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A Novel Sorting Method for Real and Integer Numbers: An Extension of Counting Sort

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Abstract: ***Sorting is an essential conceptin the study of data structures. There are many sorting algorithms that can sort elements in a given array or list. Counting sort is a sorting algorithm that has the best time complexity. However, the counting sort algorithm only works for positive integers. In this paper, an extension of the counting sort algorithm is proposed that can sort real numbers and integers (both positive and negative).***

Index Terms: ***Counting Sort, Sorting, Algorithm.***

I. INTRODUCTION

In the field of computer science, **sorting**denotes the process of arranging items in a sequence ordered by a given criterion. A sorting procedure is aprocedure that places elements of a list or array in a certain order. Acapable sorting algorithm helps optimize the competence of other procedures, such as search and merge algorithms, which require input data in the form of sorted lists. In fact, **search preprocessing** is perhaps the single most important application of sorting algorithms. Sorting is also useful for **canonicalizing** data (i.e converting it into a standard representation) and for producing human-readable output. Sorting algorithms function as a basic building block for a wide variety of applications, including problems of closest pair finding, element uniqueness, frequency distribution and selection.Commonly used sorting algorithms include **quick sort, counting sort, heap sort, bubble sort, selection sort, insertion sort, merge sort** and **radix sort.**

The efficiency of an algorithm is measured as a function of the computational cost it exacts on the system, in relations of its space and time complexity. **Time complexity** is a measure of the time it takes for an expression to be executed, as a function of the input size. It is generally expressed in **big O notation (O(n)),** a mathematical notation that is used to describe the limiting manners of a function when its argument tends towards a given value or infinity (asymptotic complexity). This representationdescribes functions according to their **growth rate,** or the rate at whichthe time taken to execute a function increases with increase in input size.

Space complexity is a measure of the volume of memory space mandatory to solve an instance of a problem, as a function of input size.

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It is also often expressed asymptotically in big O notation O(n), where n is the input size in bytes.

Given below is a comparison of the space and time complexity of various popular sorting algorithms:

Algorithm	Best Time Complexity	Average Time Complexity	Worst Time Complexity	Worst Space Complexity
Linear Search	O(1)	O(n)	O(n)	O(1)
Binary Search	O(1)	O(log n)	O(log n)	O(1)
Bubble Sort	O(n)	O(n^2)	O(n^2)	O(1)
Selection Sort	O(n^2)	O(n^2)	O(n^2)	O(1)
Insertion Sort	O(n)	O(n^2)	O(n^2)	O(1)
Merge Sort	O(nlogn)	O(nlogn)	O(nlogn)	O(n)
Quick Sort	O(nlogn)	O(nlogn)	O(n^2)	O(log n)
Heap Sort	O(nlogn)	O(nlogn)	O(nlogn)	O(1)
Bucket Sort	O(n+k)	O(n+k)	O(n^2)	O(n)
Radix Sort	O(nk)	O(nk)	O(nk)	O(n+k)
Tim Sort	O(n)	O(nlogn)	O(nlogn)	O(n)
Shell Sort	O(n)	O(nlogn)or O(n^2)	O(nlogn)or O(n^2)	O(1)

Fig. 1.

In this paper, we will focus on a discussion of counting sort, a unique sorting algorithm. Unlike other sorting algorithms, it does not compare elements to arrange them in a particular order. We will test the working of the proposed extension of the counting sort algorithm with large data sets, and compare its space and time complexity with that of other popular sorting algorithms.

II. WORKING OF COUNTING SORT ALGORITHM

Let us assume that an array A of size N is to be sorted.

Algorithm: CountingSort(A, N , SortedA, Count, S)
// A is the array to be sorted
// The result is stored in SortedA
// N is the size of arrays A and SortedA
// Count is an array whose size is equal to the value of maximum element of A
// S is the maximum element of array A
// Each element of Count is initialized to 0

Step 1: Set i← 0
Step 2: Repeat this step while i< N
  a. Set Count[A[i]] ← Count[A[i]] + 1
  b. Set i←i + 1
  End of Loop
Step 3: Set i← 0
Step 4: Set j ← 0
Step 5: Repeat this step while i< S:
  a. Repeat while Count[A[i]] > 0:
    a. Set SortedA[j] ← A[i]
    b. Set j ←j + 1
    c. Set Count[A[i]] ← Count[A[i]] − 1
  End of Loop

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Novel Numbers Counting

Brendan G. Carr

Novel Numbers Counting :

Unveiling the Power of Verbal Art: An Emotional Sojourn through **Novel Numbers Counting**

In a global inundated with monitors and the cacophony of instant conversation, the profound power and mental resonance of verbal beauty frequently disappear in to obscurity, eclipsed by the constant onslaught of sound and distractions. However, situated within the musical pages of **Novel Numbers Counting** , a charming perform of fictional splendor that pulses with fresh feelings, lies an memorable trip waiting to be embarked upon. Written with a virtuoso wordsmith, that exciting opus courses readers on a psychological odyssey, lightly revealing the latent potential and profound affect stuck within the delicate internet of language. Within the heart-wrenching expanse of this evocative analysis, we will embark upon an introspective exploration of the book is key styles, dissect their charming publishing design, and immerse ourselves in the indelible impact it leaves upon the depths of readers souls.

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