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In [1]: import time
import random
import matplotlib.pyplot as plt
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In [2]: def Count_sort(A):
    maximum = max(A) + 1
    C = [0] * maximum
    B = [0] * len(A)
    #print(A, B , C)
    index = len(A)-1

    for i in range( 0 , len(A) ):
        C[A[i]] = C[A[i]] + 1
    #print(C)
    for j in range( 1 , len(C)):
        C[j] = C[j] + C[j-1]
    #print(C)
    for k in range(index , -1, -1):
        #print(k, A[k],C, C[A[k]], B[C[A[k]]-1] )
        B[C[A[k]]-1] = A[k]
        C[A[k]] = C[A[k]] - 1

    return B
```

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In [3]: #Check with random data
A = [2, 3 , 0 , 1, 7, 9, 2, 1 , 1, 5]
Count_sort(A)
```

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Out[3]: [0, 1, 1, 1, 2, 2, 3, 5, 7, 9]
```

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In [4]: Best_case = [1]

st = time.time()
Count_sort(Best_case)
et = time.time()
elapsed_time = et - st
print('Best Case Execution time:', elapsed_time, 'seconds')
```

Best Case Execution time: 4.792213439941406e-05 seconds

```
In [5]: worst_case = [10, 9, 8 , 7, 6, 4, 2, 1]

st = time.time()
Count_sort(worst_case)
et = time.time()
elapsed_time = et - st
print('Worst Case Execution time:', elapsed_time, 'seconds')
```

Worst Case Execution time: 5.2928924560546875e-05 seconds

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In [6]: avg_case = [1, 2 , 4, 6, 10, 9 , 8 , 7]

st = time.time()
Count_sort(avg_case)
et = time.time()
```

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elapsed_time = et - st  
print('Avg Case Execution time:', elapsed_time, 'seconds')
```

Avg Case Execution time: 5.1975250244140625e-05 seconds

```
In [7]: input_list = [10, 1000, 5000, 10000]  
time_taken = []  
for i in input_list:  
    random.seed(10)  
    randomlist = random.sample(range(0 , i), i)  
    st = time.time()  
    Count_sort(randomlist)  
    et = time.time()  
    elapsed_time = et - st  
    time_taken.append(elapsed_time)  
    print('When input is', i ,': Execution time:', elapsed_time, 'seconds')
```

When input is 10 : Execution time: 1.1205673217773438e-05 seconds  
When input is 1000 : Execution time: 0.0006709098815917969 seconds  
When input is 5000 : Execution time: 0.003467082977294922 seconds  
When input is 10000 : Execution time: 0.007014751434326172 seconds

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plt.figure(figsize=(10,10)) plt.plot(input_list,time_taken, 'ro') plt.xticks(input_list)  
plt.yticks(time_taken) plt.xlabel("input size") plt.ylabel("time taken for sorting")  
plt.savefig('countsort.png') plt.show() plt.close()
```