Assignment #5

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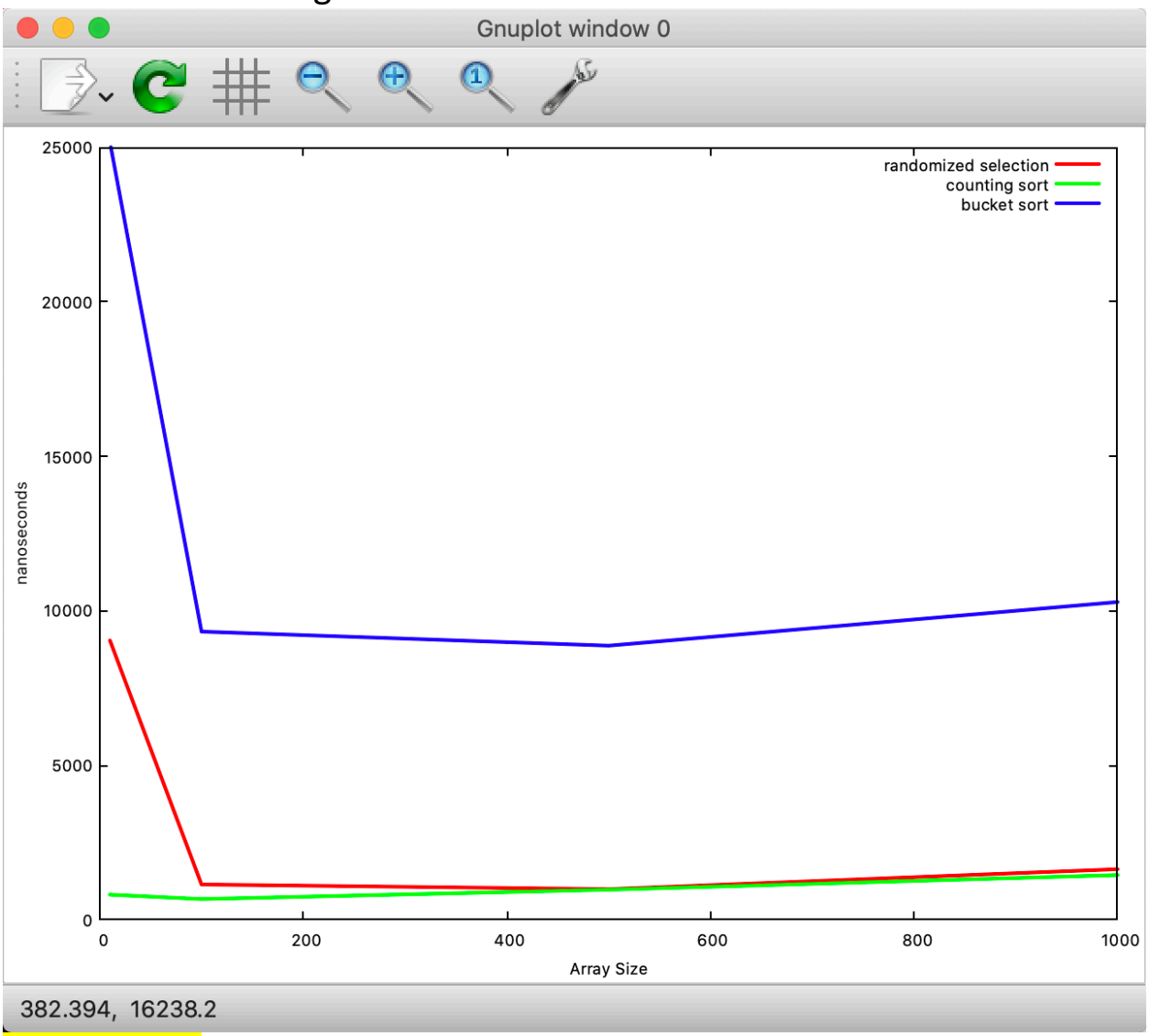

explanation:

Counting Sort: the time complexity is O(m+n), m is 13 – array size, n is range of max and min, when n is small, the plot of counting sort and randomized selection will be close.

Randomized Selection: the excepted time complexity is O(n), n is 13- array size. But in the worst-case, the running time is o(n^2). So the counting sort doesn't always takes longer than randomized selection. But anyway, the plot of randomized selection is linear.

bucket Sort: the running time depends on how even every element be assigned to the buckets. When n = 10, the probability for selected element is around 0.1(1/10). So it takes longer time. Beside, for each bucket, we need sort the elements. In this case, I used quicksort. That's why bucket sort always takes longer time than the others.

The output of my code(same as the file LiuF_5.dat):

CPE593_2020S013

```
/Users/fengliu/CLionProjects/CPE593_2020S/cmake-build-debug/CPE593_2020S013
when n = 10:
for randomized select :
lucky number is:      3     It wins 2 times     probability : 0.2
unlucky number is:    0     It wins 0 times     probability : 0
for counting sort :
lucky number is:      3     It wins 2 times     probability : 0.2
unlucky number is:    0     It wins 0 times     probability : 0
for bucket sort :
lucky number is:      3     It wins 2 times     probability : 0.2
unlucky number is:    0     It wins 0 times     probability : 0

when n = 100:
for randomized select :
lucky number is:     10     It wins 12 times        probability : 0.12
unlucky number is:    7     It wins 4 times     probability : 0.04
for counting sort :
lucky number is:     10     It wins 12 times        probability : 0.12
unlucky number is:    7     It wins 4 times     probability : 0.04
for bucket sort :
lucky number is:     10     It wins 12 times        probability : 0.12
unlucky number is:    7     It wins 4 times     probability : 0.04

when n = 500:
for randomized select :
lucky number is:      7     It wins 44 times        probability : 0.088
unlucky number is:    3     It wins 26 times        probability : 0.052
for counting sort :
lucky number is:      7     It wins 44 times        probability : 0.088
unlucky number is:    3     It wins 26 times        probability : 0.052
for bucket sort :
lucky number is:      7     It wins 44 times        probability : 0.088
unlucky number is:    3     It wins 26 times        probability : 0.052

when n = 1000:
for randomized select :
lucky number is:      5     It wins 99 times        probability : 0.099
unlucky number is:   12     It wins 67 times        probability : 0.067
for counting sort :
lucky number is:      5     It wins 99 times        probability : 0.099
unlucky number is:   12     It wins 67 times        probability : 0.067
for bucket sort :
lucky number is:      5     It wins 99 times        probability : 0.099
unlucky number is:   12     It wins 67 times        probability : 0.067
```

```
#n      randomized_selection        counting_sort       bucket_sort
10            9033                      805          25180
100           1135                      664           9321
500            988                      968           8868
1000          1629                     1439          10277

Process finished with exit code 0
```