UPPSALA UNIVERSITET

Algorithms and Datastructures Assignment 2

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1 Implementation of Sorting Algorithms

See source code for algorithm implementations.

1.5 Comparison

Table 1: declares the three input sizes of n.

n_i	Input size
n_1	1000
n_2	10000
n_3	20000

Table 2: shows the average running time for the four algorithms for the three different sizes of n.

Algorithm	n_1	n_2	n_3
Bubblesort	0,19714	17,992	77,412
Mergesort	0,01086	0,09292	0,1697
Quicksort	0,00682	0,05752	0,11064
Heapsort	0,01454	0,1169	0,23706

Table 3: shows the average running time for the four algorithms for the three different sizes of n.

Algorithm	theoretical change $\frac{n_2}{n_1}$	measured change $\frac{n_2}{n_1}$	theoretical change $\frac{n_3}{n_2}$	measured change $\frac{n_3}{n_2}$
Bubblesort	100	91,26	4	4,3
Mergesort	13,3	8,556	2,15	1,826
Quicksort	13,3	8,434	2,15	1,923
Heapsort	13,3	8,039	2,15	2,028

The first observation we made was that quicksort had, on average, the fastest running time in practice, for the tested input sizes n_i.

Furthermore, looking at table 3 we can see that the expected increase in run time from the mathematical calculations are roughly the same as the ones seen in the measured testing. We can thereby conclude that the algorithms behave as expected.

The difference in change between the theoretical and measured run times seem to shrink with bigger input sizes n. Perhaps this is a general behaviour, however we would probably need more test cases with larger and smaller inputs to validate this hypothesis.

2 Heap

In the worst case scenario, x is a leaf or not in the heap at all. From a node there is no way to determine whether to look in the left or right branch for a node with value x. In the worst case you would therefor have to look through every element in the heap. Worst case time-complexity would be n. Or, $T(n) = \mathcal{O}(n)$.

3 Work Distribution

We sat in out group and coded on separate computers while helping and discussing the problems we encountered.