

Foursum Report

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Exhaustive search

¹

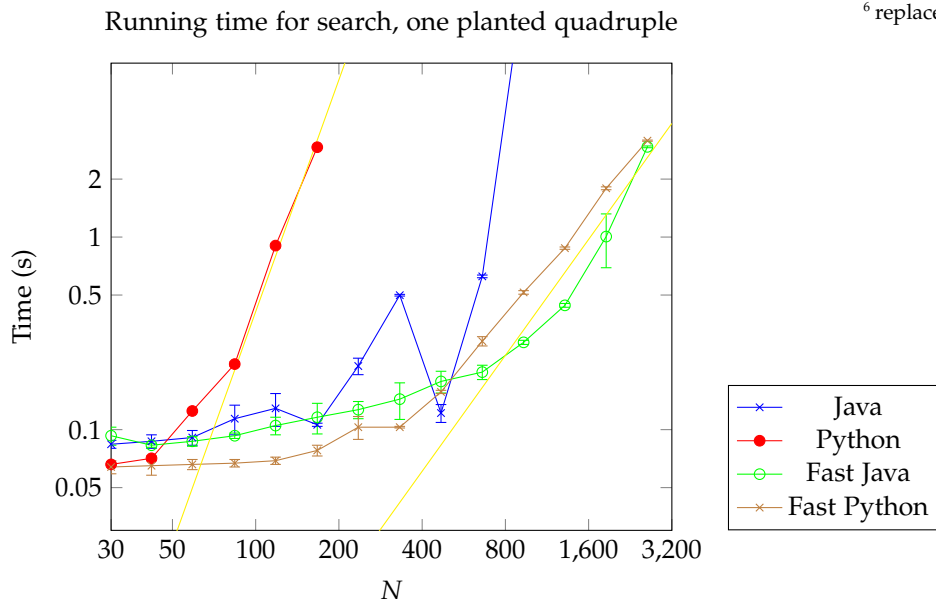
Our program [Simple.java / simple.py]² solve the Four-sum problem using four nested loops. The index variables i, j, k, l run from [...]³ Thus, we can bound the number of array accesses by $\sim \frac{1}{10}(\cos N) \binom{N}{5}$.⁴

Experiments

The following table summarises the empirical performance data on the input files in the data directory. We have run each file once, and report the minimum, maximum, and average running time over the files for each input size.

N	Java			Python		
	min	max	avg.	min	max	avg.
100	1 sec	5 days	23.5 hours			
[...]						

We can plot the maximum running time as a function of input size, as a standard plot and as a log-log plot.⁵ In the latter, note that the points fall nicely on a line of slope [...]⁶.



¹ Complete the report by filling in your names, filling in the parts marked [...] and changing other parts wherever necessary. (For instance, the numbers is the tables are nonsense right now.) Remove the sidenotes in your final hand-in.

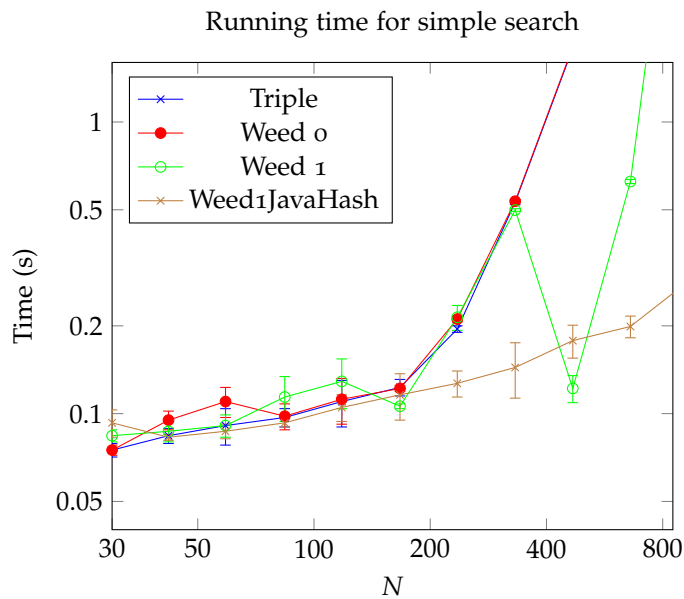
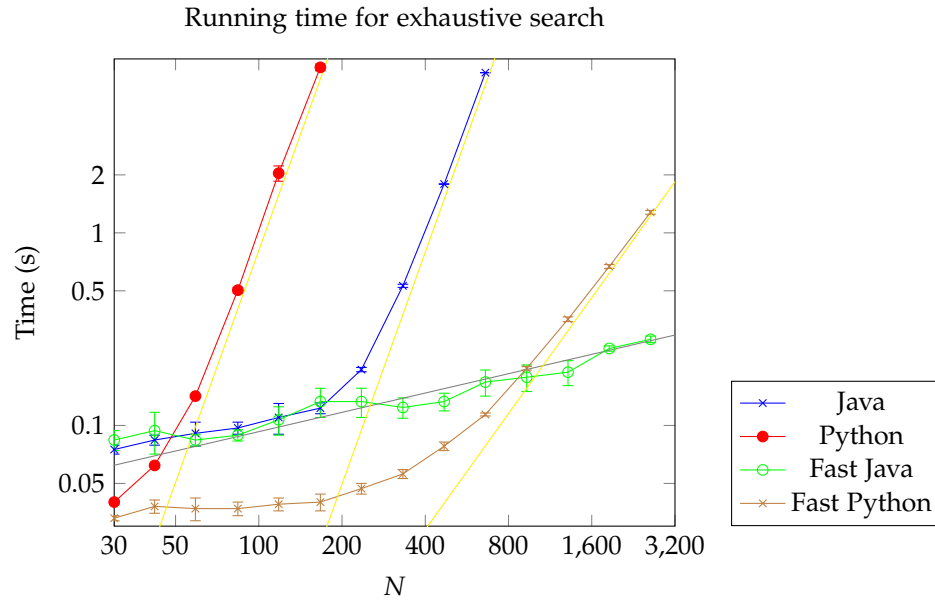
² Choose one.

³ Explain. Do you start in 0? One sentence.

⁴ Replace by an expression that corresponds to your code.

⁵ Draw both graphs, as two separate figures. Use any software you want, or draw it hand.

⁶ replace by an integer



Improvements

Using the binary search-based idea sketched in [SW, 1.4] for the Three-sum problem, we can improve our running time to $\sim N^3 \log N$.

⁷

The following table reports our maximum running times on the test inputs. [...]

The following log-log plot shows these values graphically, note that the points are on a line of slope [...].

⁷ Correct as necessary. If instead you've figured out how to do it even faster, rewrite the whole sentence so as to explain what you do.