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Programming Assignment 1 Report

Here are the results calculated from different size of input file:

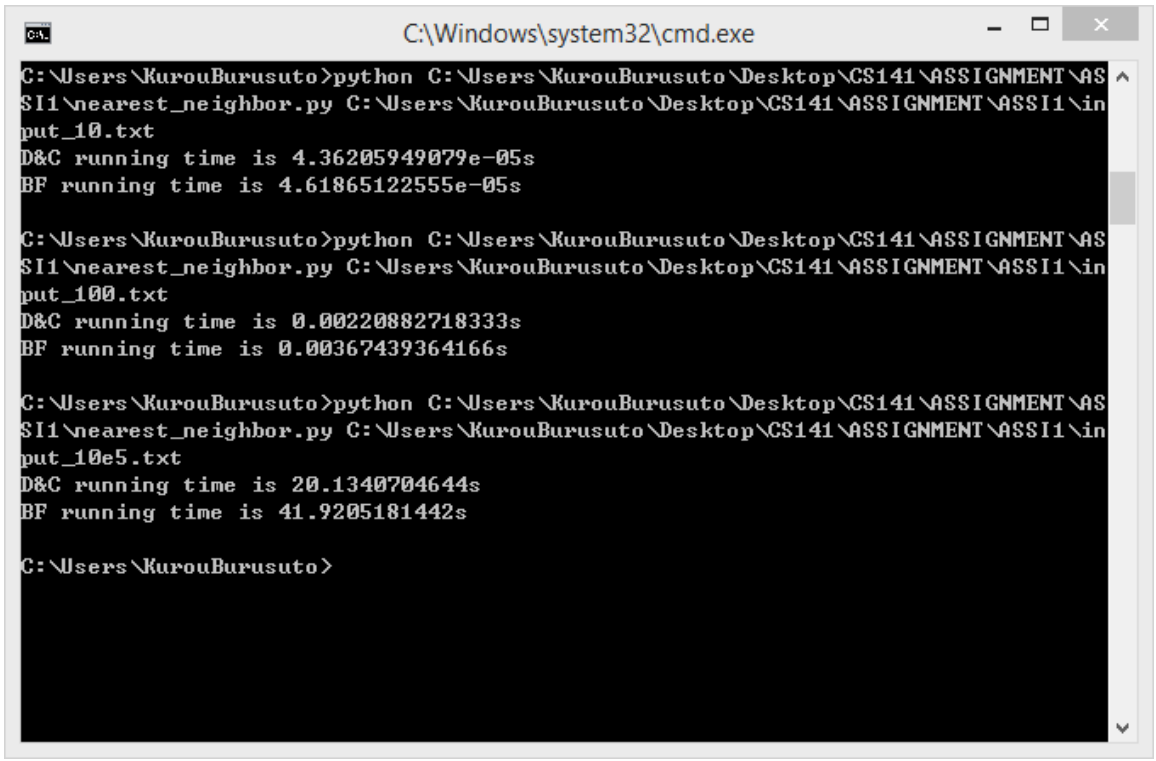
Input Size	D&C Running Time (s)	BF Running Time (s)
input10	4.362e-5	4.619e-5
input100	0.002	0.004
input10e5	20.134	41.921
input10e6	2612.113	5379.653

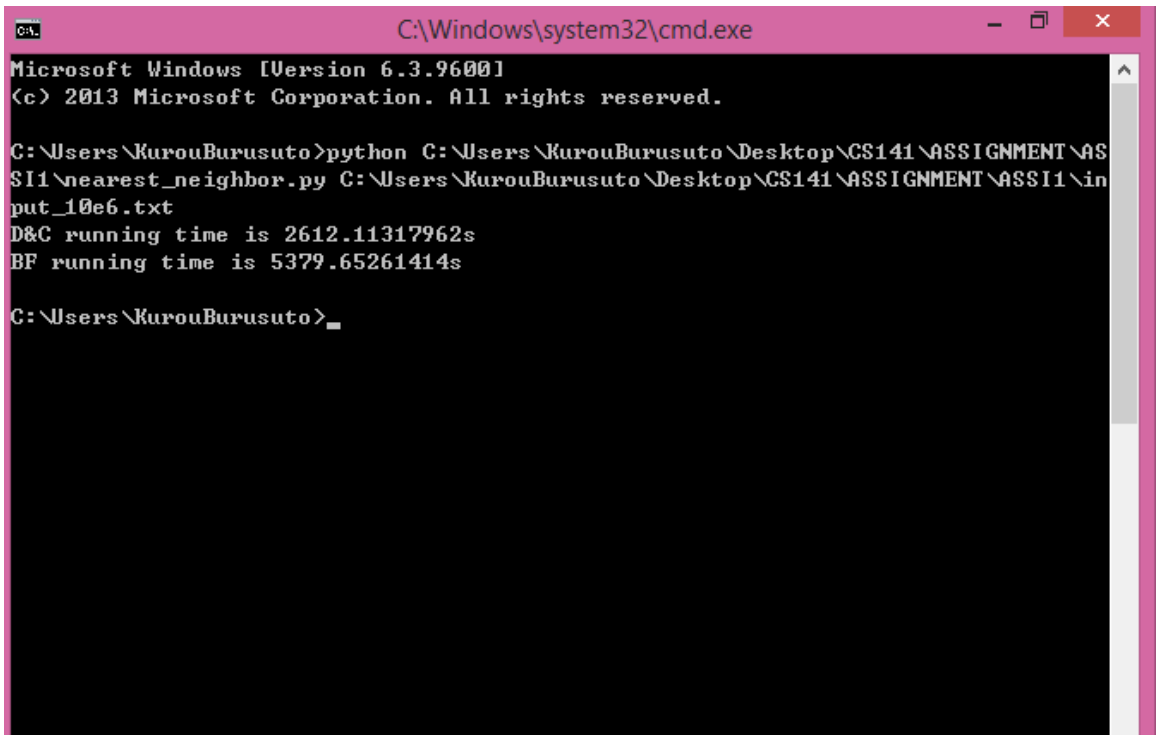
The theoretical running time of the Brute Force method is

$$T(n) = \frac{(n-1)(n-1+1)}{2} + \frac{(n-1)(n-1+1)}{2} = n(n-1) = n^2 - n = O(n^2)$$

And we know the time complexity of Divide and Conquer method is $O(n^2)$. When the input size is 10, the number of cases is too small so that there is no obvious difference between the running time of D&C and BF. Let's compare input size 10e5 and 10e6; 10e6 = 10e5*10. Here n is 10, and 2612.113 $\approx$ 20.134*(10^2), 5379.653 $\approx$ 41.921*(10^2); and these results qualified the theoretical result as I found. The reason why we have 5379 instead if 4192 is due to the computer processor.

Here are 2 screenshots for data:


C:\Windows\system32\cmd.exe
C:\Users\KurouBurusuto>python C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\nearest_neighbor.py C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\input_10.txt
D&C running time is 4.36205949079e-05s
BF running time is 4.61865122555e-05s
C:\Users\KurouBurusuto>python C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\nearest_neighbor.py C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\input_100.txt
D&C running time is 0.00220882718333s
BF running time is 0.00367439364166s
C:\Users\KurouBurusuto>python C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\nearest_neighbor.py C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\input_10e5.txt
D&C running time is 20.1340704644s
BF running time is 41.9205181442s
C:\Users\KurouBurusuto>


C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.3.9600]
(c) 2013 Microsoft Corporation. All rights reserved.
C:\Users\KurouBurusuto>python C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\nearest_neighbor.py C:\Users\KurouBurusuto\Desktop\CS141\ASSIGNMENT\ASSI1\input_10e6.txt
D&C running time is 2612.11317962s
BF running time is 5379.65261414s
C:\Users\KurouBurusuto>