 2^{18}, 2^{19}, 2^{20}, \dots$. Increase n as long as your computer can deal with the size and the computation time is still bearable. Generate a plot with the value of n on the x-axis (logarithmic scale) and a curve for the runtime of (A) as well as curve for the runtime of (B) (different color).

Exercise 4 (5 points)

Discuss your plot from exercise 3. In particular: How does it fit your assumptions from exercise 1 and the explanations from the last lecture? The discussion does not have to be long, just focus on the valid arguments.

Commit

Commit your code into the SVN in a new subdirectory **uebungsblatt_08** and the PDFs with

the solutions of the theoretical tasks in the sub folder *non-code*. Commit your feedback in a text file *erfahrungen.txt* and specify: The length of time needed for the exercise. Which tasks have been difficult for you and where did you have problems? How much time did you spend to solve the problems?