Iterative Models Loops.java(1-4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| n | TLoop1(ms) | TLoop2(ms) | TLoop3(ms) | TLoop4(ms) |
| 100 | 0,0089 | 0,283 | 1,07 | 1,04 |
| 200 | 0,0181 | 1,077 | 4,81 | 7,75 |
| 400 | 0,0420 | 5,004 | 20,77 | 60,29 |
| 800 | 0,0939 | 22,861 | 86,48 | 474,38 |
| 1.600 | 0,2061 | 87,115 | 366,73 | 3.763,4 |
| 3.200 | 0,4262 | 372,840 | 1569,89 | 29.979,7 |
| 6.400 | 0,9385 | 1.416,640 | 6.679,00 | 241.597 |
| 12.800 | 2,0656 | 6.321,000 | 28.470 | OT |
| 25.600 | 4,4895 | 27.713,000 | 120.481 | OT |
| 51.200 | 9,0168 | 111.423,000 | 504.722 | OT |

Python vs Java execution times (Loop4 n^3)

|  |  |  |
| --- | --- | --- |
| n | PLoop4(ms) | JLoop4(ms) |
| 100 | 4,53 | 1,04 |
| 200 | 32,82 | 7,75 |
| 400 | 250,71 | 60,29 |
| 800 | 2.092,6 | 474,38 |
| 1.600 | 17.549 | 3.763,4 |
| 3.200 | 157.866 | 29.979,7 |
| 6.400 |  | 241.597 |

T1 / T2

|  |  |  |  |
| --- | --- | --- | --- |
| n | TLoop1(ms) | TLoop2(ms) | T1/T2 |
| 100 | 0,0089 | 0,283 | 0,03144876 |
| 200 | 0,0181 | 1,077 | 0,01680594 |
| 400 | 0,0420 | 5,004 | 0,00839329 |
| 800 | 0,0939 | 22,861 | 0,00410743 |
| 1.600 | 0,2061 | 87,115 | 0,00236584 |
| 3.200 | 0,4262 | 372,840 | 0,00114312 |
| 6.400 | 0,9385 | 1.416,640 | 0,00066248 |
| 12.800 | 2,0656 | 6.321,000 | 0,00032678 |
| 25.600 | 4,4895 | 27.713,000 | 0,000162 |
| 51.200 | 9,0168 | 111.423,000 | 8,0924E-05 |

Based on the calculated time complexities and the provided data, the observed trend in the quotient T1/T2 aligns with the expected behavior O(n) / O (n^2). As n increases, the ratio between the execution times of loop1 and loop2 decreases, indicating that loop1 outperforms loop2 for larger input sizes, consistent with the theoretical expectations.

T3 / T2

|  |  |  |  |
| --- | --- | --- | --- |
| n | TLoop2(ms) | TLoop3(ms) | T3/T2 |
| 100 | 0,283 | 1,07 | 3,78091873 |
| 200 | 1,077 | 4,81 | 4,46610956 |
| 400 | 5,004 | 20,77 | 4,15067946 |
| 800 | 22,861 | 86,48 | 3,78286164 |
| 1.600 | 87,115 | 366,73 | 4,20972278 |
| 3.200 | 372,840 | 1569,89 | 4,21062654 |
| 6.400 | 1.416,640 | 6.679,00 | 4,71467698 |
| 12.800 | 6.321,000 | 28.470 | 4,50403417 |
| 25.600 | 27.713,000 | 120.481 | 4,34745426 |
| 51.200 | 111.423,000 | 504.722 | 4,5297829 |

Based on the calculated time complexities and the provided data, the observed trend in the quotient T3/T2 aligns with the expected behavior O(n^2 \* log2(n)) / O(n^2 \* log3(n)/2) == > 2log2(n)/log3(n) . As n increases, the ratio between the execution times of loop3 and loop2 remains constant, indicating that loop3 outperforms loop2 in a ratio of 1 to 4, consistent with the theoretical expectations.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| n | TLoop4 (Python) t41 | TLoop4(java without optimization) T42 | TLoop4(java with optimization) T43 | T42/T41 | T43/T42 |
| 100 | 4,53 | 1,04 | 0,0229 | 0,2296 | 0,0220 |
| 200 | 32,82 | 7,75 | 0,1089 | 0,2361 | 0,0141 |
| 400 | 250,71 | 60,29 | 0,5202 | 0,2405 | 0,0086 |
| 800 | 2.092,6 | 474,38 | 4,3771 | 0,2267 | 0,0092 |
| 1.600 | 17.549 | 3.763,4 | 27,4666 | 0,2145 | 0,0073 |
| 3.200 | 157.866 | 29.979,7 | 151,721 | 0,1899 | 0,0051 |
| 6.400 |  | 241.597 | 911,80 |  | 0,0038 |