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ALGEBRA

Learning outcome 5

Task 51. Selection sort and Merge sort are at your disposal (available to you in additional files). Using the data in Figure 1, from the two algorithms, choose the one that has better complexity in the worst case. Change the selected algorithm to sort the rectangles (width, height) ascending by surface. Load all 1000 rectangles from the file rectangles.txt (in each line the width and height of one rectangle are separated by a space) and write them in another file, but sorted ascending.

Algorithm	Time Complexity		
	Best	Average	Worst
Quicksort	Ω(n log(n))	Θ(n log(n))	O(n^2)
Mergesort	Ω(n log(n))	Θ(n log(n))	O(n log(n))
Timsort	Ω(n)	Θ(n log(n))	O(n log(n))
Heapsort	Ω(n log(n))	Θ(n log(n))	O(n log(n))
Bubble Sort	Ω(n)	Θ(n^2)	O(n^2)
Insertion Sort	Ω(n)	Θ(n^2)	O(n^2)
Selection Sort	Ω(n^2)	Θ(n^2)	O(n^2)
Tree Sort	Ω(n log(n))	Θ(n log(n))	O(n^2)
Shell Sort	Ω(n log(n))	Θ(n(log(n))^2)	O(n(log(n))^2)
Bucket Sort	Ω(n+k)	Θ(n+k)	O(n^2)
Radix Sort	Ω(nk)	Θ(nk)	O(nk)
Counting Sort	Ω(n+k)	Θ(n+k)	O(n+k)
Cubesort	Ω(n)	Θ(n log(n))	O(n log(n))

Figure 1

The beginning of rectangles.txt is the following:

10 19
11 10
7 7
14 11
…

Task 52. Generate a vector from shuffled numbers from 1 to 100. In the most efficient way, sort it in the following three ways and write the results of each sort in a separate file (three files should be created by your program):

a. Ascending
b. Descending
c. First all even, then all odd numbers.

Task 53. Write a program that sorts words from a person.txt file in such a way that longer words come first and then shorter ones. Words of equal length should be sorted alphabetically. The beginning of person.txt is the following:

Kerrie
Alexandra
Ernesto
Mikael
…