

Introduction to Non-Comparison Algorithms :  $\rightarrow$

Count Sort Algorithm :  $\rightarrow O(n + \max)$   $C = C + P$

\* Single digit whole numbers 0-9

Step:  $\rightarrow$

- Find the max  
max = 6
- Create a count array 0-max
- Calculate the freq of each element
- Cumulative count
- O/p array
- Start from R  $\rightarrow$  L

i/p: 3 1 5 2 1 4 6 1 3

Count: 0 2 1 3 2 0 1

Cumulative Count: 0 2 3 6 8 8 9

O/p array: 1 1 2 3 3 4 4 6

Radix Sort :  $\rightarrow$  (Bucket Sort)  $\rightarrow$  1's, 10's, 100's

- Multiple digits
- Constant length strings

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Step:  $\rightarrow$

- Find the max  
m = 325  $\rightarrow$  3 digits  $\rightarrow$  3 passes
- 0-9 10 buckets

Count sort: 325, 236, 008, 091, 007

091, 325, 236, 007, 008  $\rightarrow$  (1)

007, 008, 325, 236, 091  $\rightarrow$  (2)

007, 008, 091, 236, 325  $\rightarrow$  (3)

0 1 2 3 4 5 6 7 8 9

007, 008, 091, 236, 325

O (n + max)

How do we control the number of passes (rounds) (iterations) in the radix sort algorithm? [Oracle] max = 325  $\rightarrow$  (3)

for (int exp = 1; max/exp > 1; exp \*= 10)

{

countsort(arr, size, exp);

}

HLW

exp = 100

max = 325 / 1 = 325

325 / 10 = 32

325 / 100 = 3

1000 325 1000

Maximum Subarray Sum :  $\rightarrow$  Kadane's Algo

int arr[] = { 5, -8, 1, 2, -1, 4 }

cmax = arr[0] = 5

gmax = arr[0] = 5

cmax = max(arr[i], cmax + arr[i]); m(2, 3)

gmax = max(cmax, gmax); (5, -3)

1, 5

3, 5

\* Swap two variables without using a third variable :  $\rightarrow$

Two ways

Don't use arithmetic operators

x = 10

y = 20

op  $\rightarrow$  x = 20

y = 10

x = x ^ y = 10

y = x ^ y = 20

x = x ^ y = 10

Sorted Array

Binary Search :  $\rightarrow$

Key = (12, 15)

mid = (s + e) / 2

mid = (0 + 4) / 2 = 2

arr[mid] = 9

arr[mid] < key

S = m + 1

arr[mid] > key

e = m - 1

Time Complexity

N

N/2

N/4

N/8

N/16

N/32

N/64

N/128

N/256

N/512

N/1024

N/2048

N/4096

N/8192

N/16384

N/32768

N/65536

N/131072

N/262144

N/524288

N/1048576

N/2097152

N/4194304

N/8388608

N/16777216

N/33554432

N/67108864

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