**CS575 Project 4**

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1. **What machine you ran this onText

   Description automatically generated**
2. **Show the table of performances for each array size and the corresponding speedups**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ARRAYSIZE | NonSimdMul | SimdMul | Speedup | NonSimdMulSum | SimdMulSum | Speedup |
| 1024 | 221.05 | 1818.88 | 8.23 | 223.52 | 1790.74 | 8.01 |
| 11264 | 222.34 | 1824.92 | 8.21 | 225.92 | 1825.6 | 8.08 |
| 21504 | 222.18 | 1674.08 | 7.53 | 225.99 | 1821.32 | 8.06 |
| 31744 | 221.66 | 1425.73 | 6.43 | 225.87 | 1796.59 | 7.95 |
| 41984 | 221.66 | 1385.8 | 6.25 | 225.83 | 1787.47 | 7.92 |
| 52224 | 221.48 | 1098.43 | 4.96 | 225.79 | 1777.31 | 7.87 |
| 62464 | 221.51 | 1295.63 | 5.85 | 225.78 | 1782.12 | 7.89 |
| 72704 | 221.44 | 1075.1 | 4.86 | 225.46 | 1608.57 | 7.13 |
| 82944 | 221.23 | 972.83 | 4.4 | 225.39 | 1473.14 | 6.54 |
| 93184 | 221.07 | 1071.06 | 4.84 | 225.5 | 1580.44 | 7.01 |
| 103424 | 220.99 | 1075.57 | 4.87 | 225.48 | 1585.92 | 7.03 |
| 113664 | 220.85 | 1067.18 | 4.83 | 225.36 | 1477.96 | 6.56 |
| 123904 | 220.81 | 1031.4 | 4.67 | 225.37 | 1470.27 | 6.52 |
| 134144 | 220.86 | 1069.11 | 4.84 | 225.87 | 1797.22 | 7.96 |
| 144384 | 221.38 | 1345.37 | 6.08 | 225.88 | 1796.81 | 7.95 |
| 154624 | 221.31 | 1346.48 | 6.08 | 225.87 | 1798.5 | 7.96 |
| 164864 | 221.3 | 1344.66 | 6.08 | 225.87 | 1798.31 | 7.96 |
| 175104 | 221.26 | 1357.14 | 6.13 | 225.87 | 1799.34 | 7.97 |
| 185344 | 221.21 | 1340.46 | 6.06 | 225.86 | 1797.87 | 7.96 |
| 195584 | 221.11 | 1332.78 | 6.03 | 225.79 | 1794.73 | 7.95 |
| 205824 | 220.98 | 1331.81 | 6.03 | 225.77 | 1796.33 | 7.96 |
| 216064 | 220.01 | 1303.67 | 5.93 | 225.79 | 1795.13 | 7.95 |
| 226304 | 219.9 | 1199.08 | 5.45 | 222.4 | 1720.1 | 7.73 |
| 236544 | 217.36 | 1173.44 | 5.4 | 224.71 | 1795.37 | 7.99 |
| 246784 | 220.16 | 1323.2 | 6.01 | 224.95 | 1791.23 | 7.96 |
| 257024 | 220.15 | 1325.99 | 6.02 | 224.97 | 1790.96 | 7.96 |
| 267264 | 220.17 | 1339 | 6.08 | 224.96 | 1787.97 | 7.95 |
| 277504 | 220.08 | 1301.74 | 5.91 | 224.93 | 1786.56 | 7.94 |
| 287744 | 220 | 1295.34 | 5.89 | 224.92 | 1782.65 | 7.93 |
| 297984 | 220.27 | 1299.74 | 5.9 | 225.07 | 1780.34 | 7.91 |
| 308224 | 220.46 | 1305.25 | 5.92 | 225.12 | 1777.83 | 7.9 |
| 318464 | 220.02 | 1300.3 | 5.91 | 224.86 | 1775.57 | 7.9 |
| 328704 | 220.05 | 1296.35 | 5.89 | 224.91 | 1767.77 | 7.86 |
| 338944 | 219.53 | 1291.06 | 5.88 | 224.91 | 1771.61 | 7.88 |
| 349184 | 219.86 | 1299.56 | 5.91 | 224.85 | 1772.07 | 7.88 |
| 359424 | 219.81 | 1296.55 | 5.9 | 224.81 | 1678.46 | 7.47 |
| 369664 | 213.97 | 1095.37 | 5.12 | 225.1 | 1773.04 | 7.88 |
| 379904 | 220.46 | 1302.11 | 5.91 | 227.26 | 1849.67 | 8.14 |
| 390144 | 224.07 | 1298.49 | 5.8 | 229.2 | 1850.4 | 8.07 |
| 400384 | 221.44 | 1304.41 | 5.89 | 225.07 | 1771.96 | 7.87 |
| 410624 | 220.2 | 1302.26 | 5.91 | 225.14 | 1772.03 | 7.87 |
| 420864 | 224.81 | 1327.27 | 5.9 | 225.02 | 1771.95 | 7.87 |
| 431104 | 223.26 | 1345.96 | 6.03 | 229.3 | 1847.5 | 8.06 |
| 441344 | 224.46 | 1331.46 | 5.93 | 227.42 | 1849.38 | 8.13 |
| 451584 | 222.02 | 1347.03 | 6.07 | 230.16 | 1849.55 | 8.04 |
| 461824 | 224.38 | 1325.11 | 5.91 | 228.98 | 1851.41 | 8.09 |
| 472064 | 221.81 | 1359.21 | 6.13 | 225.89 | 1849.61 | 8.19 |
| 482304 | 221.21 | 1339.34 | 6.05 | 228.12 | 1771.77 | 7.77 |
| 492544 | 221.95 | 1331.26 | 6 | 227.69 | 1847.89 | 8.12 |
| 502784 | 222.43 | 1320.24 | 5.94 | 226.69 | 1848.42 | 8.15 |
| 513024 | 221.4 | 1292.16 | 5.84 | 227.7 | 1770.36 | 7.78 |
| 523264 | 219.94 | 1295.18 | 5.89 | 224.82 | 1771.88 | 7.88 |
| 533504 | 222.32 | 1299.91 | 5.85 | 224.79 | 1771.33 | 7.88 |
| 543744 | 218.32 | 1315.67 | 6.03 | 224.53 | 1771.51 | 7.89 |
| 553984 | 219.37 | 1292.14 | 5.89 | 223.67 | 1771.59 | 7.92 |
| 564224 | 219.77 | 1288.6 | 5.86 | 227.91 | 1848.92 | 8.11 |
| 574464 | 222.38 | 1323.27 | 5.95 | 228.41 | 1852.84 | 8.11 |
| 584704 | 224.21 | 1319.69 | 5.89 | 228.34 | 1848.36 | 8.09 |
| 594944 | 221.87 | 1285.96 | 5.8 | 228.89 | 1853.49 | 8.1 |
| 605184 | 221.18 | 1295.06 | 5.86 | 226.71 | 1803.96 | 7.96 |
| 615424 | 218.95 | 1255.14 | 5.73 | 225.08 | 1771.23 | 7.87 |
| 625664 | 228.23 | 1293.63 | 5.67 | 235.19 | 1777.35 | 7.56 |
| 635904 | 229.39 | 1324.28 | 5.77 | 226.41 | 1776.49 | 7.85 |
| 646144 | 222.78 | 1315.24 | 5.9 | 226.87 | 1776.67 | 7.83 |
| 656384 | 221.47 | 1329.11 | 6 | 226.93 | 1853.92 | 8.17 |
| 666624 | 221.01 | 1297.46 | 5.87 | 226.31 | 1829.55 | 8.08 |
| 676864 | 220.63 | 1282.89 | 5.81 | 224.64 | 1779.4 | 7.92 |
| 687104 | 219.02 | 1298.47 | 5.93 | 227.36 | 1856.22 | 8.16 |

1. **Show the graph of SIMD/non-SIMD speedup versus array size (either one graph with two curves, or two graphs each with one curve)**

**Chart, line chart

Description automatically generated**

1. **What patterns are you seeing in the speedups?**

At the beginning, both speed ups start from 8, but as the data set size (array size) increase till around 100000, performance decreases. Then they start to increase, note that the increasing rates are quite similar. Afterwards, as the array size increase, both performances remain stable.

1. **Are they consistent across a variety of array sizes?**

Yes, they are relatively high in consistency across a variety of array size.

1. **Why or why not, do you think?**

Since SIMD represents “single instruction, multiple data”, we can infer that with the same (single) instruction, which in this case is array\*array, the result should be in relatively high consistency in terms of different array size.