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CptS 223

PA 2 Report

**A: Problem Statement**

The goal of this exercise was to compare the execution speeds of the four different

maximum-subsequence-sum algorithms across varying input sizes.

**B. Experimental Setup**

I used a MacAir with a 2.2 GHz Intel Core i7 CPU, with 8GB RAM. I used Mac OSX for testing and timing.

For each point in my plot, I performed and averaged 10 experiments.

**C. Experimental Results**

Table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Array Length | maxSubSeq1 | maxSubSeq2 | maxSubSeq3 | maxSubSeq4 |
| 8 | 0.1 | 0 | 0 | 0 |
| 16 | 0.3 | 0.1 | 0.1 | 0 |
| 32 | 5 | 0.3 | 0.4 | 0 |
| 64 | 14 | 1.2 | 0.7 | 0.1 |
| 128 | 137.1 | 3.3 | 1.3 | 0.1 |
| 256 | 803.5 | 16.1 | 3.3 | 0.2 |
| 512 | 6644 | 50.2 | 8.2 | 0.3 |
| 1024 | 55947.5 | 211.7 | 14.4 | 0.7 |
| 2048 | 402479 | 751.1 | 23.4 | 0.9 |
| 4096 | 2.99E+06 | 3013.6 | 40.2 | 2.6 |
| 8192 | 2.41E+07 | 13192.2 | 83.8 | 3.8 |

Firstly, past a certain array length N (e.g. 128), we see that the algorithms, ordered by speed with slowest first, are: (maxSubSeq1, maxSubSeq2, maxSubSeq3, maxSubSeq4). This is consistent with the order of the algorithms’ growth rates.

When both axes are on a log scale, polynomial curves become straight lines, where higher degree polynomials have a greater slope. In the above graph, the slope of maxSubSeq1 is greater than the slope of maxSubSeq2. This is consistent with the actual algorithmic complexities of the two algorithms, as maxSubSeq1 is O(N^3), while maxSubSeq2 is O(N^2) (where N is the number of integers in the array). Additionally, the slope of maxSubSeq2 is greater than the slope of maxSubSeq3. This is also consistent with their algorithmic complexities, where maxSubSeq2 is O(N^2) and maxSubSeq3 is O(NlogN). However, we cannot discern a difference in slope from maxSubSeq3 and maxSubSeq4. This is because that although their complexities are different (O(NlogN) and O(N) respectively), they have the same degree. A downside of using the log scale is that we cannot directly observe the difference in growth rates, but using the standard scale the differences between the y-values of the majority of the data points would not be visible due to how high the highest y-values are. Overall, the observations made from the plot are as per my theoretical expectations.