

Algorithms – Homework 5

Linear Time Sorting

Due: October 13.

- 1) Sort the following sequence using radix sort with base 10.

761	669	254	857	150	249	927	592
961	799	885	391	167	235	364	412

For each digit, show the array C used to count and order after sorting each digit.

- 2) Suppose that we have an array of n data records to sort and that the key of each record has the value 0 or 1. An algorithm for sorting such a set of records might possess some subset of the following three desirable characteristics:
1. The algorithm runs in $\mathcal{O}(n)$ time.
 2. The algorithm is stable.
 3. The algorithm sorts in place, using no more than a constant amount of storage space in addition to the original array.
- a) Give an algorithm that satisfies criteria 1 and 2 above.
 - b) Give an algorithm that satisfies criteria 1 and 3 above.
 - c) Give an algorithm that satisfies criteria 2 and 3 above.
 - d) Can you use any of your sorting algorithms from parts (a)–(c) as the sorting method used in radix sort, so that radix sort sorts n records with b -bit keys in $\mathcal{O}(bn)$ time? Explain how or why not.
- 3) You are given an array of integers, where different integers may have different numbers of digits, but the total number of digits over all the integers in the array is n . Show how to sort the array in $\mathcal{O}(n)$ time.