Matt Drill

COP4400

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Programming Assignment

Comparing the runtimes of different algorithms.

/Users/mddrill/IdeaProjects/COP4400/algorithm-comparisons.pdf

Comparison on a logarithmic scale (This wasn’t in the assignment, but it shows the merge and quicksorts more clearly)

/Users/mddrill/IdeaProjects/COP4400/algorithm-comparisons-logarithmic.pdf

|  |  |  |  |
| --- | --- | --- | --- |
| Insertion Sort |  |  |  |
| N of Elements | Actual Value | Theoretical value | Actual/Theoretical |
| 5000 | 5.1 | 25000000 | 0.000000204 |
| 10000 | 13.1 | 100000000 | 0.000000131 |
| 15000 | 22.9 | 225000000 | 1.01778E-07 |
| 20000 | 48 | 400000000 | 0.00000012 |
| 25000 | 62.4 | 625000000 | 9.984E-08 |
| 30000 | 105.8 | 900000000 | 1.17556E-07 |
| 35000 | 134.3 | 1225000000 | 1.09633E-07 |
| 40000 | 166.3 | 1600000000 | 1.03938E-07 |
| 45000 | 212.3 | 2025000000 | 1.0484E-07 |
| 50000 | 268.6 | 2500000000 | 1.0744E-07 |
| 55000 | 314.4 | 3025000000 | 1.03934E-07 |
| 60000 | 379.3 | 3600000000 | 1.05361E-07 |
| 65000 | 441.5 | 4225000000 | 1.04497E-07 |
| 70000 | 514.8 | 4900000000 | 1.05061E-07 |
| 75000 | 596.1 | 5625000000 | 1.05973E-07 |
| 80000 | 672.5 | 6400000000 | 1.05078E-07 |
| 85000 | 765.9 | 7225000000 | 1.06007E-07 |
| 90000 | 841 | 8100000000 | 1.03827E-07 |
| 95000 | 907.6 | 9025000000 | 1.00565E-07 |
| 100000 | 1032.7 | 10000000000 | 1.0327E-07 |
|  |  |  |  |
|  |  |  |  |
|  | Approxiate Hidden Constant | | 0.000000204 |
|  |  |  |  |
| Merge Sort |  |  |  |
| N of Elements | Actual Value | Theoretical value | Actual/Theoretical |
| 5000 | 1.2 | 61438.5619 | 1.95317E-05 |
| 10000 | 2.6 | 132877.1238 | 1.95669E-05 |
| 15000 | 2.2 | 208090.1232 | 1.05723E-05 |
| 20000 | 3.6 | 285754.2476 | 1.25982E-05 |
| 25000 | 4.8 | 365241.0119 | 1.3142E-05 |
| 30000 | 6.7 | 446180.2464 | 1.50164E-05 |
| 35000 | 6.4 | 528327.3556 | 1.21137E-05 |
| 40000 | 6 | 611508.4952 | 9.8118E-06 |
| 45000 | 5.2 | 695593.6821 | 7.47563E-06 |
| 50000 | 6.7 | 780482.0237 | 8.58444E-06 |
| 55000 | 6.9 | 866092.9199 | 7.96681E-06 |
| 60000 | 6.9 | 952360.4928 | 7.24516E-06 |
| 65000 | 8.2 | 1039229.886 | 7.89046E-06 |
| 70000 | 8.6 | 1126654.711 | 7.63322E-06 |
| 75000 | 9.4 | 1214595.223 | 7.7392E-06 |
| 80000 | 10 | 1303016.99 | 7.6745E-06 |
| 85000 | 11 | 1391889.894 | 7.90292E-06 |
| 90000 | 11.1 | 1481187.364 | 7.49399E-06 |
| 95000 | 11.2 | 1570885.79 | 7.12974E-06 |
| 100000 | 12.3 | 1660964.047 | 7.40534E-06 |
|  |  |  |  |
|  |  |  |  |
|  | Approxiate Hidden Constant | | 1.95669E-05 |
|  |  |  |  |
| Quicksort |  |  |  |
| N of Elements | Actual Value | Theoretical value | Actual/Theoretical |
| 5000 | 0.4 | 25000000 | 0.000000016 |
| 10000 | 0.7 | 100000000 | 0.000000007 |
| 15000 | 1.1 | 225000000 | 4.88889E-09 |
| 20000 | 1.8 | 400000000 | 4.5E-09 |
| 25000 | 2.1 | 625000000 | 3.36E-09 |
| 30000 | 2.9 | 900000000 | 3.22222E-09 |
| 35000 | 3.3 | 1225000000 | 2.69388E-09 |
| 40000 | 3.6 | 1600000000 | 2.25E-09 |
| 45000 | 4.3 | 2025000000 | 2.12346E-09 |
| 50000 | 4.9 | 2500000000 | 1.96E-09 |
| 55000 | 5.5 | 3025000000 | 1.81818E-09 |
| 60000 | 5.9 | 3600000000 | 1.63889E-09 |
| 65000 | 6.6 | 4225000000 | 1.56213E-09 |
| 70000 | 7.6 | 4900000000 | 1.55102E-09 |
| 75000 | 8.7 | 5625000000 | 1.54667E-09 |
| 80000 | 9.5 | 6400000000 | 1.48438E-09 |
| 85000 | 10.3 | 7225000000 | 1.42561E-09 |
| 90000 | 11.4 | 8100000000 | 1.40741E-09 |
| 95000 | 11.4 | 9025000000 | 1.26316E-09 |
| 100000 | 13.1 | 10000000000 | 1.31E-09 |
|  |  |  |  |
|  |  |  |  |
|  | Approxiate Hidden Constant | | 0.000000016 |