Son Vo

CS-3310.01

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Project 1

Task1 – Sorting Algorithms

|  |  |  |
| --- | --- | --- |
|  | Time (seconds) | |
| Number of Elements (n) | Merge Sort | Quick Sort |
| 10000 | 0.04841185 | 0.02479768 |
| 20000 | 0.10813785 | 0.05365014 |
| 50000 | 0.27457404 | 0.14761472 |
| 100000 | 0.64087129 | 0.31919909 |
| 200000 | 1.28970408 | 0.73307133 |
| 500000 | 3.57424235 | 2.55157113 |
| 1000000 | 7.78040624 | 4.71194625 |
| 2000000 | 17.75664067 | 11.78075171 |
| 5000000 | 44.11392236 | 33.46955013 |
| 10000000 | 95.59080434 | 64.19231462 |
| 20000000 | 205.32452893 | 151.45980167 |
| 50000000 | 580.21546936 | 399.18890548 |
| 100000000 | Over 600 | Over 600 |

Task2 – Tower of Hanoi

|  |  |
| --- | --- |
| Number of Elements (n) | Time (seconds) |
| 2 | 0.00006127 |
| 4 | 0.00020146 |
| 8 | 0.00370288 |
| 16 | 0.95260358 |
| Over 600 | Over 600 |

T(0) = 1

T(n) = 2T(n-1) + 1

= 2(2T(n-2) + 1) + 1

= 2(2(2T(n-3) + 1) + 1) +1

= 23 T(n-3) + 22 + 21 + 1

T(n) = 2k T(n-3) + 2(k-1) +2(k-2) + … + 21 + 1

n – k = 0 -> n = k

T(n) = 2n T(0) + 2(n-1) + 2(n-2) + … + 21 + 1

T(n) = 2(n+1) -1

Time complexity 0(2n)

Task3 – Matrix Multiplication

|  |  |  |
| --- | --- | --- |
|  | Time (seconds) | |
| Number of Elements (n) | Classical Method | Strassen’s Method |
| 2 | 0.00008345 | 0.00001907 |
| 4 | 0.00030279 | 0.00036764 |
| 8 | 0.00089955 | 0.00102854 |
| 16 | 0.00434351 | 0.01001096 |
| 32 | 0.04702997 | 0.06000876 |
| 64 | 0.41207314 | 0.41235685 |
| 128 | 2.89852786 | 3.17452908 |
| 256 | 22.56642699 | 19.65306091 |
| 512 | 184.20240760 | 134.35489249 |
| 1024 | Over 600 | Over 600 |