Divide & Conquer by Subtraction

Subtraction 1 &2 produce stack memory overflow when n reaches 16.000

The execution n=80 would take 3.142.923.027 years to execute

Sub4 complexity : O(n^3)

|  |  |
| --- | --- |
| n | Subtraction4 |
| 100 | 6 |
| 200 | 45 |
| 400 | 352 |
| 800 | 2807 |
| 1.600 | 22501 |
| 3.200 | Oot |
| 6400 | OoT |

Sub5 complexity : O(3^(n/2))

|  |  |
| --- | --- |
| n | Subtraction5 |
| 30 | 621 |
| 32 | 1.845 |
| 34 | 5.561 |
| 36 | 17.032 |
| 38 | 50.281 |
| 40 | 149.463 |
| 42 | 448.164 |

The iteration number 80 for substraction5 would be the following:

N = 80 => t2 = F(n2)/ F(n1) \* t1 = 521.145.256.900 seconds = 14.4762.571 hours = 16.525years

Divide & Conquer by Division

Div 4 complexity : O(n^2 \* log2(n))

|  |  |
| --- | --- |
| n | Division4 |
| 1.000 | 9 |
| 2.000 | 39 |
| 4.000 | 144 |
| 8.000 | 597 |
| 16.000 | 2359 |
| 32.000 | 9388 |
| 64.000 | 37.747 |

|  |  |
| --- | --- |
| n | Division5 |
| 1.000 | 58 |
| 2.000 | 216 |
| 4.000 | 862 |
| 8.000 | 3.457 |
| 16.000 | 13.828 |
| 32.000 | 55.268 |
| 64.000 | Oot |

Merge Sort

|  |  |  |  |
| --- | --- | --- | --- |
| n | Ordered | Reversed | Random |
| 31250 | 20 | 20 | 24 |
| 62500 | 40 | 39 | 49 |
| 125000 | 85 | 83 | 104 |
| 250000 | 165 | 160 | 202 |
| 500000 | 345 | 335 | 419 |
| 1000000 | 721 | 695 | 878 |
| 2000000 | 1.432 | 1.383 | 1.758 |
| 4000000 | 2.921 | 2.832 | 3.606 |
| 8000000 | 6.002 | 5.797 | 7.408 |
| 16000000 | 12.330 | 11.908 | 15.387 |
| 32000000 | 25.144 | 24.353 | 31.386 |
| 64000000 | 51.285 | 49.379 | 64.225 |
| 128000000 | 104.929 | 101.631 | 131.573 |

Merge Sort vs Quicksort

|  |  |  |  |
| --- | --- | --- | --- |
| n | Merge Sort | Quicksort | M/Q |
| 160.000 | 130 | 82 | 1,58536585 |
| 320.000 | 262 | 172 | 1,52325581 |
| 640.000 | 536 | 367 | 1,46049046 |
| 1.280.000 | 1.108 | 797 | 1,3902133 |
| 2.560.000 | 2.258 | 1.756 | 1,28587699 |
| 5.120.000 | 4.621 | 4.017 | 1,15036097 |
| 10.240.000 | 9.559 | 9.933 | 0,96234773 |
| 20.480.000 | 19.549 | 27.226 | 0,71802689 |
| 40.960.000 | 40.146 | 82.390 | 0,48726787 |