Counting Sort

Counting sort is an algorithm for sorting a list according to keys that are small integers, It is an integer sorting algorithm and **not comparison based**. It operates by counting the number of list elements that have each distinct key value, and using arithmetic on those counts to determine the positions of each key value in the output sequence. Its running time is linear in the number of items and the difference between the maximum and minimum key values, so it is only suitable for direct use in situations where the variation in keys is not significantly greater than the number of items. It is a stable sort.

Visualisation is as follows :

Counting sort

A count array is maintained which takes the cumulative count with respect to before elements, we build output array linearly with respect to this array. Count of an element a is just

count[a]-count[a-1].

Pseudo Code :

```
CountingSort(A)
    //A[] Initial Array to Sort
```

```
   for i = 0 to k do
   c[i] = 0

   //Storing count of each element in array c
   for j = 0 to n do
   c[A[j]] = c[A[j]] + 1

   // Change c[i] such that it contains actual
   // cumulative position prefix sum way.
   for i = 1 to k do
   c[i] = c[i] + c[i-1]

   //Build Output array from c[i]
   for j = n-1 to 0 do
   B[c[A[j]]-1] = A[j]
   c[A[j]] = c[A[j]] - 1
 end func
```